MedGeo'17

7th International Conference on Medical Geology

August 28 - September 01, 2017
Moscow, Russia

Conference Materials

ORGANIZERS

Ministry of Natural Resources and Environment
of the Russian Federation

SUPPORTED BY

Ministry of Healthcare
of the Russian Federation

7th International Conference on Medical Geology (MedGeo 2017). Conference Materials, 28 August – 01 September 2017, Moscow, Russia/ Publishing House of I.M. Sechenov First MSMU, M.: 2017, 96 pp.

Приветствие Министра природных ресурсов и экологии Российской Федерации С.Е. Донского участникам VII Международной конференции по медицинской геологии

Приветствую участников и гостей VII Международной медико-геологической конференции (МедГео-2017).

В этом году Конференция впервые проходит на территории Российской Федерации. Наша страна уникальна разнообразием геологических обстановок, знание которых позволяет оценивать различные аспекты влияния геологических процессов и явлений на здоровье человека, изменение климата, состав воды и почв. Это чрезвычайно важно как для развития экономики, так и для обеспечения экологически безопасной среды проживания, защиты здоровья и осуществления профессиональной деятельности населения. В контексте текущего года, объявленного Президентом Российской Федерации В.В. Путиным Годом экологии, обсуждение этих тем приобретает особое звучание и значимость.

Конференция МедГео традиционно привлекает внимание большого количества участников, а обсуждаемые в ее рамках темы вызывают повышенный интерес у международной научной общественности. Уверен, что и нынешнее мероприятие не станет исключением из правил, и конференция МедГео-2017 в очередной раз станет эффективной площадкой для обмена знаниями и опытом, накопленными в различных областях естественных наук: медицине, геологии, экологии и биологии.

Итоги работы конференции должны стать хорошим стимулом для развития столь актуального направления науки, каким является медицинская геология, и обозначить новые пути исследований, направленных на охрану здоровья населения нашей Планеты.

Желаю участникам плодотворной работы, новых контактов и интересных идей!

Сергей Донской

Welcome Message to Participants of the 7th International Conference on Medical Geology MedGeo'17 from Sergei Donskoi, Minister of Natural Resources and Environment of the Russian Federation

It gives me great pleasure to welcome the participants and guests of the 7th IMGA International Conference on Medical Geology (MedGeo'17)".

This year the Conference is held for the first time on Russian Federation territory, which is unique in its variety of geological features. This diversity is required for the assessment of various properties of geological processes and phenomena influence, as well as for examination of the effects of climate change and water and soil composition on human health.

This is extremely important for both the economy's sustainable development and for ensuring a safe living environment, health protection, and ability for professional activity within the population. Vladimir Putin, President of the Russian Federation, has declared this year as the Year of Ecology in Russia because discussions of these topics are gaining particular importance in our country.

MedGeo traditionally attracts the attention of a large number of participants and the interest of the international scientific community because of the topics discussed during the Conference.

I am confident that this year's event will not differ in the amount of participation or importance to the scientific community. MedGeo'17 will be an effective platform for the exchange of knowledge and experiences accumulated in the various fields of natural sciences represented at the Conference: Medicine, Geology, Ecology and Biology.

The goal of the Conference is to create a stimulus for the further development of Medical Geology, a very topical area of science, and to identify new ways to conduct research. These outcomes are focused on protecting the health of the population on our Planet.

I wish you a successful Conference and fruitful discussion!

Faithfully yours,
Sergei Donskoi

Уважаемые коллеги!

Мы рады пригласить вас принять участие в **VII Международной конференции по медицинской геологии**, которая пройдет в Москве с **28 августа по 01 сентября 2017 года**. Проведение очередной конференции МЕДГЕО в столице России приурочено, в том числе, к 25-летнему юбилею Российского геологического общества (РОСГЕО).

В мероприятии примут участие специалисты из России, стран ближнего и дальнего зарубежья, а также многочисленные гости.

Организаторами конференции выступают Международная медико-геологическая ассоциация (ММГА-IMGA) и Российское геологическое общество (РОСГЕО), при поддержке федеральных органов исполнительной власти и профильных профессиональных организаций.

Международная медико-геологическая ассоциация (ММГА-IMGA) была основана в январе 2004 года. В настоящее время в составе ММГА-IMGA насчитывается примерно 300 членов из 50 стран мира. ММГА-IMGA объединяет в своих рядах геологов и представителей медико-биологического сообщества практически во всех частях света. Благодаря этому, актуальное научное направление, изучающее различные аспекты воздействия геологических объектов и процессов на здоровье людей, – медицинская геология получила в последние два десятилетия широкое распространение в мире и служит надежным мостом в отношениях между различными областями геологических наук, биологии и медицины.

Каждые два года ММГА-IMGA проводит Международную конференцию МЕДГЕО. РОСГЕО получило право на проведение МЕДГЕО 2017 года в России. Организаторы видят цель Конференции в консолидации усилий учёных и специалистов различных направлений естественных наук в деле поиска новых решений экологических и медицинских проблем, консолидации междисциплинарных исследований и обмена опытом представителей различных специальностей. На конференции участники имеют возможность познакомиться с новейшими результатами в области геохимии, биологии, геологии, геоэкологии, гидрогеологии, эпидемиологии, химии, медицины, диетологии и токсикологии, профессиональных заболеваний и др.

В программе Конференции запланированы пленарные и секционные заседания, круглые столы и семинары, экскурсии в музеи геологического и медицинского профиля, а также на природные объекты. Важной составляющей частью мероприятия станет выставка, на которой участники Конференции смогут ознакомиться с новинками и последними достижениями ведущих российских и мировых производителей оборудования и его приложений в области медицинской диагностики, анализа различных видов данных.

Благодаря участию в МЕДГЕО 2017 года, у вас будет уникальная возможность обменяться знаниями с коллегами со всего мира.

Будем рады видеть вас в числе участников **VII Международной конференции по медицинской геологии**!

С уважением,
Президент РОСГЕО,
Сопредседатель VII Международной
конференции по медицинской геологии

Орлов В.П.

Dear Colleagues!

On behalf of the Russian Geological Society, I am glad to invite you to participate in **the 7th International Conference on Medical Geology "MedGeo2017"** to be held in **Moscow, Russia, August 28 – September 1, 2017**.

The Russian Geological Society (ROSGEO) hosts the Conference with the support of the Ministry of Natural Resources and Ecology of Russian Federation, Ministry of Health Protection of Russian Federation and the International Medical Geology Association (IMGA).

The location of MedGeo2017 is chosen not by chance. On the one part, it is the first time when the Conference will take place in Russia, on the other part, Russia is famous for its mineral resources, which however affect health of the professionals and population, and thus there is a need to conduct further research and share information in this field of science. In addition, we are going to celebrate the 25th Anniversary of the Russian Geological Society, which is the initiator and one of the main organizers of MedGeo17.

Moscow, Russia is an exciting city to visit. Known as the "City on Seven Hills", it was founded in 1147 by Prince Yuri Dolgoruky and has the great history. Nowadays, Moscow is a modern multicultural metropolis with the population of more than 12 million people. The capital of Russia is perfect for business opportunities and cultural events. It is one of the best locations for welcoming people from all over the world.

Every two years participants gather for MedGeo Conferences, where they update the outstanding Scientific Program on the latest global perspectives on medical geology. MedGeo conference brings together geologists, geochemists, mineralogists, hydrologists, geophysicists, geographers, physicians, chemists, biologists, microbiologists, toxicologists, decision makers and others who study the effects of geological processes, objects, phenomena, materials (minerals, ores, volcano emissions, atmospheric dust, water and elements, falling into their composition and etc.) and other natural processes as well as terms under which such effects become possible.

The highly topical program of the Conference will include plenary lectures, keynote lectures, courses and workshops as well as field trips, which will give the participants the better understanding of the main issues on medical geology.

We believe that your attendance and active participation will guarantee the success of MedGeo2017 as it will be a unique opportunity to share knowledge with colleagues from all over the world.

We look forward to welcome you in Moscow in 2017!

Faithfully yours,
ROSGEO President
Co-Chairman of the 7th International
Conference on Medical Geology

Victor Orlov

Dear Friends
and Colleagues

On behalf of the International Medical Geology Association (IMGA), it is a great pleasure to welcome you to the 7th International Conference on Medical Geology (MEDGEO´17).

MEDGEO´17 brings together experts, professors, researchers, and students from the geosciences and bioscience fields to interchange advances in their research, to perform fruitful discussions and to stimulate interdisciplinary links. This 7th Conference will have also an outstanding impact on the consolidation of IMGA as an international platform for researchers and professionals working on environment, health, and related areas to meet and share the latest understanding of a wide range of naturally and environmental induced health issues.

The activities developed in MEDGEO´17 together with our association IMGA, contribute to improve all efforts that address local, national and global health impacts of environmental and natural factors promoting multidisciplinary actions.

We are sure that Medical Geology research is extremely promising and MEDGEO´ 17 contributions of senior and young colleagues compiled in this Book of Abstracts, will promote the international scientific exchange contributing to create healthier communities.

Once again, the International Medical Geology Association welcomes you to the seventh edition of its main scientific event, MEDGEO 17 in MOSCOW, hoping that friendship and professional contacts will strengthen in a very productive and outstanding international scientific meeting.

Prof. Nelly Mañay, PhD
IMGA chairperson

INTERNATIONAL SCIENTIFIC COMMITTEE

Nelly Mannay – University of the Republic of Uruguay, Uruguay – Chair;

Alper Baba – Izmir Institute of Technology, Turkey;

Carla Patinha – Universidade de Aveiro, Portugal;

Cassio Roberto da Silva – CPRM, Geological Survey, Brazil;

Chaosheng Zhang – NUI Galway, Ireland;

Diego Fridman – Director, Research Department, FUNCEI, Buenos Aires, Argentina;

Dra Laura Borgel – Toxicology and Risk Assessment Universidad de Chile Santiago de Chile, Chile;

Eduardo Ferreira da Silva – Universidade de Aveiro/GeoBioTec, Portugal;

Fernando P. Carvalho – IST University of Lisbon, Portugal;

Fetullah Arik – Selçuk University, Konya, Turkey;

Gurhan Yalcin – Akdeniz University, Turkey;

Hassina Mouri – University of Johannesburg, South Africa;

Héctor Rubio – College of Animal Production and Ecology Autonomous University of Chihuahua Chihuahua, México;

Igor Pechenkin – Russian Geological Society, Russia;

Iosif Volfson – Russian Geological Society, Russia;

Jose Centeno – US Food and Drug Administration, United States of America;

Krasimira Staneva – Bulgarian Association on Geomedicine and Geotherapy (BAGG), Bulgaria;

Leonid Rikhvanov -Tomsk Polytechnic University, Russia;

Maria Aurora Armienta – Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México;

Mark Cave – British Geological Survey, Keyworth, Nottingham, United Kingdom;

Natalia Baranovskaya – Tomsk Polytechnic University, Russia;

Nurdane Ilbeily – Akdeniz University, Turkey;

Olle Selinus – Linneus University Kalmar, Sweden;

Prosun Bhattacharya – KTH Royal Institute of Technology, Sweden;

Robert Finkelman – University of Dallas, United States of America;

Robert Walinder – Universtiy of Uppsala, Sweden;

Saverio Fiori – University of Bari, Italy.

ORGANIZING AND EXECUTIVE COMMITTEE

Chairman:

Victor Orlov	President of ROSGEO, PhD in Economy;

Cochairmen:

Sergey Donskoy	Minister of Ministry of Natural Resources and Environment of the Russian Federation, Russia
Vladimir Zakharov	Head of Scientific and Expert Center of Sustainable Development and Environmental Health, IDB RAS, Doctor of Biological Sciences, Professor, Corresponding Member of the Russian Academy of Sciences;
Dmitry Puscharovsky	Dean of the Faculty of Geology, Moscow State University, Doctor of Geological and Mineralogical Sciences, Professor, Honored Scientist of the Russian Federation;

Vice Chairman:

Evgeny Farrakhov	1st. Vice-President ROSGEO, PhD in Technical sciences;

Members of the Executive Committee:

Iosif Volfson	IMGA Chapter NIS, Chair, ROSGEO Science Secretary, PhD in Mineralogy & Geochemistry;
Vladimir Syvorotkin	Head of Seminar "Planet Earth" at Lomonosov Moscow State University Geology Department, Doctor of Sciences in Geology;
Yulia Bespalova	Tyumen State Oil and Gas University;
Azariy Gamburtsev	Head Scientific Specialist of Schmidt Institute of Physics of the Earth;
Lyudmila Dasaeva	Head Scientific Specialist of the Russian Research Center of Gerontology, Doctor of medical science;
Alexandr Vikulin	Head Scientific Specialist of the Institute Volcanology and Seismology of Russian Academy of Sciences, the Far East branch, Doctor of Physics and Mathematics;
Marina Prozorova	ROSGEO Bookkeeper Deputy, PhD in Mineralogy;
Irina Lugovskaya	Science Secretary of Fedorovsky VIMS Scientific Research Institute, Moscow, Doctor of Sciences in Geology;

Members of the Organizing Committee:

Victor Trofimov	Head of Department of Engineering and Ecological Geology, Moscow State University, Doctor of Geological and Mineralogical Sciences, Professor;
Victor Starostin	Head of Petroleum Geology Department, Moscow State University, Doctor of Geological and Mineralogical Sciences, Professor;
Oxana Pikhur	ROSGEO Medical Geology Division Saint-Petersburg branch, Chair, PhD in Medical sciences;
Olga Menchinskaya	ROSGEO Medical Geology Division. Advisor in urban medical geology, PhD in Geology & Geochemistry;
Alexei Starodubov	ROSGEO Medical Geology Division. Advisor in radiogeoecology, PhD in Geology;
Alexandr Gulynin	ROSGEO Medical Geology Division. Advisor in veterinary & radiogeoecology, PhD in Biological sciences;
Armen Saghatelyan	IMGA Chapter NIS, Head of the Armenian branch, Doctor of Sciences in Geology & Geochemistry;

Olga Belyayeva	IMGA Chapter NIS, member of the Armenian branch, PhD in Geology & Geochemistry;
Lilit Sahakyan	IMGA Chapter NIS, member of the Armenian branch, PhD in Geography;
Georgy Rud'ko	IMGA Chapter NIS, Head of the Ukranian branch, Doctor of Sciences in Geology, Geography, & Economics;
Farah Velieva	IMGA Chapter NIS, Head of the Azerbaijan branch, PhD in Geology & Geochemistry;
Elena Kremkova	Doctor of Sciences in Medicine, Russian State Medical University, Moscow;
Alexandr Vercheba	Doctor of Sciences in Geology, Institute of Mineral Resources of Moscow Geological Prospecting University, Director;
Leonid Rikhvanov	Doctor of Sciences in Geology, Head of the Chair of Mineral Resources and Geochemistry of Radioactive Elements and REE's at Tomsk Polytechnic University;
Natalya Baranovskaya	Doctor of Sciences in Biology, Head of the Department of Foreign Affairs at Tomsk Polytechnic University;
Olga Frank-Kamenetskaya	Doctor of Sciences in Geology, professor of Geology Department of Saint-Petersburg State University;

Venue Coordinator:

Natalia Usova	Trialogue Ltd.;

Technical Program Coordinators:

Vladimir Gavrilenko	IMGA Chapter NIS, executive committee member, Doctor of Sciences in Geology;
Dmitry Vlasov	Saint-Petersburg Society of Naturalists, President, Doctor of Sciences in Biology;
Julia Plotkina	IMGA Chapter NIS executive committee Member, PhD in Mineralogy;

Short Course (Workshop) Coordinators:

Igor Pechenkin	IMGA Chapter NIS executive committee member, Doctor of Sciences in Geology;
Elena Panova	IMGA Chapter NIS, executive committee member, Doctor of Sciences in Geology;
Vladimir Chelibanov	Saint-Petersburg Society of Naturalists member of the board, OPTEC company, Director, PhD in Chemistry;

Field Trip Coordinators:

Victor Garanin	Director of Fersman Mineralogy Museum of Russian Academy of Sciences, Doctor of Sciences in Geology;
Tatyana Suvorova	Director of Kaliningrad Regional Amber Museum;
Irina Polyakova	Head Scientific Specialist, Kaliningrad Regional Amber Museum, PhD in Philosophy;

Publicity Coordinator:

Alexander Prokin	1st Geological Internet Chanel, Director;
Vadim Kantor	GREENPEACE, photographer, observer.

GENERAL INFORMATION

1. Registration and Information Desk:

1. The Registration Desk is located at 2nd floor at Topaz Hall

28 August 2017 from 08:00 till 18:00

29 August 2017 from 08:00 till 18:00

30 August 2017 from 08:00 till 18:00

31 August 2017 from 08:00 till 18:00

01 September 2017 from 08:00 till 14:00

2. Slides – preview:

We kindly ask you to submit your presentations IN ADVANCE to a technical specialist at the Registration Desk.

IMPORTANT!!!

When you create a file in Power Point for your presentation, please make sure that all graphics are included into the presentation file. Fonts should be standard, for example, Times New Roman, Arial or Courier. If you want to use non-standard fonts, they should be included in the presentation file. We also ask you to set the size of the slide "Screen".

Presentation timings:

It is extremely important to the success of the event that speakers respect the time schedule. For standard presentations, the allotted time is 15 minutes. Please plan your presentation in a way that it will not exceed the allocated time and will allow some questions within your allotted time.

Equipment for presentation:

PowerPoint (OS: Windows XP, Russian version; Software: Microsoft PowerPoint 2007) and LCD with a resolution of at least 1024X768 dots per inch. Private computers cannot be allowed to be used for the sessions.

Each session hall is equipped with PC laptop computer, one data/video projector and one large screen.

Please provide your presentation on a CD-ROM or USB memory stick ("flash drive") for a technical expert beforehand. CD-ROMs in Microsoft Windows or USB memory sticks ("USB flash drives") are accepted. The file name should contain your name. The presentation should be prepared in Microsoft PowerPoint 2003 or 2007.

3. Certificates of Participation:

Certificates of Participation will be included into the Conference Kit. A certificate about oral/poster presentations will be available upon request.

4. Meals for participants:

Coffee breaks will be arranged in the Exhibition hall of the Salut Hotel (2nd floor).

29 August 2017 – 10.00–10.30; 16.00–16.30

30 August 2017 – 10.30–11.30; 16.30–17.00

31 August 2017 – 10.30–12.00; 16.30–17.00

01 September 2017 – 10:30–11:00

5. Exhibition:

The important component of the event will be the exhibition at which the participants will be able to get acquainted with new scientific results and underlying theoretical approaches.

If you have any questions, please do not hesitate to contact the Registration Desk during the whole event.

Contacts:

tel.: + 7 (926) 848-23-58, +7 (919) 760-80-98
Email: medgeo2017@confreg.org

CONFERENCE VENUE

HOTEL SALUT 4*, MOSCOW

Hotel Salut 4* is located in the South-West of Moscow from airport Vnukovo side and connected with Sheremetyevo and Domodedovo airports by the Moscow Ring Road. Perfect transport connection, closeness to Yugo-Zapadnaya metro station and Vernadskogo and Leninskiy prospects, make it easy for the guests to reach any destination within Moscow in a fast and comfortable way. Combination of services meeting any needs of our guests, comfort of living, hotel location and prices make Hotel Salut 4* one of the most popular hotels in Moscow. The whole Hotel Salut 4* staff does the best to meet the demands of the clients by giving good and various services.

Address: 119571, Moscow,
Leninskiy prospect, 158

Yugo-Zapadnaya and Troparevo metro stations (15 minutes on foot, the hotel provides a free shuttle to the metro station Yugo-Zapadnaya according to schedule).

Salut Hotel has wide range of bars and restaurants where one can have a tasty dinner and have a good time – starting from haute cuisine restaurant for real gourmets to a traditional café with perfect coffee, light snacks and desserts.

Also Salut Hotel has wide opportunities for conducting negotiations, presentations, seminars, conferences and trainings.

HOW TO REACH THE SALUT HOTEL:

From metro station: Troparevo (Sokolnicheskaya Line)

Exit to the Ruzskaya street, further along the underground passage to the side of Leninsky Prospekt (traffic towards the city center), then 900 meters straight forward on foot or by any transport (the second stop is required).

From metro station: Yugo-Zapadnaya (Sokolnicheskaya Line)

The first car from the city center, exit to the left along the underground passage, exit from the metro to the city to the left. On the right side (26, Baku Commissars Street) there is a stop of municipal passenger transport, bus number 720 to the stop "Hotel Salut" (the third stop is required).

From metro station: Leninskiy Prospect (Kaluzhsko-Rizhskaya Line)

The first car from the center, opposite the exit from the metro take the city mini bus number 553 to the stop "Hotel Salut".

From metro station: Oktyabrskaya (Kaluzhsko-Rizhskaya Line)

Exit to the city, to the right of the metro exit take the city bus number 144 (express train) to the stop "Hotel Salut".

FREE SHUTTLE FROM THE SALUT HOTEL
(BUS WITH THE HOTEL LOGO)

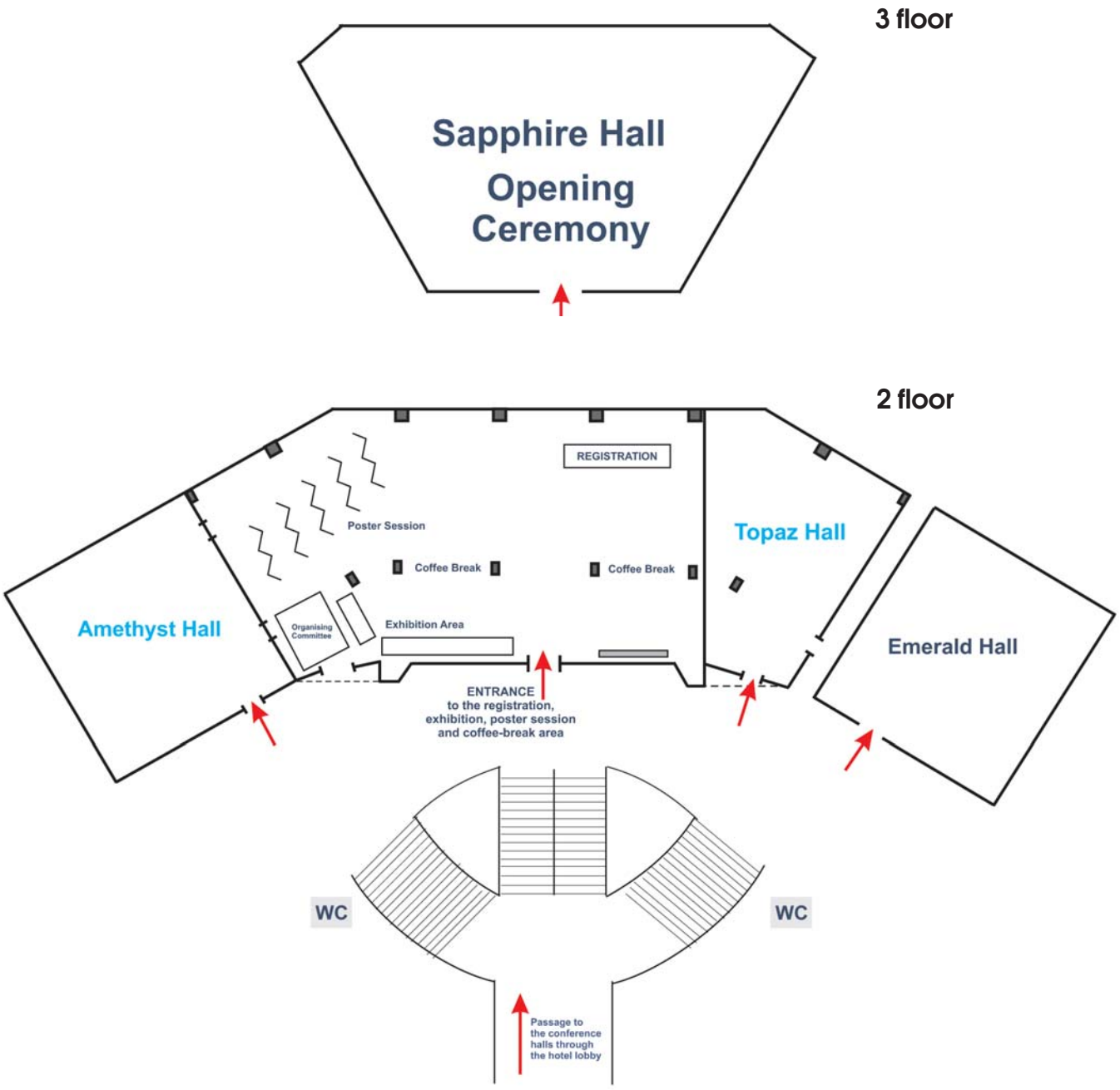
Working hours: every day from 07.30 to 19.30
(with a break from 13.00 to 14.00.)

Meeting Place: Main Entrance of the Hotel

Route: To Metro Station "Yugo-Zapadnaya".

LOCATION PLAN

VENUE PLAN


3 floor
Sapphire Hall
Opening Ceremony
2 floor
REGISTRATION
Poster Session
Coffee Break
Coffee Break
Topaz Hall
Amethyst Hall
Organising Committee
Exhibition Area
Emerald Hall
ENTRANCE
to the registration,
exhibition, poster session
and coffee-break area
WC
WC
Passage to
the conference
halls through
the hotel lobby

TIMETABLE

27 August 2017, Sunday					
10.00-18.00	Excursions				
28 August 2017, Monday					
12.00-17.00	Pre-registraion				
10.00-17.00	Excursions				
09.00-18.00	***Workshop: FUNDAMENTALS OF MEDICAL GEOLOGY*** Jose Centeno, Robert B. Finkelman, Chaosheng Zhang, Saverio Fiore				
18.00-21.00	City tour (included in the registration fee)				
29 August 2017, Tuesday					
Hall	**Sapphire**				
09.00-09.30	Opening Ceremony				
09.30-09.45	Documentary about RosGeo				
09.45-10.00	Surprise for participants				
10.00-10.30	Coffee Break Opening Exhibition				
Chair	***Davies Theophilus Clavell,*** *University of Nigeria, Nigeria* ***Vladimir Zakharov,*** *Head of the Center of Sustainable Development and Environmental Health, Koltzov Institute of Developmental Biology of Russian Academy of Sciences, Moscow, Russia*				
10.30-11.30	**PL-01** Plenary lecture: **Jose Centeno, US Food and Drug Administration, USA** Health and Earth - Medical Geology: Building a Safer Environment				
11.30-12.30	**PL-02** Plenary lecture: **Yanxin Wang, China University of Geosciences, China** Geo-statistical Analysis of Urinary Stone Disease Prevalence in China				
Hall	**Amethyst**	**Hall**	**Topaz**	**Hall**	**Emerald**
12.30-13.30	**Occupational Health Issues (OH)**	**12.30-13.30**	**Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)**	**12.30-13.30**	**Arsenic and Other Toxianions in the Environment (ATE)**
Chair	***Iosif Volfson,*** *Russian Geological Society, ROSGEO, Russia*	*Chair*	***Davies Theophilus Clavell,*** *University of Nigeria, Nigeria*	*Chair*	***Jose Centeno,*** *US Food and Drug Administration, USA*
13.30-14.30	Break				
Hall	**Amethyst**	**Hall**	**Topaz**	**Hall**	**Emerald**
14.30-16.00	**Occupational Health Issues (OH)**	**14.30-16.00**	**Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)**	**14.30-16.00**	**Arsenic and Other Toxianions in the Environment (ATE)**
Chair	***Diego Fridman,*** *FUNCEI, Argentina*	*Chair*	***Syed E Hasan,*** *University of Missouri, USA* ***Carla Patinha,*** *University of Aveiro, Portugal*	*Chair*	***Prosun Bhattacharya,*** *KTH Royal Institute of Technology, Sweden* ***Nelly Manay,*** *University of the Republic (UdelaR), Montevideo-Uruguay*
16.00-16.30	Coffee Break				
Hall	**Amethyst**	**Hall**	**Topaz**	**Hall**	**Emerald**
16.30-18.00	**Occupational Health Issues (OH)**	16.30-18.00	**Environmental Geochemistry (EG)**	16.30-18.00	**Arsenic and Other Toxianions in the Environment (ATE)**

Chair	***Olga Denisova,*** *Siberian State Medical University, Russia* ***Katarina Fajcikova,*** *State Geological Institute of Dionyz Stur, Slovakia*	*Chair*	***Farah Fuad Mahmudova,*** *Institute of Geology and Geophysics, National Academy of Sciences, Republic of Azerbaijan*	*Chair*	***Yamin Deng,*** *China University of Geosciences, China*
18.00-21.00	Welcome Reception (included in the registration fee)				
30 August 2017, Wednesday					
Hall	**Amethyst**		**Hall**	**Topaz**	
09.00-10.30	**Occupational Health Issues and Medical Problems of Mining Areas (OH)**		**09.00-10.30**	**Radioactivity, Radio Geoecology and Human Health (RRG)**	
Chair	***Maria Aurora Armienta,*** *Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México*		*Chair*	***Bonotto Daniel Marcos,*** *IGCE-UNESP, Brazil* ***Natalya Baranovskaya,*** *National Research Tomsk Polytechnic University, Russia*	
10.30-11.30	Poster session, Coffee Break				
Hall	**Amethyst**				
Chair	**Natalia Baranovskaya,** *National Research Tomsk Polytechnic University, Russia*				
11.30-12.30	**Plenary lecture (PL-03):** Africa: A natural laboratory for medical geology investigations **Hassina Mouri, University of Johannesburg, Republic of South Africa**				
12.30-13.00	Keynote lecture **(KL-06)**: Environmental health impact of past uranium mining **Fernando Carvalho, Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal**				
Hall	**Amethyst**		**Hall**	**Topaz**	
13.00-14.00	**Soils in Medical Geology and Environmental Geochemistry (S)**		13.00-14.00	**Radioactivity, Radio Geoecology and Human Health (RRG)**	
Chair	***Hassina Mouri,*** *University of Johannesburg, Republic of South Africa*		*Chair*	***Fernando Carvalho,*** *Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal* ***Igor Pechenkin,*** *All-Russian Research Institute for Mineral Resoureces named after N. Fedorovsky, VIMS, Moscow*	
14.00-15.00	Break				
Hall	**Amethyst**		**Hall**	**Topaz**	
15.00-16.30	**Soils in Medical Geology and Environmental Geochemistry (S)**		15.00-16.30	**Water and Human Health (WHH)**	
Chair	***Lilit Sahakyan,*** *Center of Environmental and Noospheric Research, National Academy of Sciences, Armenia*		*Chair*	***Leonid Elpiner,*** *Institute for Water Problems RAS, Moscow, Russia*	
16.30-17.00	Coffee Break				
Hall	**Amethyst**		**Hall**	**Topaz**	
17.00-18.00	**Soils in Medical Geology and Environmental Geochemistry (S)**		17.00-18.00	**Water and Human Health (WHH)**	
Chair	***Gurhan YALCIN,*** *Akdeniz University, Turkey*		*Chair*	***Fetullah Arik,*** *Selcuk University, Turkey*	
Hall	**Amethyst**				
18.00-19.30	IMGA General Assembly and Bussiness Meeting				
18.00-22.00	City tour (included in the registration fee)				

31 August 2017, Thursday			
Hall	**Amethyst**	**Hall**	**Topaz**
09.00-10.30	**Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)**	**09.00-10.30**	**Water and Human Health (WHH)**
Chair	***Vladimir Gavrilenko,*** *Herzen State Pedagogical University, Saint Petersburg, Russia*	*Chair*	***Alena Drazdova,*** *Republican unitary enterprise «Scientific practical center of hygiene», Belarus*
10.30-12.00	Poster session, Coffee Break		
Hall	**Amethyst**		
12.00-13.00	Plenary lecture **(PL-04)**: **Finkelman Robert Barry, University of Texas at Dallas, USA** Health Benefits of Geologic Materials and Geologic Process		
Hall	**Amethyst**	**Hall**	**Topaz**
13.00-14.00	**Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)**	**13.00-14.00**	**Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)**
Chair	***Robert Barry Finkelman,*** *University of Texas at Dallas, USA*	*Chair*	***Iosif Volfson,*** *Russian Geological Society, ROSGEO, Russia*
14.00-15.00	Break		
Hall	**Amethyst**	**Hall**	**Topaz**
15.00-16.30	**Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)**	**15.00-16.30**	**Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)**
Chair	***Cristiana Costa,*** *University of Aveiro, Department of Geosciences, Aveiro, Portugal*	*Chair*	***Chaosheng Zhang,*** *National University of Ireland, Ireland*
16.30-17.00	Coffee Break		
Hall	**Amethyst**	**Hall**	**Topaz**
17.00-18.15	**Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)**	**17.00-18.15**	**Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)**
Chair	***Karakaya Çelik Muazzez, Necati Karakaya,*** *Selcuk University, Turkey,* ***El Ghalbi Khallaf,*** *University Mohamed Premier, Morocco*	*Chair*	***Rodrigues - Sonia - Morais,*** *University of Aveiro, Portugal*
19.00	Dinner		
01 September 2017, Friday			
Hall	**Amethyst**		
09.00-10.30	**Medical Geology, Public Health and Regulatory Sciences (MG)**		
Chair	***Jose Centeno,*** *US Food and Drug Administration, USA* ***Vladimir Zakharov,*** *Head of the Center of Sustainable Development and Environmental Health, Koltzov Institute of Developmental Biology of Russian Academy of Sciences, Moscow, Russia*		
13.00-13.30	Closing Ceremony		

PROGRAM

29 August 2017, Tuesday					
Hall	**Sapphire**				
09.00-09.30	Opening Ceremony				
09.30-09.45	Documentary about RosGeo				
09.45-10.00	Surprise for participants				
10.00-10.30	Coffee Break Openning Exhibition				
Chair	***Davies Theophilus Clavell,*** *University of Nigeria, Nigeria* ***Vladimir Zakharov,*** *Head of the Center of Sustainable Development and Environmental Health, Koltzov Institute of Developmental Biology of Russian Academy of Sciences, Moscow, Russia*				
10.30-11.30	**PL-01** **Jose Centeno, US Food and Drug Administration, USA** Health and Earth - Medical Geology: Building a Safer Environment				
11.30-12.30	**PL-02** **Yanxin Wang, China University of Geosciences, China** Geo-statistical Analysis of Urinary Stone Disease Prevalence in China				
Hall	**Amethyst**	**Hall**	**Topaz**	**Hall**	**Emerald**
12.30-13.30	**Occupational Health Issues (OH)**	**12.30-13.30**	**Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)**	**12.30-13.30**	**Arsenic and Other Toxianions in the Environment (ATE)**
Chair	***Iosif Volfson****, Russian Geological Society, ROSGEO, Russia*	*Chair*	***Davies Theophilus Clavell,*** *University of Nigeria, Nigeria*	*Chair*	***Jose Centeno,*** *US Food and Drug Administration, USA*
12.30-13.00	**KL-01** ***Diego Fridman, FUNCEI, Argentina*** Environmental Epidemiology and Health Effects of Mining in Argentina	12.30-13.00	**KL-02** ***Syed E Hasan, University of Missouri, USA*** Total Health Initiative and Medical Geology: Need for a Fresh Perspective	12.30-13.00	**KL-04** ***Nelly Manay, University of the Republic (UdelaR), Montevideo-Uruguay*** Estimating Low-dose Health Risks from Environmental Arsenic in Uruguayan Populations
13.00-13.30	***Anatoly V. Skalny*****,** Trace elements in medicine in Russia. Trace Element – Institute for UNESCO, Lyon (France), Moscow (Russia)	13.00-13.30	**KL-03** ***Carla Patinha, University of Aveiro, Portugal*** Total and Bioaccessible PTEs Levels in Urban Street Dusts from Two Cities of Portugal under Different Anthropogenic Pressures	13.00-13.30	**KL-05** ***Prosun Bhattacharya, KTH Royal Institute of Technology, Sweden*** Arsenic and Fluoride in Groundwater – Health Problems of Global Concern and Sustainable Mitigation
13.30-14.30	Break				
Hall	**Amethyst**	**Hall**	**Topaz**	**Hall**	**Emerald**
14.30-16.00	**Occupational Health Issues (OH)**	**14.30-16.00**	**Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)**	**14.30-16.00**	**Arsenic and Other Toxianions in the Environment (ATE)**
Chair	***Diego Fridman,*** *FUNCEI, Argentina*	*Chair*	***Syed E Hasan,*** *University of Missouri, USA* ***Carla Patinha,*** *University of Aveiro, Portugal*	*Chair*	***Prosun Bhattacharya,*** *KTH Royal Institute of Technology, Sweden*

14.30-14.45	**OH-01** Mercury Contamiation to the Environment and Health Impacts by Small and Large Scale Hg Mining Activities in China **Xinbin Feng, Institute of Geochemistry, CAS, China**	14.30-15.00	**UMG-01** Distribution and Health Risk Assessment of Hexachlorocyclohexanes (HCHs) in Urban Soils with Various Types of Land Use in Beijing, China **Xia Xinghui, Beijing Normal University, China**	14.30-15.00	**ATE-02** Spatial Distribution and Risk Assessment of As and Metals in Sediment of Kocacay River Impacted by Historical Pb-Zn Mine Wastes **BALCI Nurgul, Istanbul Technical University, Turkey**
14.45-15.00	**OH-02** Potential Health Effects of Pollution of Soils and Dusts around Metal Recycling Factories in South-western Nigeria **Akinade Shadrach Olatunji, University of Ibadan, Nigeria**				
15.00-15.15	**OH-03** The Impact of Potentially Toxic Elements on the Health Status of Residents Living in Historical Mining Areas, Slovak Republic **Rapant Stanislav, State Geological Institute of Dionyz Stur, Slovakia**	15.00-15.15	**UMG-02** Urban Geochemistry of African Megacities **Davies Theophilus Clavell, University of Nigeria, Nigeria**	15.00-15.15	**ATE-03** Mercury Isotopes Link the Source and Biomarkers in Human Mercury Exposure **Li Ping, Institute of Geochemistry, Chinese Academy of Sciences**
15.15-15.30	Universal Cell ICP-MS and Single Particle ICP-MS for Radio Geoecological and Ocupational Health Studies **Petr Timofeev, Scheltec AG, Moscow, Russia**	15.15-15.30	**UMG-03** Correlative Relationships Between the Properties of Bricks Made With Fly Ash **Yalcin Fusun, Akdeniz University, Turkey**	15.15-15.30	**ATE-04** Geographical Clustering of Urinary Stone Disease in China: a Geo-environmental Perspective **Yang Yijun, China University of Geosciences, China**
15.30-15.45	**OH-04** Sarcoidosis in Terms of Medical Geology **Olga Denisova, Siberian State Medical University, Russia**	15.30-15.45	**UMG-04** Geochemical Assessment of Fate and nature of Potentially Toxic Elements in Selected Nigerian Cities **Akinade Shadrach Olatunji, University of Ibadan, Nigeria**	15.30-15.45	**ATE-05** Geographic Variation Between Arsenic in Drinking Water and the Occurrence of Chronic Kidney Disease: A Nationwide Population-Based Study in Taiwan **Guo How-Ran, National Cheng Kung University, Taiwan**
15.45-16.00	**OH-05** Chemical Composition of the Placenta Biopsies as an Indicator of Enterprise Technogenic Impact on the Environment **Alexandra Belyanovskaya, National Research Tomsk Polytechnic University, Russia**	15.45-16.00	**UMG-05** Professor T. G. Ilyina Contribution in Formation of Medical Geology Fundamentals **Igor Pechenkin, All-Russian Research Institute for Mineral Resourses, Moscow, Russia**	15.45-16.00	**ATE-06** We Use the Phosphorus and Other Fertilizers. Is It Dangerous? **Evgeniya Vasileva, Dmitry Mendeleev University of Chemical Technology of Russia, Russia**
16.00-16.30	Coffee Break				

Hall	Amethyst	Hall	Topaz	Hall	Emerald
16.30-18.00	**Occupational Health Issues (OH)**	16.30-18.00	**Environmental Geochemistry (EG)**	16.30-18.00	**Arsenic and Other Toxianions in the Environment (ATE)**
Chair	***Olga Denisova,*** *Siberian State Medical University, Russia*	*Chair*	***Farah Fuad Mahmudova,*** *Institute of Geology and Geophysics, National Academy of Sciences, Republic of Azerbaijan*	*Chair*	***Nelly Manay,*** *University of the Republic (UdelaR), Montevideo-Uruguay*
16.30-16.45	**OH-06** High Mo Concentrations in Areas with Coalcombustion Related Endemic Fluorosis: Emerging Metal Toxin? **Haiyan Chen, Chinese Academy of Sciences, China**	16.30-16.45	**EG-01** Soil Carbonate Minerals and Food Safety: A Field Investigation from the Yangtze River Delta, China Li-Wei**, Nanjing University, China**	16.30-16.45	**ATE-07** Bromine in the Environment and its Impact on Human Health **Tatiana Perminova, University of Technology of Troyes, France**
16.45-17.00	**OH-07** The Impact of Geological Factors on Prevelance of Type 2 Diabetes in the Republic of Bashkortostan **Iskhak Farkhutdinov, Bashkir State University, Russia**	16.45-17.00	**EG-02** Mercury in Amazon Rainforest Soils, Brazil **Figueiredo Bernardino Ribeiro, University of Campinas, Brazil**	16.45-17.00	**ATE-08** Arsenic in Groundwater of Daghestan Republic **Tamila Abdulmutalimova, Dagestan Scientific Center of the Russian Academy of Science, Russia**
17.00-17.15	**OH-08** The potential Environmental & Health Implications from Bauxite Tailings Dust: a Pilot Study in Jamaica **Shields Rahje Jared, University of the West Indies, Jamaica**	17.00-17.15	**EG-03** Sanitary Functions of Soil **Tatiana Zubkova, Lomonosov Moscow State University, Russia**	17.00-17.15	**ATE-09** The main directions of the environmental justification for the development of Elans and Jolkinsks copper-nickel deposits **Irina Kosinova, Voronezh State University, Russia**
17.15-17.30	**OH-09** Problems Using Mercury In Local Mining, Pasaman District Of Indonesia **Aminuddin, Geological Agency of the Ministry of Energy and Mineral Resources, Indonesia**	17.15-17.30	**EG-04** Distribution of Germanium in Soils in the Southeast and Part of the Northeast of Brazil and its Importance for Human Health **Cássio Roberto da Silva, CPRM - Geological Survey of Brazil, Brazil**	17.15-17.30	**ATE-10** High As and F concentrations in drinking waters of southern Pampean Plain, Argentina—Health Impact Study **Datta Saugata, Kansas State University, USA**
17.30-17.45	**OH-10** To the Proposal of Medical Geology Research on the Territory of Kamchatka Peninsula (Russia) **Iosif Volfson, Rosgeo, Russia**	17.30-17.40	**EG-05** Heavy Metal Distribution of Stream Sediments in Gürkuyu Sb Mineralization (Gediz-Kütahya, NW Turkey) **Arif Delikan, Selcuk University, Turkey**	17.30-17.45	**ATE-11** Interconnections of Chemical Composition of Anthropogenic Carbonates and Human Health Data **Bulat Soktoev, National Research Tomsk Polytechnic University, Russia**
		17.40-17.50	**EG-06** Environmental geochemistry in stream sediments from the Pınarbaşı Pb-Zn mineralization (Gediz-Kütahya, NW Turkey) **Fetullah ARIK, Selcuk University, Turkey**		
17.45-18.00	**OH-11** Localizing Crystal-sites of Long-term Radical Formation in Weathered Chrysotile Asbestos **Martin Walter, University of Vienna, Austria**	17.50-18.00	**EG-07** Heavy metal distribution in the southern Meram region (Konya-Turkey), which is a newly urbanization area **Fetullah ARIK, Selcuk University, Turkey**	17.45-18.00	**ATE-12** Drinking Water (Ground and Surface), Iron Overload and Liver Pathology **Abdeldayem Raafat, Egypt**
18.00-21.00	Welcome Reception (included in the registration fee)				

30 August 2017, Wednesday			
Hall	**Amethyst**	**Hall**	**Topaz**
09.00-10.30	**Occupational Health Issues and Medical Problems of Mining Areas (MA)**	**09.00-10.30**	**Radioactivity, Radio Geoecology and Human Health (RRG)**
Chair	***Maria Aurora Armienta,*** *Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México*	*Chair*	***Bonotto Daniel Marcos,*** *IGCE-UNESP, Brazil*
09.00-09.15	**MA-01** Spatial Distribution and Risk Assessment of As and Metals in Sediment of Kocacay River Impacted by Historical Pb-Zn Mine Wastes **Balci Nurgul, Istanbul Technical University, Turkey**	09.00-09.15	**RRG-01** High Natural Radioactivity in the Soils as a Reason of Radioecological Problems **Anastasia Zlobina, National Research Tomsk Polytechnic University, Russia**
09.15-09.30	**MA-02** Uptake of metal(loid)s by Cabbage (Brassica olerácea L.) and chemical risk of consumption in contaminated soils from tungsten mines in Portugal **Paula Freire Ávila, National Laboratory of Energy and Geology, Portugal**	09.15-09.30	**RRG-02** Mineralogical and Geochemical Composition of Human Body Ash Residue as Reflection of Environmental Factors **Maria Deriglazova, National ResearchTomsk Polytechnic University, Russia**
09.30-09.45	**MA-03** Impact of Heavy Metals Contamination by Artisanal Gold Mining at Jatiroto Village, Wonogiri District, Central Java, Indonesia on Stream Sediment **Budianta Wawan, Gadjah Mada University, Indonesia**	09.30-09.45	**RRG-03** Anomalous Concentrations of Radionuclides in Groundwater of Ede Area, Southwestern Nigeria: a Direct Impact of Metamictization? **Dr. A. Adetunji, Obafemi Awolowo University, Nigeria**
09.45-10.00	**MA-04** Population Morbidity Due to Liquidation of Coal Deposits in Ukraine **Georgii Rudko, State Commission of Ukraine for Mineral Reserves, Ukraine**	09.45-10.00	**RRG-04** Areas with a High Content of Radioactive Elements and Some Medico-biological Problems in These Areas **Leonid Rikhvanov, National Research Tomsk Polytechnic University, Russia**
10.00-10.15	**MA-05** Molecular, Isotopic and Genetic Composition of Human Gallstones: A Geomedical Study **Kose - Sureyya, Curtin University, Australia**	10.00-10.15	**RRG-05** Determination of Natural Radio Active Element Concentration in the Terra-Rosa of Minim-Martap District Area **Yalcin Mustafa Gurhan, Akdeniz University, Turkey**
10.15-10.30	**MA-06** Volcanic Gas-ash Interaction: an in Vitro Study of Respiratory Health Hazard **Tomašek Ines, Durham University, Great Britain**	10.15-10.30	**RRG-06** Which Environmental Factor Is Correlated with the Long-term Multiple Sclerosis Incidence Trends: Ultra-Violet B Radiation or Geomagnetic Disturbance? **Sajedi Seyed Aidin, Golestan University of Medical Sciences, Iran**
10.30-11.30	Poster session, Coffee Break		
Hall	**Amethyst**		
Chair	***Natalia Baranovskaya,*** *National Research Tomsk Polytechnic University, Russia*		
11.30-12.30	**PL-03** Africa: A natural laboratory for medical geology investigations **Hassina Mouri, University of Johannesburg, Republic of South Africa**		

12.30-13.00	**KL-06** Environmental health impact of past uranium mining **Fernando Carvalho, Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal**		
Hall	**Amethyst**	**Hall**	**Topaz**
13.00-14.00	**Soils in Medical Geology and Environmental Geochemistry (S)**	13.00-14.00	**Radioactivity, Radio Geoecology and Human Health (RRG)**
Chair	***Hassina Mouri,*** *University of Johannesburg, Republic of South Africa*	*Chair*	***Fernando Carvalho,*** *Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal* ***Igor Pechenkin****, All-Russian Research Institute for Mineral Resoureces named after N. Fedorovsky, VIMS, Moscow*
13.00-13.30	**KL-07** Soils in Medical Geology and Environmental Geochemistry **Olle Selinus** (Skype), **Linneus University Kalmar, Sweden**	13.00-13.30	**KL-09** Gross Alpha and Beta Activities in Groundwaters from Spas of Southeast Brazil **Bonotto Daniel Marcos, IGCE-UNESP, Brazil**
13.30-14.00	**KL-08** Medical Geology and Arsenic in México; an Overview **Maria Aurora Armienta, Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México**	13.30-14.00	**KL-10** Heterogeneity of the Geochemical Parameters of Natural Environments in Tomsk Region and Manifestation of Certain Types of Diseases **Natalya Baranovskaya, National Research Tomsk Polytechnic University, Russia**
14.00-15.00	Break		
Hall	**Amethyst**	**Hall**	**Topaz**
15.00-16.30	**Soils in Medical Geology and Environmental Geochemistry (S)**	15.00-16.30	**Water and Human Health (WHH)**
Chair	***Lilit Sahakyan,*** *Center of Environmental and Noospheric Research, National Academy of Sciences, Armenia*	*Chair*	***Leonid Elpiner,*** *Institute for Water Problems RAS, Moscow, Russia*
15.00-15.15	**S-01** Geochemistry and the Life of Human Society **Vladimir Gavrilenko, A. Herzen Russian State Pedagogical University, Russia**	15.00-15.30	**KL-11** Effect of Geogenic Factors on Groundwater Quality and Its Relation to Human Health: Case Study: Turkey **Alper Baba, Izmir Institute of Technology, Turkey**
15.15-15.30	**S-02** Factors Controlling the Potential of Arsenic of Soils within Konya Settlement **Horasan Bilgehan Yabgu, Turkey**		
15.30-16.00	**KL-12** Assesment of natural molasses soil in terms of Medical Geology **Gurhan YALCIN, Nurdane ILBEYLI, Akdeniz University, Turkey**	15.30-16.00	**KL-13** Medical Hydrogeology as a New Branch of Medical Geology **Leonid Elpiner, Institute of Water Problems, Russian Academy of Science, Russia**
16.00-16.15	**S-03** Geochemical Assessment Of Heavy Metals In Wetland Sediments From Around Maryland Area of Lagos, Southwestern Nigeria **Omotunde Victoria Bolaji, African University of Life and Earth Sciences (Including Health and Agriculture), Nigeria**	16.00-16.15	**WHH-01** Macro- and Microelement Composition of Groundwaters of the Republic of Belarus and the Population Health: Prospects for Scientific Research and Sanitary Regulation **Alena Drazdova,** **Republican unitary enterprise «Scientific practical center of hygiene», Minsk, Belarus**

16.15-16.30	**S-04** Impact of Fly ash Disposal on Soil and Groundwater Quality in Parts of Central Ganga Plain, India: A case Study **Azim Uddin Mirza,** **Akdeniz University, Turkey**	16.15-16.30	**WHH-02** Hydrogeochemical Characteristics of Groundwater in Menteş Watershed and Environmental Impacts (Yahyalı- Kayseri-Turkey) **Muhterem Demiroğlu, Istanbul Technical University, Turkey**
16.30-17.00	Coffee Break		
Hall	**Amethyst**	**Hall**	**Topaz**
17.00-18.00	**Soils in Medical Geology and Environmental Geochemistry (S)**	17.00-18.00	**Water and Human Health (WHH)**
Chair	***Gurhan YALCIN,*** *Akdeniz University, Turkey*	*Chair*	***Fetullah Arik,*** *Selcuk University, Turkey*
17.00-17.15	**S-05** Accumulation of Heavy Metals (Ni, Cu, Cd, Cr, Pb, Zn, Fe) in the Soil, Water and Vegetables Collected from Migori Gold Mines Vicinity, Kenya **Veronica Ngure, Laikipia University, Kenia**	17.00-17.15	**WHH-03** Geological Environment and Groundwater Quality, a Key to Social Development: the Binomial Southern Edge of the Duero Basin Spanish Central System, Spain **Giménez-Forcada Elena, Instituto Geológico Minero de España (IGME), Spain**
17.15-17.30	**S-06** Importance of Humic Acid for the Diversity of Microorganisms Involved in the Biodegradation of Pentachlorophenol in Soils **Tong Hui, Institute of Geochemistry, Chinese Academy of Sciences, China**	17.15-17.30	**WHH-04** Correlation Between Water EEDs Levels and Occurrence of PCOS in Chengdu, China **Nie Ying, Sichuan University Chengdu, China**
17.30-17.45	**S-07** Comparative Chemical Analysis and Mineralogy of the Soils Eaten by Ungulates in Sikhote-Alin and Caucasus Mountains **Tatiana Stoliarova, Lomonosov Moscow State University, Russia**	17.30-17.45	**WHH-05** Geochemical and Petrographical Investigations in Stream Sediments from the Pınarbaşı Pb-Zn Mineralization (Gediz-Kütahya, NW Turkey): Implications for the Public Health **Fetullah Arik, Selcuk University, Turkey**
17.45-18.00	**S-08** Plant Uptake of Au in Agricultural Soils Amended with Au Nanoparticles or HAuCl4: Role of Soil Geochemistry **Rodrigues - Sonia - Morais,** **University of Aveiro, Portugal**	17.45-18.00	**WHH-06** Impact of the Water Which Lack Element of Iodium against Public Health in Balong and Jambon Ponorogo East Java Province of Indonesia **Aminuddin, Geological Agency of the Ministry of Energy and Mineral Resources, Indonesia**
Hall	**Amethyst**		
18.00-19.30	IMGA Conference		
18.00-22.00	City tour (included in the registration fee)		

31 August 2017, Thursday			
Hall	**Amethyst**	**Hall**	**Topaz**
09.00-10.30	**Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)**	**09.00-10.30**	**Water and Human Health (WHH)**
Chair	***Vladimir Gavrilenko,*** *Herzen State Pedagogical University, Saint Petersburg, Russia*	*Chair*	***Alena Drazdova,*** *Republican unitary enterprise «Scientific practical center of hygiene», Belarus*
09.20-09.40	**UMG-06** Oral Bioaccessibility of Potentially Toxic Elements (PTEs) in Urban Area of Belfast **Tatiana Cocerva, Queen's University Belfast, Great Britain**	09.20-09.40	**WHH-07** Exposure to Lead and Cadmium Via Private Drinking Wells in Scania, Sweden **Larsson Estelle, Lund University, Sweden**

09.40-10.00	**UMG-07** Mineralogy of Human Kidney Stones **Alina Izatulina,** **Saint-Petersburg State University,** **Russia**	09.40-10.00	**WHH-08** Impact of Deficit Contents of Calcium and Magnesium in Groundwater/Drinking Water on Health Status of Inhabitants, Slovak Republic **Veronika Cveckova, State Geological Institute of Dionyz Stur, Slovakia**
10.00-10.20	**UMG-08** Characterization of Solid Airborne Particles in Industrialized Cities – a Case Study of Western Siberia (Russia) **Anna Talovskaya, National Research Tomsk Polytechnic University, Russia**	10.00-10.20	**WHH-09** Recharge History and Provenance of Salinity in the Aquifer Systems of Yuncheng Basin, Northern China **Li Chengcheng, University of Toronto, Canada**
10.20-10.30	Discussion	10.20-10.30	Discussion
10.30-12.00	Poster session, Coffee Break		
Hall	**Amethyst**		
12.00-13.00	Plenary lecture **(PL-04):** **Finkelman Robert Barry, University of Texas at Dallas, USA** Health Benefits of Geologic Materials and Geologic Process		
Hall	**Amethyst**	**Hall**	**Topaz**
13.00-14.00	**Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)**	**13.00-14.00**	**Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)**
Chair	***Robert Barry Finkelman,*** *University of Texas at Dallas, USA*	*Chair*	***Iosif Volfson,*** *Russian Geological Society, ROSGEO, Russia*
13.00-13.30	**KL-14** Medical Geology and its Role in Brownfield Site Evaluation and Development: When Wealth Generation of the Past Impacts Prosperity of the Future **Dowling Kim, Federation University, Australia**	13.00-13.30	**KL-15** Mathematical Modelling of Biospheric Regulation of the Carbon Cycle in Central Asia in the Conditions of Global Climate Change **Anna Kurbatova, RUDN University, Russia**
13.30-14.00	Health of the environment: methodology and practice of evaluation **Vladimir Zakharov, Center of Sustainable Development and Environmental Health IBD RAS, Moscow, Russia**	13.30-14.00	**KL-16** Spatial variation in soil geochemistry at regional, field and micro scales: New opportunities and challenges **Chaosheng Zhang, National University of Ireland**
14.00-15.00	Break		
Hall	**Amethyst**	**Hall**	**Topaz**
15.00-16.30	**Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)**	**15.00-16.30**	**Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)**
Chair	***Cristiana Costa,*** *University of Aveiro, Department of Geosciences, Aveiro, Portugal*	*Chair*	***Chaosheng Zhang,*** *National University of Ireland, Ireland*
15.00-15.15	Mineral Composition and Physico-chemical Characteristics of Curable Muds and Clays **Boris Belashev, Institute of Geology of the Karelian Research Center of the Russian Academy of Sciences, Russia**	15.00-15.15	Medical Geology Applications of an Africa Geochemical Database **Ibe Chinedu Uduma, University of Nigeria**
15.15-15.30	**MHHR-01** Hydrochemical and Health Evalution of the Thermal and Mineralized Waters in Gazligöl (Afyon) **Güler Göçmez, Selçuk University, Turkey**	15.15-15.30	**MT-01** Application of Solid State NMR at Mineral/Water Interface: A Molecular Level Investigation of Fluoride Removal by Nano-sized Hydroxyapatite **Li-Wei, Nanjing University, China**
15.30-15.45	**MHHR-02** Arsenic Biogeochemistry in Hot Springs in Tengchong Geothermal Area, China **Ping Li, China University of Geosciences, China**	15.30-15.45	**MT-02** Hardware and Software for Seismic Radon Station Srs-05 **Boris Belashev, Institute of Geology of the Karelian Research Center of the Russian Academy of Sciences, Russia**

15.45-16.00	**MHHR-03** Therapeutic Mineral Waters of the Republic of Tatarstan. Settlement and Spread Patterns, Problems of Their Use **Rafail Ibragimov, Tatneft, Russia**	15.45-16.00	**MT-03** Multivariate Data Analysis of Specimens Containing Silica Fume **Yalcin Fusun, Akdeniz University, Turkey**
16.00-16.15	**MHHR-04** The Use of Minerals in Arab-Islamic Medieval Medicine: Examples from "The Canon of Medicine" by Ibn Sina (11th Century) **El Ghalbi Khallaf, University Mohamed Premier, Morocco**	16.00-16.15	**MT-04** Removal of Thallium from Aqueous Solutions Using Fe-Mn Binary Oxides **Li - Huosheng, Guangzhou University, China**
16.15-16.30	**MHHR-05** New Trends in Pelotherapy **Gomes Celso de Sousa Figueiredo, University of Aveiro, Portugal**	16.15-16.30	**MT-05** The Role of Soil Properties on the Transformation and Fate of Nano-enabled Agrochemicals in the Soil System **Rodrigues - Sonia - Morais, University of Aveiro, Portugal**
16.30-17.00	Coffee Break		
Hall	**Amethyst**	**Hall**	**Topaz**
17.00-18.15	**Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)**	**17.00-18.15**	**Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)**
Chair	***Karakaya Çelik Muazzez, Necati Karakaya,*** *Selcuk University, Turkey,* ***El Ghalbi Khallaf,*** *University Mohamed Premier, Morocco*	*Chair*	***Rodrigues - Sonia - Morais,*** *University of Aveiro, Portugal*
17.00-17.15	**Detailed Characterization and Amine Binding Capacity of Natural Cuban Zeolite as Well as its Oral and Topical Applications in the Medicine** **Dathe Wilfried Heinz, Heck Bio-Pharma GmbH, Germany**	17.00-17.15	**Global Climate Change, Ground-level Ozone and Human Health** **Chelibanov Vladimir Petrovich, OPTEC, Russia**
17.15-17.30	**MHHR-06** Residual Smectitic Clays from Santiago (Cape Verde): Assessment of Their Properties as Healing and Geophagic Materials **Angela Cerqueira, University of Aveiro, Portugal**	17.15-17.30	**MT-06** The Spatiotemporal Analysis of Thermal Comfort and Public Health in Urban Centers of Russia **Natalia Shartova, Lomonosov Moscow State University, Russia**
17.30-17.45	**MHHR-07** Hydrothermal in Situ Maturation of Clayey Geomaterials (Azores, Portugal): Assessment of Their Properties for Pelotherapy **Rocha Fernando, University of Aveiro, Portugal**	17.30-17.45	**MT-07** Microorganisms Isolated from Permafrost as Facilities for the Development of New Drugs **Sergei Petrov, Tyumen Scientific Center of the Siberian Branch of the Russian Academy of Sciences, Russia**
17.45-18.00	**MHHR-08** Study of Historical and Contemporary Aspects for Medical Use of Talaya Health Resort Water Resources in Russian Cultural Educational Foundation named after V.A. Tsaregradsky **Dmitrii V. Vorobev** **Department of Medical Geology Russian Cultural Educational Foundation of V.A. Tsaregradski (RCEF), LLC «The doctor Vorobev medical innovation centre», Russia**	17.45-18.00	**MT-08** Mineralogical, Geochemical and Technological Characterization of Clayey Commercial Cosmetic Products **Carla Marina Bastos, University of Aveiro, Portugal**
18.00-18.15	**MHHR-09** Chemical Composition and Suitability of Some Turkish Thermal Muds Used as Peloids **Karakaya Çelik Muazzez, Necati Karakaya, Selcuk University, Turkey**	18.00-18.15	**MT-09** Prospects of Application of Geoinformational Systems for Veterinary Geology **Vladislav Belimenko, All-Russian Scientific Research Institute of Experimental Veterinary Sciences named after Ya.R. Kovalenko, Russia**
19.00	Dinner		

01 September 2017, Friday	
Hall	**Amethyst**
09.00-10.30	**Medical Geology, Public Health and Regulatory Sciences (MG)**
Chair	***Jose Centeno,*** *US Food and Drug Administration, USA* ***Vladimir Zakharov,*** *Center of Sustainable Development and Environmental Health IBD RAS, Moscow, Russia*
09.00-09.15	**MG-01** How to Promote Medical Geology in Developing Countries. Challenges, Achievements and Success in Uruguay **Nelly Mañay, University of the Republic (UdelaR), Montevideo-Uruguay**
09.15-09.30	**MG-02** Environmental Geochemistry and Human Health: General and Regional Aspects (in Russian Federation and Crimea Region) **Elena Evstafeva, Crimea Federal University, Russia**
09.30-09.45	**MG-03** Hydrocarbon Sphere and Some Diseases Associated with It **Yuri Galant, Israel**
09.45-10.00	**MG-04** Medical Geology Investigation in Indonesia **Andiani, Geology Agency, Indonesia**
10.00-10.15	**MG-05** Development and Management of Integrated Mineral Resource Policy for Environmental Sustainability: The Mindanao Experience, The Philippines **Egirani Davidson Enoni, Niger Delta University, Nigeria**
10.15-10.30	**MG-06** Exploratory Study Between Renal and Genotoxic Damage in Costa Rican Children with Respect to Geographic Location in the Mesoamerican Nephropathy **Montero-Campos Virginia, Institute of Technology Costa Rican, Costa-Rica**
10:30-11:00	Coffee Break
11:00-11:15	**MG-07** Open-Cut Mining: Its Devastating Socio-Environmental Effects on Comunitary Health **Campa Uranga Maria Fernanda, Universidad Autónoma de la Ciudad de México, Mexico**
11:15-11:30	**MG-08** Effect of Waste-Dump Sites on the Sustainability of the Water Resource Environment in Gbarain-Niger Delta Catchment of Nigeria **Egirani Davidson Enoni, Niger Delta University, Nigeria**
11:30-11:45	**MG-09** We Use Phosphorus and Other Fertilizers. Is it Dangerous? **Vasileva Evgeniya Grigor'evna**
11:45-12:00	**MG-10** Modeling of Regularities of Geodynamic and Geosocial Processes **Anna Dolgaya, Institute of volcanology and seismology FEB RAS, Russia**
12:00-12:15	**MG-11** The Current State of Medical Geology Investigations in Azerbaijan **Farah Fuad Mahmudova, Institute of Geology and Geophysics, Azerbaijan**
12:15-12:30	**MG-12** Geo-spatial Impact on Public Health in the Coastal Region of West Bengal, Eastern India: an Appraisal on Medical Geology **Acharya Tapas Hooghly, Mohsin College, (University of Burdwan), India**
12:30-12:45	**MG-13** Global climate change, ground-level ozone and human health **Vladimir Chelibanov, Department of Environmental Instrument-Making and Monitoring ITMO University, Saint Petersburg, Russia**
12:45:13:00	**MG-14** Medical Geology and Volcanoes **Armienta Maria Aurora, Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México**
13.00-13.30	Closing Ceremony

POSTER SESSION

Environmental geochemistry and human health (EG), 30 August 2017, Wednesday		
EG-01	Products Based on Zeolite for Oral Use in a Free Market in Serbia	S. Erić, A. Rosić, V. Matović, A. Vujinović
EG-02	Preliminar Studies of Annual Effective Dose Equivalent (AEDE) due to Terrestial Radionuclides Received by Barra de Valizas Inhabitants and Tourist	A. Noguera, H. Bentos Pereira, L. Fornaro
EG-03	Medical and Geological Problems of the Northern Black Sea Region	T. Baraboshkina
EG-04	On Distribution of Radionuclides in Cultivated Elementary Landscape-Geochemical Systems Contaminated After the Chernobyl Accident	V. Baranchukov, E. Korobova, S. Romanov, S. Kirov, V. Beryozkin, D. Dolgushin
EG-05	Arsenic: Contamination of Drinking Water and Human Exposure in Ouro Preto, Iron Quadrangle – Minas Gerais, Brazil	B.C. Nardy, M.N. de Almeida Fonseca, A. Costa, A.T. de Abreu, T.S. Noci, E. Muniz
EG-06	Soil Radioactivity and Dose Rate Assessment in Mining Centers of Armenia	O. Belyaeva, N. Movsisyan, G. Muradyan, L. Sahakyan, K. Pyuskyulyan
EG-07	Shifting Cyanobacterial Diversity in Response to Agricultural Soils Associated with Dust Emission	E. Ben-Dov, I. Katra, S. Laor, N. Swet, A.Kushmaro
EG-08	Cancer and Non-Cancer Risk due to Exposure to Potentially-Toxic Elements in Contaminated Groundwater Adjacent to an Industrial Chemical Complex (Estarreja, NW Portugal)	M. Cabral Pinto, C. Ordens, T. Condesso Melo
EG-09	Neuropsychological Assessment and Trace Metal Content in Urine, Hair and Fingernails Samples From Inhabitants of a Chemical Industrial Region (NW Portugal)	M. Cabral Pinto, P.Marinho Reis, A.Almeida, C. Ordens, E.Pinto, S. Freitas, M. Simões, L. Diniz, P. Moreira, M.M.V.G. Silva, E. Ferreira Silva, T. Condesso Melo
EG-10	Links Between Chronic Exposure to Manganese and the Occurrence of Dementia in Mining Areas of the Southern Part of Portugal	M. Cabral Pinto, P.Marinho Reis, A. Almeida, E.Pinto, P.Ramos, S. Freitas, M. Simões, L. Diniz, P. Dinis, P. Moreira, M.M.V.G. Silva, E. Ferreira Silva
EG-11	Linking Volcanic Soil Composition and Cancer Risk in Santiago Island (Cape Verde)	M.Cabral Pinto, C. Patinha, P. Marinho Reis, P. Dinis, Maria M. V. G. Silva, Eduardo. A. Ferreira da Silva
EG-12	Ecosystemic Approach to Human Health: a Tool for Environmental Studies	A.Z. Cousillas
EG-13	Leaching of Thallium from Extremely Contaminated Soils Collected from Guizhou, China	Hongmei Deng,Mengting Luo, Mengyun Zhou, Yongheng Chen,Tangfu Xiao
EG-14	In Situ Biosynthesis of Bacterial Cellulose Hybrids Composites for Bio-Applications: Green One-Step Process	F.M.C. Gonçalves, R. Pinto, N. Cordeiro
EG-15	Identification of the Impact of Irrigation Using Alkaline Na-As Rich Groundwater on Soils in the Southern Corner of the Duero Basin (Spain), Using Geostatistic Tools	E. Giménez-Forcada, J.A. Luque-Espinar
EG-16	Chemical Properties of Ilica (Kahramanmaraş) Thermal Waters and Their Beneficial Effects on Human Health	G. Göçmez, I. Kara
EG-17	In Situ Bioremediation of Acid Mine Drainage: A Low-Cost Approach to Protect Drinking Water Source	Haiyan Chen
EG-18	Chemical Contamination in Agricultural and Pasture Soils from an Industrial Site in North Central Portugal	M. Inácio, O. Neves, V. Pereira
EG-19	Determination of Tl(I) and Tl(III) Based on Microcolumn Separation by ICP-MS and Application to Tl Speciation Analysis at the Interface of Soil and Green Cabbage	Yanlong Jia , Tangfu Xiao , Jialong Sun , Zengping Ning , Tao Jiang , Fei Yang , Yizhang Liu
EG-20	Effects of Various Amendments on Mulberry Uptake Cd from Polluted Soil	Zhizheng Wang, Xiangwei Nie, Hong He, Zhi Li, Tao Luo, Meiling Jiang, Chunyan Wang, Dan Xing, Yanlong Jia

EG-21	Biosorption and Bioaccumulation of Thallium by Thallium-Tolerant Fungal Isolates	Jialong Sun, Xiao Zou, Tangfu Xiao, Yanlong Jia
EG-22	Occurrence of Uranium in Chinesehigh-Uranium Coals and the Release Behaviours During Combustion	Jianping Yang, Yongchun Zhao, Junying Zhang
EG-23	Serum Cu/Zn Ratio is Associated with Blood Glucose Level, Renal Function, and Bone Mineral Density in People Living near a Copper Smelter in Korea	Yong-Dae Kim, Sang-Yong Eom, Dong-Hyuk Yim, Byung-Sun Choi, Jung-Duck Park, Heon Kim
EG-24	Environmental Geochemistry of Estuarine Sediments in the Suape Port Complex, Pernambuco, Brazil	E. Santos de Lima, R. Ferreira da Silva
EG-25	Geogenic Cadmium Pollution and Potential Health Risks in China	Yizhang Liu, Tangfu Xiao
EG-26	Organic Matter in Soils Exposed to Regular Pollution by Overland Runoff from Oil-Production Sites	T. Lygina, A. Gordeev, A. Shinkarev
EG-27	Geochemical Indicators of Anthropogenic Apport in the Tatuoca River from Activities of the Industrial Portuary Complex of Suape, Brazil	A. Souza Moraes, E. Santos de Lima
EG-28	Tracking Heavy Metals Pollution in the Ogudu Wetland, Lagos Nigeria Using Sediments	Akinade S. Nana Olatunji, Aferhurhobo B. Ajayi, F. Felicia
EG-29	Arsenic Concentrations Evolution Preserved in Estuarine Sediments Core Profiles in the Alagoas and Pernambuco States, Brazil	M.M.R.B.F. Lima, E.A.M. Lima, V.H. Neumann, M.T. Taboada-Castro, A.S. Moraes, M.A.R.B.F. Lima, M.R. Costa, F.S.M. Torres
EG-30	Evidence of Anthropogenic Contamination by Chromium Preserved in Estuarine Sediments, Jaboatão River, Pernambuco, Brazil	M.M.R.B.F Lima, E.A.M Lima, V.H. Neumann, M.T. Taboada-Castro, A.S. Moraes, M.A.R.B.F. Lima, M.R. Costa, F.S.M. Torres
EG-31	Mercury in Black Shales of Baltic Paleobasin	Ya. Fadin, E. Panova, D. Voronin
EG-32	Ultrasonic Studies on B-Cyclodextrin/Hydroxyapatite Composites for Potential Water Depollution	M. Predoi, S. Iconaru, M. Ech Cherif El Kettani, D. Leduc, A. Prodan, D. Predoi
EG-33	Human Health Risk Assessment of Heavy Metals in the Urban Environments of Armenia	A. Saghatelyan, G.Tepanosyan, L. Sahakyan
EG-34	Characterising Aluminium Dynamics in a Rural Stream Using Concentration-Discharge Relationships	F. Soto-Varela, M.L. Rodríguez-Blanco, M.M. Taboada-Castro, M.T.Taboada-Castro
EG-35	Assessment of the Potential Bioavailability of Cu and Zn by Sequential Extraction in River Bed Sediments of a Small Rural Setting (NW Spain)	M.M. Taboada-Castro, M.L. Rodríguez-Blanco, M.T. Taboada-Castro
EG-36	Spatiotemporal Variability of Dissolved Metals in Surface Waters of a Humid Agroforestry Catchment with Low Levels of Anthropogenic Pollution	F. Soto-Varela, M.L. Rodríguez-Blanco, M.M. Taboada-Castro, E.A.M. Lima, V.H. Neumann, M.M.R.B.F. Lima, A.S. Moraes, E.S. Lima, M.T. Taboada-Castro
EG-37	Hydrogeochemistry of the Drinking Water Sources of the Tombak Village (KAHRAMANMARAŞ) and Their Effects on Human Health	Y. Uras, İ. Dinçer, S. Ercan
EG-38	Hydrogeochemistry of the Drinking Water Sources of the Yukarikargabuku (Anzorey) Village (Kahramanmaraş) and Their Effects on Human Health	Y. Uras, İ. Dinçer, A.Yedikardeş
EG-39	Hydrogeochemistry of the Drinking Water Sources of the Değirmentaş Village (Sarız-Kayseri) and Their Effects on Human Health	Y. Uras, İ. Dinçer
EG-40	Distribution, Sources and Environmental Risk of Trace Metals in Sediments of Longjiang River, South China	Xiaolong Lan
EG-41	Poplar Leaf Elemental Composition as a Reflector of the Intensity of Anthropogenic Impact on Ecosystems and Human Health	A. Yalaltdinova, K. Junbeum, N. Baranovskaya, L. Rikhvanov
EG-42	Availability of Heavy Metals in the Karst Soils and Their Uptake by Rice	Xuyin Yuan, Rui Zhou, Sun Hu

EG-43	Impacts of Soil Pollution on Human Health in Iraq	Z.M. Hassan
EG-44	Impact of the Less Iodine in Water for Public Health in Ponorogo, East Java of Indonesia	Aminuddin Aminuddin
EG-45	Water as a Source of Radiation Exposure: Laboratory Experience and Methods of Radionuclide Analysis	D. Zuev, T. Ovsyannikova, A.Gulynin, A. Bakhur, A. Starodubov, L. Manuilova
EG-46	Well Water Manganese in Finland	A. Kousa, B. Backman, H. Komulainen, S. Hartikainen
EG-47	Agricultural Soil Geochemistry of Trace Elements: Accumulation Patterns in Citrus, Olive Groves and Vineyards from Peloponnese, Greece	E. Kelepertzis
EG-48	About Scientific Heritage of the Eminent Geochemist and Mineralogist Stepan Badalov	A. Badalov
EG-49	Biogeochemical Assessment of the Impact of Ciscarpathian Landscape on Population Health	G. Rudko
EG-50	An Arsenic Geologic Province in Northern Mexico, and the Implications of Low Level Exposure in Drinking Water: Insights from a Murine Model	S. Navarro-Espinoza, B. González-Grijalva, M. Acosta-Elias, A. Angulo-Molina, D. Meza-Figueroa, M. Pedroza-Montero
Sustainable development and environmental health (SD), 31 August 2017, Thursday		
SD-01	Study to Determine Factors that Affect Malnutrition in Children of Río Blanco, Zapopan, Jalisco. Mexico	L.E. Peña -García, J. Rosas Elguera, R. Maciel-Flores, Celia de la Mora Orozo
SD-02	Adequate Technical for Water Management Reduce Public Health Problems in Northeastern Brazil	M.R. Costa, A.L.S. Borba, E.A.M. Lima, F.S.M. Torres, V.H. Neumann, M.T. Taboada-Castro, A.S. Moraes, M.M.R.B.F. Lima
SD-03	Chemical Quality of Mineral Waters in the Metropolitan Region of Recife - PE	A.L.S. Borba, M.R. Costa, E.A.M. Lima, F.S.M. Torres, V.H. Neumann, M.T. Taboada-Castro, A.S. Moraes, M.M.R.B.F. Lima
SD-04	Study of Radon Concentration in Bama Mine	J. Tabatabaei
SD-05	Risk Assessment for Children Exposed to Trace Elements in an Urban, Multi-Pathway Exposure Scenario (Madrid, Spain)	E. De Miguel, A. Gómez, M. Izquierdo, F. Barrio-Parra, J. Mingot, R. Álvarez, J. Loredo
SD-06	Assessment of Mercury in Diagnostic Biomaterials of Different Population Groups in Urban Areas of the Moscow Region	A. Gorbunov, S. Lyapunov, O. Okina, I. Ilchenko, M.Frontasyeva
SD-07	Pigments as Sources of Lead and Hexavalent Chromium in Urban Dust	D. Meza-Figueroa, B. González-Grijalva, S. Navarro-Espinoza, M. Acosta, A. Angulo-Molina, M. Pedroza-Montero
SD-08	Pedestrian Exposure to Metals and Catalyst-Derived Minerals by Dust Suspension at Arid Zones: Implications for Human Health	D. Meza-Figueroa, M. Pedroza-Montero, C. Ibañez-Del Rivero, R. Ochoa, B. González-Grijalva, S. Navarro-Espinoza, M. Acosta, A. Angulo Molina
SD-09	Assessment of PTEs Levels of Urban Street Dusts from Two Cities of Portugal: Potential Human Health Risks Determined by Oral Bioaccessibility	C. Patinha, N. Durães, A. C. Dias, E. Ferreira da Silva
SD-10	Impact of Climate and Technogenic Activity on Population Health	G. Rudko
SD-11	Health Conditions of Tour Managers Leading International Tours to Different Geographic Areas	Fan-Yun Lan, How-Ran Guo, Yen-Cheng Tseng
SD-12	Health Risks Exposure to Building Materials Used in Civil Engineering Works. An Example in Uruguay	A. Cousillas, N. Mañay
SD-13	Coal Processing Causes Health Problems	M. Gunes, A. Gunes, B. Yalcin, H. Ertugrul, N. Ilbeyli, B. Kaya
SD-14	Harmful Effects of Asbestos	A. Gunes, M. Gunes, B. Yalcin, H. Ertugrul, N. Ilbeyli, B. Kaya
SD-15	The industrial Factors Impact on the Functional State of Mining Workers in the Murmansk Region	A. Martynova, D. Petrashova, V. Pozharskaya

SD-16	Molecular, Isotopic and Genetic Composition of Human Gallstones: A Geomedical Study	S. Kose, M. Coolen, K. Grice, M. Ballal
SD-17	Blood Mercury Level of People Living in Coastal Areas	Heon Kim, Sang-Yong Eom, Yong-Dae Kim, Jung-Duck Park, Ho-Jang Kwon
SD-18	Toxicity Studies on Dextran Stabilized Iron Oxide Nanoparticles	A. Prodan, S. Iconaru, S. Predoi, M. Beuran, C. Ciobanu, M. Soare, M. Predoi
SD-19	Psycho-Immune Aspects of Adaptation to the Injection of Microorganisms from Permafrost in Experiment	S. Petrov, T. Fisher
SD-20	Determination of Heavy Metal Levels in Groundwater as Possible Cause of Balkan Endemic Nephropathy (BEN) in the Village Miloševac	L. Milanović, A. Vujinović
SD-21	Health Problems Related to Inadequate Public Supply in Rural Areas of Northeastern Brazil	M.R. Costa, A.L.S. Borba, E.A.M. Lima, F.S.M. Torres, V.H. Neumann, M.T. Taboada-Castro, A.S. Moraes, M.M.R.B.F. Lima
SD-22	Water – Rock –Man, Conceptual Model of the Equilibrium System of V.I. Vernadsky	Y. Bespalova, V. Matusevich
SD-23	The Education Role for the Popular Participation Face to Public Policies Directed to Hydric Resources	D.M. Bonotto, D.M. Bianchini Bonotto
SD-24	Fluoride in Bulgarian Groundwater – Distribution, Status and Problems	O. Pikhur, A.Benderev, V. Hristov, T. Kehayov, A. Toteva
SD-25	A Global Problem: Arsenic	M. Gunes, H. Ertugrul, A. Gunes, B. Yalcin, N. Ilbeyli, B. Kaya
SD-26	Synthesis and Characterization of Magnetic Iron Nanoparticles with Potential Applications in Geochemical Processes	S. Iconaru, C. Ciobanu, A. Prodan, S.A. Predoi, C.S. Turculet, M. Beuran, M. Soare, R.V. Ghita, D. Predoi
SD-27	Variation of Chemical Groundwater Composition: Incidence of Enteroviruses Occurrence and Their Transport Mechanism in the Salto Aquifer, Uruguay	E. Alvareda, P. Gamazo,R. Colina, M. Victoria, L. Burutaran, J. Ramos, F. Lopez, M. Olivera, A. Lizasoain, G. Sapriza, M. Castells, M. García
SD-28	Quality of Irrigation Water in a Highly Industrialized Area in NW of Portugal	M. Inácio, O. Neves, V. Pereira
SD-29	Natural Minerals - Natural Protection of Water Sources	I. Lugovskaya, I. Krylov
SD-30	Geographic Variation Between Arsenic in Drinking Water and Chronic Kidney Disease: A Nationwide Population-Based Study in Taiwan	Ya-Yun Cheng, Yen-Cheng Tseng, How-Ran Guo
SD-31	Fluorine Concentration in Earth Materials in Parts of Northern Nigeria	H.U. Dibal, E.Y. Yenne,S.S. Daku, D. Shem
SD-32	A Statistical Approach of Heavy Metal Pollution Index in Creek Surface Water Samples (Nigde, Turkey)	F. Yalcin, N. Ilbeyli, O. Aydin, M. G. Yalcin, Y. Leventeli
SD-33	Aqueous Biphasic Separation of Thallium from Aqueous Solution Using Propanol and Salts	Huosheng Li, Xiuyuan Li, Yongheng Chen, Tangfu Xiao
SD-34	Isotopic and Race Element Constraints on the Origin and Evolution of Saline Ground Waters in Confined Aquifer Systems of Yuncheng Basin, Northern China	Chengcheng Li, Xubo Gao, Ken Howard, Yanxin Wang
SD-35	Effect of Calcium and Magnesium Contents in Drinking Water to the Arterial Stiffness, Slovak Republic	K. Fajčíková, V. Cvečková, S.Rapant
SD-36	Contents of Essential Macro-Elements in Hair and Nails of Residents in the Krupina District, Slovak Republic	K. Fajčíková, V. Cvečková, S.Rapant
SD-37	Curative Water in Karelia	G. Borodulina
SD-38	Pulmonary Toxicity of Particulate Matter Derived from Dust Samples from Dzhida Mine (Transbaikalia): Preliminary Results	M.J. Campen, O. Smirnova, V. Belogolovov

SD-39	Appraisal of Microbiological Safety of Natural Peloids	J.H. Gomes, C.F. Gomes, J.B. Silva, E.F. Silva
SD-40	Geosocial Process: Concept and Laws	A. Vikulin, M. Vikulina, A. Dolgaya, I. Volfson
SD-41	Advancing MedGeo in University Environmental Education: Progress in Uruguay	T. Heller, N. Mañay
SD-42	Main Characteristics of the Geomagnetic Variations In the Moscow Region	S. Riabova
SD-43	The Effects of Air Pollutant Change on Respiratory Disease During Dust Storm Days in Taipei City, Taiwan	How-Ran Guo, Shao-Wei Yang
SD-44	Indoor radon exposure in high radioactivity regions and public health	F.P. Carvalho, J.M. Oliveira, M. Malta
SD-45	Situation Analysis of Cutaneous Leishmaniasis in an Endemic Area, South of Iran	M. Nazari, S. Nazari, A.A. Hanafi-Bojd, A. Najafi, S. Nazari
SD-46	Climate Change and the Distribution of Malaria Vectors During the past 5 Decades in Iran: A Spatial Analysis	Salahi-Moghaddam, Khoshdel, Sedaghat, Ali Niloufari, Khoshdel- Ali- Reza
SD-47	Characterization and benefit of Portuguese gypsums as raw materials for dermocosmetics	C. Costa, A. Fortes, A. Cerqueira, F. Rocha, D. Santos, M.H. Amaral, D. Terroso
SD-48	What Does Geochemical Composition of Children's Hair Reflect More: Gender Peculiarities or Environmental Exposure?	R. Taraškevičius, R. Zinkutė, L. Gedminienė, Ž. Stankevičius, R. Morkūnaitė
SD-49	Hemoglobin Blood - Indicator of a Human's Long-Term Adaptation to the Environment Geophysical Parameters	G. Taumanova
SD-50	Influence of Regional Geophysical Factors on Organism of Local Sportsmen. Special Aspects of Their Preparation for Competitions	L. Taumanova
SD-51	The Impact of Medical and Geological Factors on the Wellbeing of the Population in the Tyumen and Kaliningrad regions	O. Yakushina, Y. Bespalova, I. Volfson, L. Dasaeva
SD-52	Dust Pollution in the Vicinity of Petrochemical Plant: Case Study of Pavlodar (Republic Kazakhstan)	T. Shakhova, A. Talovskaya, E. Yazikov
SD-53	Natural Occurrence of Potentially Harmful Fluoride Content in Groundwater: an Example from Nakuru County, the Kenyan Rift Valley	P. Gevera, H. Mouri
SD-54	Geophagic Termite Mound Soils and Their Potential Health Impact on Pregnant Women in Onangama Village, Northern Namibia	S. Kambunga, H. Mouri, C. Candeias, I. Hasheela, F. Nakakuwa
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EKOGRAD. Moscow journal of ecology

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The popular science magazine published by the Department of Natural Resources and Environmental Protection of the city Moscow. Themes: econews, the first faces of the urban ecology, ecoprojects and discussions, the history of the Moscow ecosystems, citizens about environmental issues, scientific developments in the ecosphere, travel, etc.

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A scientific, technical and methodological journal it addressing a wide range of aspects of underground resource management, including such issues as legal and regulatory frameworks and methodological support, economic strategy and innovation-driven development of the Russian mining industries. The Journal provides detailed coverage of efficient and comprehensive development of mineral deposits, high-level processing and conversion of minerals, development and application of novel geotechnologies and equipment, and industrial safety; discusses the environmental aspects of underground resource management; presents the analytics on mineral reserves and resources, mineral markets, and keeps the readership informed on the important industry events.

PROSPECT AND PROTECTION OF MINERAL RESOURCES

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Periodical journal has been published from 1931 to the present day. It highlights the actual problems of geology. The journal was awarded the honorary signs and gratitude letters. «Prospect and protection of mineral resources» is a multidisciplinary scientific-and-technical journal that brings together all the geological institutions of the country. Firstly it was published in July 1931 in Moscow and it has been one of the basic geology journals. On the pages you can observe boards of the Federal Agency of Natural resources of Russia, from time to time selections on various aspects of mineral resources of the country, new methods and technologies of exploration. The main subjects are the details about new deposits of solid minerals, materials, techniques and technology for exploration, articles on management and economics of geological exploration, conservation of resources, professional life and other issues.

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The Russian Geological Society (ROSGEO) is a non-profit organization that brings together over 2500 individual members in many regions of Russia, 52 regional offices, Interdepartmental Council for Museum Activity, Central Council for Youth Geological Movement.

The main objective of ROSGEO is uniting the efforts of geologists to increase countries mineral and raw resources, contributing to the geological science, protecting the rights of specialists.

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SOCIAL PROGRAM

MOSCOW KREMLIN AND CATHEDRALS

Date: 28.08.2017 and 30.08.2017

Price: 68 EUR*/ 4800 RUR

* Price in EUR is approximate and based on the rate 1 EUR = 70 RUR.
Please, rely on the price given in RUR.

Time: 10:00–15:00

Duration: 5 hours

Meeting point: Lobby of the Salut Hotel

The price includes:

- English-speaking guide;
- transport (bus);
- entrance tickets.

Red Square

Cathedrals of Moscow Kremlin

Stroll around the territory of the Kremlin and appreciate its fantastic sights such as the Assumption Cathedral which held the ceremonies of Tsars and Emperors as well as the symbolic Ivan the Great Bell Tower. You'll walk past the famous Tsar Bell and Tsar Cannon before visiting the world famous museum treasury which holds a collection of ancient state insignia, gold and silver utensils, religious robes, weapons, luxury carriages as well as all the attire of famous Tsars from over the years. Occupying a beautifully old building from the middle of the 19th Century, this treasury offers you a glimpse of the glories and heroism of Russia's past, whilst you can leisurely appreciate the sights on foot.

MOSCOW CITY TOUR

Date: 28.08.2017

Price: 23 EUR*/ 1600 RUR

* Price in EUR is approximate and based on the rate 1 EUR = 70 RUR.

Please, rely on the price given in RUR.

Time: 10:00–15:00

Duration: 5 hours

Meeting point: Lobby of the Salut Hotel

The price includes:

- English-speaking guide;
- transport (bus).

Novodevichy Monastery

Bolshoi Theatre

Visit the beautiful sites of Moscow with this fully guided tour of the city. You will see the most famous sites as well as the most historic foundations. Make your way around Red Square with scenes of glorious architecture with St. Basil's Cathedral, the Lenin Mausoleum and State Historical Museum. Then continue along the peaceful Moskva River embankment as you take in the breath-taking views of the Kremlin before you reach the Cathedral of Christ the Saviour, New Maiden's Convent and Moscow State University.

The tour doesn't stop there as you get taken to Sparrow Hills' observation spot to see Moscow at its finest with a spectacular panoramic view. Travel on through the Memorial Complex at Poklonnaya Hill and Victory Park, Triumphal Arch, Kutuzov Avenue, New Arbat, Boulevard Ring, Pushkin Square, Tverskaya Street before finishing this grand tour at Manezhnaya Square. Full of sights and culture, this tour is the perfect way to see all the wonders of the city of Moscow.

CITY TOUR AT NIGHT

Date: 28.08.2017 and 30.08.2017

PRICE FOR THE CONFERENCE PARTICIPANTS: INCLUDED INTO THE REGISTRATION FEE/ IF YOU WISH TO ATTEND THIS TOUR, PLEASE ACCESS YOUR PERSONAL ACCOUNT AND ORDER IT FOR A NECESSARY DATE

Price for guests: 28 EUR*/ 2000 RUR

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Time: 18:00–21:00

Duration: 3 hours

Meeting point: Lobby of the Salut Hotel

The price includes:

- English-speaking guide;
- transport (bus).

See the bright lights of Moscow at night with this guided evening tour. You will be taken along the vibrant lit streets with several photo opportunities along the way. Experience the nighttime atmosphere in the historic city centre and see the beautiful architecture from the famous Sparrow Hills, offering astonishing panoramic views.

You will be able to see Moscow's nightlife with bars, clubs and restaurants. You will not miss the famous sites either with haunting views of Red Square as well as the architecture of the Cathedral of Christ the Saviour and the Peter the Great Monument. Finally, experience the gorgeous moonlit view of the Sophia embankment on this exciting nighttime tour of the city. See more of what Moscow has to offer by seeing its buildings come to life at night.

GALA-DINNER AT THE BOAT «CHIZHIK-2»

Date: 31.08.17

Time: 19:00

Duration: 5 hours

Price: 60 EUR/ 4200 RUR

The boat "Chizhik-2" is a sample of opulent surroundings, ergonomic layout of decks and interior spaces.

We believe that river air, good atmosphere, magnificent views over the heart of the Russian capital and great cuisine will make the participants' and guests' evening an unforgettable one. You are invited to enjoy an excellent dinner and informal interaction with the colleagues.

BOAT TRIP ON MOSCOW RIVER BY HISTORICAL CENTER

Date: 01.09.2017

Price: 48 EUR*/ 3400 RUR

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Time: 15:30 – 20:30

Duration: 5 hours

Meeting point: Lobby of the Salut Hotel

The price includes:

- English-speaking guide;
- transport (bus and boat);
- entrance tickets.

This tour is perfect to see the incredible sights of Moscow. Sail down the ancient transport route of the Moskva River and get away from the streets of the city. You will see all of the sights, whilst experiencing the beautiful currents of the river beneath you. From the ship's deck you'll be able to spot the Kremlin, The Cathedral of Christ the Saviour, the Monument to Peter the Great, House of Artist, Moscow State University and the New Maiden Convent. You will not miss anything on this fantastic river cruise in the sparkling Russian sunshine.

PLENARY LECTURES

PL-01

MEDICAL GEOLOGY – IMPACTS OF THE NATURAL ENVIRONMENT ON HUMAN HEALTH

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In the last few decades, there has been a growing awareness that some natural environmental changes occur on a scale that affects global ecologies: atmospheric, hydrogeological, and food production systems worldwide have been transformed in ways that sometimes leads to the emergence (and/or re-emergence) of health problems in humans and animals. Although it has been recognized that natural geological factors play key roles in a range of environmental health issues that impact the health and well-being of billions of people worldwide, there is a general lack of understanding of the importance of these factors on human and animal health among the general public, the biomedical/public health community and the geosciences/ environmental community.

Medical geology – the science that deals with the impacts of natural geologic materials and processes on animal and human health attempts to bridge this gap by increasing the awareness of these issues between the geoscientist, environmental and biomedical communities, and by stimulating increased research collaboration among these disciplines. Medical geologists are a group of scientists that are primarily interested in outbreaks of disease in which the characteristics of the local geological constituents contribute to the occurrence of various disease states. For the most part, diseases of interest have often included the effects of deficiency or toxicity of a variety of metallic elements on various systemic organs. Scientists have studied the long-term effects of exposure to oncogenic elements, the most prominent example being arsenic. Thus, medical geology may be considered as a complementary discipline to the established field of environmental health focusing on how the natural environment impacts health. These impacts, both deleterious and beneficial, have been known for millennia but it is just in the last decade that scientists interested in these phenomena have begun to organize local, regional and global collaborations in this emerging discipline of medical geology.

Medical geologists are scientists (geochemists, biomedical/public health professionals, chemists, toxicologists, epidemiologists, hydrologists, geographers, etc.) who generally collaborate on a wide range of environmental health problems seeking causes and solutions. Among these problems are the health impacts of geogenic (natural) dusts, naturally occurring elements in surface water, ground water and soil, geologic processes such as volcanoes, erosions, earthquakes, tsunamis, etc., occupational exposure to natural materials and natural radiation. Many medical geology studies have been focused on the health impacts of dust from various origins. Medical geologists study the source, occurrence, distribution, concentration, chemistry, crystallinity and morphology of minerals (such as asbestos, erionite, silica, pyrite) that may cause health problems. Medical geologists try to determine the sources, transport and fate of potentially harmful trace elements such as arsenic, fluorine, selenium, copper and other metals. They try to determine the pathways of exposure and produce maps that illustrate local, regional and/or global geologic and geochemical factors and their relationship to existing or potential health problems. In this presentation, we will discuss the global impact of medical geology and provide a new perspective about its future.

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PL-02

GEO-STATISTICAL ANALYSIS OF URINARY STONE DISEASE PREVALENCE IN CHINA

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Urinary stone disease (USD) has afflicted mankind for millennia and continues to be a significant medical ailment throughout the world. Although an upward trend for USD prevalence is reported in almost every country, it varies significantly among different countries and regions. A global USD belt (*Stone Belt*) was identified, stretching from Canada, southeastern North America, Iceland, Portugal, Spain, German, Italy, Tunisia, Greece, Turkey, Egypt, Sudan, Saudi Arabia, the United Arab Emirates, Iran, Pakistan, India, Myanmar, southern China, southern Japan, Thailand, and Indonesia to the Philippines. The distinctive geographical distribution attracts the attention of geoscientists to study the influence of geogenic factors on geographical clustering of USD. Among all the factors, the relationship between USD prevalence and water hardness has been under debate. The inconsistency in understanding the effect of water hardness might be attributed to the inhibitory effect of some ions in hard water that usually has a high content of calcium favorable for lithogenesis and a high magnesium content as well which reduces the risk of stone formation. Most epidemiological studies up till now have been focused on the total hardness, but ignored the effect of Mg^{2+}. We proposed to use Ca^{2+}/Mg^{2+} ratio as an indicator to reflect the combined effect of Ca^{2+} and Mg^{2+} on USD occurrence. In China, the increase of Ca^{2+}/Mg^{2+} ratio (in meq) in drinking water was found to promote stone formation in the urinary system.

The predominant urinary stone composition is a mixture of calcium oxalate and phosphate. We found that the spatial distribution of phosphate-type stones is closely related to that of phosphate ore deposits and carbonate rocks. Besides, hot or warm climate and seasons increase the risk of lithogenesis through high average air temperature. Soil environment influence the composition of food, thus affecting stone formation in the urinary system. Therefore, USD could be endemic, with geogenic factors playing critical roles in USD etiology. Choosing China as a typical area, we developed a statistical risk assessment model to predict USD prevalence in China using Weight-of-Evidence method (WOFE). WOFE is a quantitative data driven method based on the Bayesian probability theroy. Four geogenic proxies were considered in the model, including Ca^{2+}/Mg^{2+} ratio, the spatial distribution of phosphate ore deposits, the carbonate rocks distribution, and the average air temperature. The verified WOFE model was then used to estimate the probability of USD prevalence. The modeling results are significant for ameliorating health risks and reducing the prevalence and incidence of USD.

Acknowledgments. This study was supported by the National Natural Science Foundation of China (No.41521001).

PL-03

AFRICA: A NATURAL LABORATORY FOR MEDICAL GEOLOGY INVESTIGATIONS

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Medical Geology has seen an important development in the world since it was established. However, in Africa such a field is still not yet well developed although it is in Africa that the application of research would be most relevant. The African continent is characterized by a very complex and dynamic geological history including frequent earthquakes, volcanic activities in tectonically active regions, pervasive dust, water toxicity due to interaction with the geological environment etc. etc. All these naturally occurring processes and materials could have short and/or long term impact on human and animal health. The situation on the African continent can be aggravated by the fact that most of the population relies solely on groundwater and locally produced food grown from soil that can be either enriched in toxic elements or deficient from essential elements for healthy plants growth. Therefore, considering the significance of a number of serious health issues, which are prominent on the continent and for which the causes are still not well understood or not unknown, and which could possibly be related to the naturally occurring geological issues, we consider Africa a natural laboratory for investigations on possible links between the geology and such health issues. This would lead to broadening our understanding of the diagnostic spectrum as well as therapy for many geological related health issues and thus improve life quality on the African continent especially in rural areas. The presentation will highlight some examples of naturally occurring geological process and materials, which might be the cause of a number of health issues occurring in Africa such as some types of cancer, thyroid issues, cardiovascular diseases, asthma, fluorosis, silicosis, etc.

PL-04

HEALTH BENEFITS OF GEOLOGIC MATERIALS AND GEOLOGIC PROCESS

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The field of Medical Geology is concerned with the impacts of geologic materials and geologic processes on animal and human health. Most medical geology research has been focused on health problems caused by excess or deficiency of trace elements, exposure to ambient dust, and on other geologically related health problems or health problems for which geoscience tools, techniques, or databases could be applied. Little, if any, attention has been focused on the beneficial health effects of rocks, minerals, and geologic processes. These beneficial effects may have been recognized as long as two million years ago and include emotional, mental, and physical health benefits. Some of the earliest known medicines were derived from rocks and minerals. For thousands of years various clays have been used as an antidote for poisons. "Terra sigillata," still in use today, may have been the first patented medicine. Many trace elements, rocks, and minerals are used today in a wide variety of pharmaceuticals and health care products. There is also a segment of society that believes in the curative and preventative properties of crystals (talismans and amulets). Metals and trace elements are being used in some of today's most sophisticated medical applications. Other recent examples of beneficial effects of geologic materials and processes include epidemiological studies in Japan that have identified a wide range of health problems (such as muscle and joint pain, hemorrhoids, burns, gout, etc.) that may be treated by one or more of nine chemically distinct types of hot springs, and a study in China indicating that residential coal combustion may be mobilizing sufficient iodine to prevent iodine deficiency disease.

KEYNOTE LECTURES

KL-01

ENVIRONMENTAL EPIDEMIOLOGY AND HEALTH EFFECTS OF MINING IN ARGENTINA

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Mining has accompanied and made possible the development of civilization. In addition, mining companies generally handle environmental aspects with care. However, like other industrial activities, mining has made serious mistakes in the past and may also make some in the future, if adequate control measures are not implemented. A serious case in Argentina involved the lead smelter Metal Huasi, which operated between 1955 and 1987 in the city of Abra Pampa, Jujuy, where it processed minerals from the mine Pirquitas. After its closure, more than 15 tons of heavy metal waste remained accumulated at the site, of which at least 9 tons have high concentrations of lead. Because of the presence of such toxic waste in the city, the health and environmental conditions of the inhabitants of Abra Pampa –most of which belong to the Kolla indigenous people– have been negatively affected. Naturally, this and other precedents have raised concern in the Argentinean community on the environmental pollution that may result from mining, an industry that has grown steadily in the country. Nowadays, Bajo de la Alumbrera is the largest copper open-pit mine. It operates since 1997 and is in the northwestern province of Catamarca. Given the controversy aroused by the potential health hazards associated with the opencast mining, we conducted a study to evaluate the effects of this activity on the health conditions of people who work in or live near Bajo de la Alumbrera. The project was the result of a cooperation agreement between FUNCEI (Fundación Centro de Estudios Infectológicos), a non-profit organization, and the Ministry of Health of Catamarca. We found no evidence that mining had adverse health effects on the local communities. Another example is Veladero mine (the largest gold mine in Argentina), located in San Juan, that in 2016 had a fresh cyanide spill, with no proven impacts on the health of the community. To better understand how exposure to environmental factors in mining areas impact health, appropriate surveillance measures should be undertaken, according to the local needs. Health impact assessment is a framework which combines different procedures, methods and tools to evaluate the potential effects of economic activities on the susceptible populations, and makes recommendations regarding the mitigation measures. Before the launching of large-scale mining projects, health impact assessment provides useful information and helps stakeholders, local communities and government authorities make evidence-based decisions about mining activities. Mining development is fundamental to the progress of our civilization, but it must remain in harmony with the environment. Finally, the role of the expert in public health should be prioritized, in the impact assessment, communication of risks, and relationships with the community.

KL-02

TOTAL HEALTH INITIATIVE AND MEDICAL GEOLOGY: NEED FOR A FRESH PERSPECTIVE

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Recent initiatives by the World Health Organization, the U.S. National Science Foundation, and the U.S. Environmental Protection Agency, have introduced a new paradigm in human health care by including the non-medical factors. This came about in recognition of the fact that occurrence of a disease is not due solely to medical factors but embodies interplay among a number of other factors; and, while genetics and life style predispose an individual to certain disease, the influence of other contributing factors, such as the characteristics of natural and built environment, and social and economic attributes, also play a critical role in health and well-being of an individual or a population. While medical geology focuses on geological processes and materials and their impacts on human and ecological health, it is suggested that the scope and definition of medical geology be expanded to include socio-economic and public policy aspects. I also propose adoption of the term geohealth to replace medical geology—a term that is all inclusive, has a wider scope, elegantly incorporates medical geography, and fits in very well with the total health concept. Details of the initiatives are included in the presentation, along with discussion of the influence of socio-economic factors and public policies on individual's or community's health outcomes. A new definition for the specialty is proposed, and arguments are put forth to highlight the advantages of replacing medical geology by geohealth.

KL-03

TOTAL AND BIOACCESSIBLE PTES LEVELS IN URBAN STREET DUSTS FROM TWO CITIES OF PORTUGAL UNDER DIFFERENT ANTHROPOGENIC PRESSURES

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Urban street dust is a complex mixture consisting of suspended particles (aerosols), and displaced soil and biogenic materials of low grain size fraction, which can be easily mobilised and easily inhaled /ingested by people.

In this work the potentially toxic elements (PTEs) levels and its oral bioaccessibility in urban street dust samples collected in two nearby Portuguese cities were determined. Under similar geological features the two cities (Estarreja and Aveiro) located in the central coast of Portugal differ in the type of antropogenic pressures. Estarreja, with a greater influence of industry and agricultural activities, has an area of 20.2 km^2, and about 7500 inhabitants. In this city is located one of the biggest chemical industrial pole of the country, which left an environmental contamination legacy, resulting from more than 85 years of industrial production. This represents a constraint for the agricultural practices (a very important activity in the region) and a risk to human health. About 20 km away from Estarreja is located Aveiro, with an area of 45.32 km^2, and a population of 18,756. Although the ceramic industry, the production and processing of metals and pulp and paper industry are the main industrial activities of the municipality of Aveiro, in the city the main anthropogenic pressures are associated with traffic and building construction.

In both cities, the sampling was conducted in the urban areas: in Estarreja about 4 km^2 and in Aveiro 3 km^2. The results showed that levels of Cr, Ni, Fe, and Pb are quite similar between cities, whereas high levels of Zn and Mn were found in Estarreja, while Co and Al is higher in Aveiro. Anyway, a high intra-site variability of PTEs contents is verified in both cases. The oral bioaccessibility data is also very variable between PTEs and intra-city.

KL-04

ESTIMATING LOW-DOSE HEALTH RISKS FROM ENVIRONMENTAL ARSENIC IN URUGUAYAN POPULATIONS

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Medical Geology is a developing discipline in Uruguay since 2005 and arsenic (As) exposure health risks is its major area of research. Geogenic As in groundwater surveillance is recently conducted in Uruguay and different aquifers of the country have As levels above those recommended by WHO for drinking water (10 µg/L). The access to safe drinking water averages more than 90 per cent population of the whole country and the service is given by the state drinking water supplier (OSE) with a As maximum acceptable limit value of 20 µg/L and a target value of 10 ug/L. The international recommendations and Uruguayan regulations for iAs and its methylated urine species in urine is < 35 µg/L for occupationally exposed workers. Food arsenic levels are also regulated by regional guidelines and main controls are performed for international exportation. In spite of all these regulations, there is a lack of baseline studies of general population and workers exposure risks to "non occupational" sources of arsenic, and there are no epidemiological studies in regards to As environmental exposure to prevent long-term health effects exposures to low doses of As. The aim of this work is to present the ongoing studies of environmental health impacts of low doses of arsenic in Uruguayan populations, and the relationships to their biomarkers levels (As in urine and hair) among other variables. The reviewed studies are mainly from research projects of postgraduate students. After validating the analytical methodologies for toxicologically relevant species in urine and hair, small scale pilot studies on children, adults and workers populations are being evaluated in relation with different parameters that can be linked to biological levels of arsenic. Preliminary results represent the first data emerging from Uruguayan populations that could be used as a source for estimating low-dose health risks from arsenic in our countryIn conclusion, arsenic is a natural and ubiquitous element throughout the environment so it is very difficult to protect populations against low-level exposure of As. The evidence for low-dose effects is still controversial worldwide so the risk of diabetes heart disease, immunological problems, and cancer could be increased. Then, it is very important that Uruguay can have this kind of scientific studies as background data to take preventive health actions.

KL-05

ARSENIC AND FLUORIDE IN GROUNDWATER – HEALTH PROBLEMS OF GLOBAL CONCERN AND SUSTAINABLE MITIGATION

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Inorganic contaminants such as arsenic (As) and fluoride (F^-) are detected ubiquitously in the groundwater resources across the globe. Both these elements lead to sadverse health impacts following long term ingestion and hence are of concern from public health perspective. Both As as well as F^- are mobilized in groundwater from the aquifers through the interaction of groundwater with the constituent solid phases in the aquifers through a number of geochemical triggers under natural geochemical environments. Groundwater basins of wide aerial coverage in regions located in Southeast Asia, Africa and Latin America are more vulnerable where groundwater as drinking water sources among a vast majority of population especially in the rural settings. According to recent estimates, more than 130 million people worldwide potentially are exposed to As at levels above the World Health Organization (WHO) drinking water guideline value of 10 µg/L. Groundwater enriched in fluoride is a widespread problem, and endemic fluorosis is documented from at least 25 countries around the world, and is most prevalent in India, parts of Africa and China affecting a population of several millions where drinking water fluoride concentrations exceed the WHO guideline value of 1.5 mg/L. While As is a proven carcinogen and has a number of carcinogenic and non-carcinogenic effects on human health, fluoride content in drinking water is considered essential below the guideline value. Excessive fluoride has a detrimental effect on human health as excessive

fluoride can lead to dental and skeletal fluorosis, manifested through teeth mottling, calcification of ligaments and long term exposure leading to crippling bone deformations and cancers.

At a global scale, systematic pattern has been observed for the occurrence of the aquifers with elevated levels of As in groundwaters, mostly forming parts of the sedimentary basins defined tectonically as foreland basins juxtaposed to the orogenic belts. The occurrence of As in the groundwater reflects the original source terrains of sediments deposited in these foreland basins as an effect of crustal evolution in orogenic belts. The mobilization of As in groundwater, is triggered under favorable biogeochemical conditions through a water–rock interactions. The distribution of fluoride is predominantly controlled by water-rock interactions especially in rocks such as granite, amphibolites, pegmatites rich in minerals such as muscovite, biotite, hornblende. The areas traversed by acid volcanic rocks, basic dikes and hornblende gneisses contribute to fluoride-rich soils and solubility in groundwater.

Understanding the geochemical processes leading to the mobilization of the contaminants is a primary requisite for understanding the heterogeneity in the concentrations at both regional and local scales. Community education for strengthening public awareness and the involvement and capacity building of local stakeholders in testing the groundwater quality is important for targeting the safe aquifers for drinking water supplies.

KL-06

ENVIRONMENTAL HEALTH IMPACT OF PAST URANIUM MINING

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Uranium mining generated in many countries large amounts of radioactive waste that allowed the buildup of a radioactive waste legacy and environmental impacts. A radioactive environmental impact assessment was carried out in the areas of two large mines, Quinta do Bispo mine and Cunha Baixa mine, and their common drainage basin of Ribeira do Castelo, in the district of Viseu, Portugal. Analysis of radionuclides were carried out in soils, surface water, groundwater, and horticulture and animal products from the region and compared with radionuclide concentrations in samples from other regions. The dispersal of radionuclides such as uranium, radium, thorium, radioactive lead and polonium from uranium milling tailings and acid mine drainage was documented in several environmental materials. A radiological environmental risk assessment was carried out and the transfer of radionuclides with water and diet to humans was considered likely to exceed the effective radiation dose limit of 1 mSv per year adopted for members of the public in individuals of the local population. Environmental remediation measures were introduced to confine radioactive waste and abate the radiation exposure. The environmental remediation is discussed in the light of radiation protection of the population, of the environment and geo-ethics.

KL-07

SOILS IN MEDICAL GEOLOGY AND ENVIRONMENTAL GEOCHEMISTRY

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Soil is not only a part of the ecosystem but also occupies a basic role for humans because the survival of man is tied to the maintenance of its productivity. Soil functions as a filtering, buffering, storage, and transformation system protect against the effects of trace element pollution. Soil is effective in these functions only as long as its capacity for cation exchange and its biological activity are preserved. The frequent association of trace element pollution with acid deposition greatly complicates the overall effects in the environments.

Soil is the main source of trace elements for plants both as micronutrients and as pollutants. It is also a direct source of these elements to humans due to soil ingestion affected by "pica-soil", geophagia, dust inhalation, and absorption through skin.

The soil-plant transfer of trace elements is a part of chemical element cycling in nature. It is a very complex process governed by several factors, both natural and affected by humans. Thus, the prediction of trace element uptake by plants from a given growth medium should be based on several biotic and abiotic parameters that control their behavior in soil.

Soils contain trace elements of various origins: lithogenic – inherited from the lithosphere (parent material), pedogenic – from lithogenic sources but forms changed due to soil-forming processes, and anthropogenic – elements deposited onto and/ or into soils as results of human's activities. Soil processes and anthropogenic factors control the behavior of all these elements. It has been assumed that the behavior of trace elements in soils and in consequence their phytoavailability differ as to their origin. Regardless of the forms of the anthropogenic trace metals, their availability to plants is significantly higher than those of natural origin.

Soils of several regions of the world have been and will be in the future subjected to mineral fertilization, pesticide application, waste disposal and industrial pollution. All these human activities affect both chemical and physical soil properties, and will lead to changes in the behavior of trace elements in soils. The impact of soil acidification, alkalization, salinity and losses of soil organic matter on the uptake of trace elements by vegetation, particularly by crop plants, have already become serious issues for the environment and for human health.

Medical geology is among other things dealing very much with soils and health. Several important topics will be covered which in most cases are possible fields of research. Among these are the use of medicinal clays, the global health issue of acid sulphate soils, the important links between agriculture and medical geology, geophagia, children and polluted spoils in play gardens, dust and health, metals in soils. Also the important issue of bioavailability, bioaccessibility, geoavailability etc will be discussed.

KL-08

MEDICAL GEOLOGY AND ARSENIC IN MÉXICO; AN OVERVIEW

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The geological diversity of Mexico including mineralized zones, different rock types and geological formations, active volcanoes, geothermal zones, and tectonic processes, favor the release of arsenic and other potentially toxic elements to the environment. Groundwater being the main drinking potable water source is enriched in arsenic in many areas like Zimapán and Guanajuato in Central Mexico, and Comarca Lagunera and Chihuahua North of the Country. Natural and anthropogenic arsenic sources co-exist in some of these zones. Health effects resulting from As contaminated water consumption like black-foot disease, hypertension and diabetes have been identified in inhabitants of some locations. Besides co-occurrence of high levels of fluoride in many aquifers worsens the health threat. This has been revealed by the correlation between As and fluoride in water, and As in urine and/or hair and water in those and other areas like Sonora, northwestern Mexico. Specific sources and geochemical processes releasing arsenic and fluoride should be identified to develop adequate measures to protect the population. Successful actions have been put in place in specific areas reducing the exposure. However, this is still not the case at all places. In mineralized zones, polluted soil by mining activities is another As exposure source that must be considered as a potential health problem. In this work an overall picture of As sources and health effects revealed by studies carried out by diverse research groups in Mexico will be presented.

KL-09

GROSS ALPHA AND BETA ACTIVITIES IN GROUNDWATERS FROM SPAS OF SOUTHEAST BRAZIL

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Gross alpha and beta activities have been characterized in 75 water sources from spas located in 14 municipalities in São Paulo and Minas Gerais states, Brazil. These waters are extensively utilized for drinking in public places, bottling and bathing purposes, among other uses. The water samples were taken from springs and pumped tubular wells drilled into different aquifer systems in the Paraná and Southeastern Shield hydrogeological provinces. The gross beta radioactivity ranged 0.08 – 5.22 Bq/L and it was log-normally distributed, whereas the gross alpha levels were between <1.0 and 428 mBq/L. Several water sources exhibited gross beta activities higher than the guidance level of 1 Bq/L established by WHO in 2011. Doses were estimated from ingestion in them of the natural radionuclides ^{238}U, ^{234}U, ^{226}Ra, ^{222}Rn, ^{210}Po, ^{210}Pb and ^{228}Ra, yielding many values exceeding the WHO guidance level of 0.1 mSv/year. Significant correlations were found between the dose values and gross alpha and beta activities (Fig. 1). The high radioactivity levels in the water sources are related to the accentuated presence of radioelements in various rock-forming minerals. Therefore, most of them cannot be considered potable as exhibit radiological constraints according to the WHO guidelines.

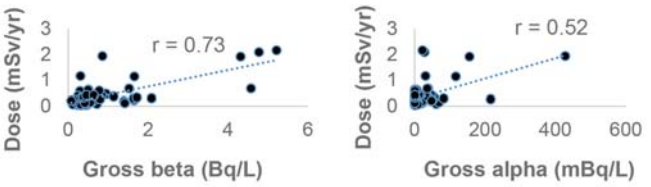

Fig. 1. The relationships between dose and gross alpha/beta activities in groundwaters from spas of southeast Brazil

KL-10

HETEROGENEITY OF THE GEOCHEMICAL PARAMETERS OF NATURAL ENVIRONMENTS IN TOMSK REGION AND MANIFESTATION OF CERTAIN TYPES OF DISEASES

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Tomsk region, the area of which is equal to France or taken together Slovakia, Czech Republic, Belgium, Austria and Ireland, in geological terms it lies at the junction of two major structures: Western Siberian Plate and Altai-Sayan folded area. Large resources of iron ore, oil and gas, peat, mineral waters are located within the plate complex, while gold, antimony, mercury, polymetallic and other ores' deposits are known in the folded part.

These geological features determine the specificity of geophysical fields, the structure and composition of the surface and underground hydrosphere and other regional environmental parameters. Redundancy of Fe, Mn, and the lack of F, I are the hydrogeochemical features of the region's waters.

In addition to natural factors, anthropogenic factors, caused by the extraction and processing of hydrocarbons, the operation of the nuclear fuel cycle, transboundary transport from industrial regions of southern Siberia (Kuznetsk, Novosibirsk industrial areas), also contribute to the environmental geochemistry of the region. The main mass flow of pollutants into the environment occurs in the last 70 years.

Comprehensive eco-geochemical studies of different natural environments – soil and snow cover, lakes bottom sediments, drinking water salt deposits, biota (peat, lichens, terrestrial and aquatic plants, tree rings, etc.), as well as the biological substrates of human and certain types of pets (hair, tissues and organs) are carried out for a long time in the region. This allowed us to carry out zoning of the region and its separate territories.

Simultaneously, the study of several human diseases is conducted in the region, especially diseases of the endocrine system and a specific human disease of unknown etiology called sarcoidosis. According to the results, regional unevenness of sarcoidosis and diseases of the endocrine system prevalence is noted due to eco-geochemical factors.

At the local level, we noted a direct correlation of a number of studied cytogenetic biomarkers (micronuclei in blood cells, chromosome aberration) and indicators of the human immune system with the maximum level of chemical elements accumulation in various natural environments.

We also reported an increase of urolithiasis level associated with changes in the total hardness of drinking water. This became particularly evident when moving river drinking water supply (soft water) to the underground one (very hard water) in Tomsk city. The doctors of Tomsk city is actively studying the impact of microbiological (nanobacterial) factor in the drinking water on the development of various pathologies in humans (gout and other diseases).

KL-11

EFFECT OF GEOGENIC FACTORS ON GROUNDWATER QUALITY AND ITS RELATION TO HUMAN HEALTH: CASE STUDY: TURKEY

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The geology of an area is a major factor in the overall quality of water and soil resources. The dissolution of numerous minerals from geological formations results in spatial and temporal variations in water quality and consequently influences human health. These interactions are mostly responsible for a variety of health concerns such as cancers of internal organs, Alzheimer's disease, mesothelioma, fluorosis, thyroid goiter problems and several others.

Based on the tectonic characteristics and the geological structure, many parts of Turkey are likely to have high heavy metals such as arsenic, boron, fluoride-containing geological formations. Most of these geological formations are hydrothermally altered and fractured, due complex geology with active tectonics and high geothermal potential. The problems of water quality have become more serious than the quantity nowadays in Turkey, which includes geogenic factors. Geogenic contaminations are mostly in volcanic regions due to arsenic and manganese in different parts of Turkey. Geothermal fluids contain high boron and fluoride levels especially in the graben areas of western Turkey. Geothermal fluids which contain fluoride poses a danger for skeleton, dental, and bone problems, especially in the areas of Denizli, Isparta, and Aydın. Arsenic levels up to 4% have been observed in mineral deposits, particularly in the Kütahya-Emet region, which is known to contain the world's largest boron deposits. High arsenic concentrations in groundwater have been detected in many provinces of Turkey with values ranging from 10 to 9300 ppb in groundwater.

Some public health survey conducted in northwest of Turkey revealed that some local people have been affected from high heavy metals such as aluminum and arsenic containing water sources coming from densely altered rocks. These results also indicate that geological formation can have considerable impact on human health when high blood lead levels in individuals living in close proximity to ore mining areas and volcanic alteration sites are taken into consideration.

KL-12

ASSESMENT OF NATURAL MOLASSES SOIL IN TERMS OF MEDICAL GEOLOGY

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Molasses is obtained with the crushing of either sweet fruits (e.g., grape, fig, carob, mulberry) or agricultural products that turning into sugar (e.g. sugar beet, juniper fruit). It is an intense and sweet syrup that is unique to Anatolia. Clay or soils are used extensively in the making of molasses thus these natural materials are called molasses soil. The material used as molasses soil is a white and whitish in color which contains 50-90% $CaCO_3$. The clay minerals are, in general, kaolinite, smectite, illite and mica.

As in every soil type, chemical pollution caused by environmental influences can be encountered in molasses soil as well. It is, particularly, important to determine heavy metal, naphthalene, pesticide contents in the soil and also to define the areas in which they can have a toxic effect. As long as these contaminants are not controlled, they can pass to molasses easily during its production. Therefore the risk of exposure to soil-related pollutants is particularly high in molasses.

Within this research, the Nigde and Denizli regions from Turkey in where molasses is produced intensively. In the samples of molasses from Nigde Province, residue levels of some kinds of pesticides and the presence of polycyclic aromatic hydrocarbons were defined. The lithological exposures of some areas in the north of Denizli have been investigated and it has been concluded that some of the molasses used may contain heavy metal contents. In this context, the use of molasses in these areas could result health problems.

KL-13

MEDICAL HYDROGEOLOGY AS A NEW BRANCH OF MEDICAL GEOLOGY

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The knowledge of the role of water factor in global processes of environmental influence on human living conditions and their health determines the creation of medical ecological parts of fundamental Earth science. The report is designed as backgrounds for a new scientific field of medical geology – medical hydrogeology.

The use of groundwater for household water supply increases dramatically as a consequence of surface water sources quality deterioration. Unfortunately, the general concept of high water quality of groundwater sources and their safety has been changed in last decades – it now includes not only anthopogenic pollution but also natural water contamination. Russian and international works show high range of causes of groudwater pollution related to the complex of ecological, legal, technological and economic problems. Medical ecological assessment of contemporary data on dynamics and character of changes of groundwater quality is based on a number of thorough epidemiological and ecological-toxicological studies in recent decades. The analysis of the data shows the increase of non-infecious and infectious diseases due to the use of groundwater of poor quality. Large-scale investigations that use modern methodologies of risk assessment present new information on negative influence of natural composition and anthropogenic pollution on human health. Cause-and-effect relationships of the pathology under study – particularly, oncology and cardio-vascular diseases, – with high content of particular macro- and microelements of natural genesis, toxic organic substances (including high danger ones – e.g. dioxins), heavy metals have been established. Studies of the problem show the significance of any part of modern hydrogeology – science on origins, content, conditions of location, peculiarities of movements, and interrelationships of groundwater with enclosing rocks, – for safe groundwater supply. Interdisciplinary approach for complex use of forecasting techniques of hygiene, ecological toxicology, epidemiology, hydrochemistry, hydrogeology, sanitation, geoecology is necessary to solve the complex of emerging problems. The use of the approach for water management problems related to groundwater use will help researchers to make a right choice of groundwater reserves' replenishment, safety of sanitary protection, techniques of water quality amelioration, and desalinisation. Therefore, there is the necessity for views and information exchange among specialists on forms and nature of collaboration when making a choice of water management decision with regard to medical ecological interests. The approach needs the creation of special guidelines for researchers and managers.

Introduction of medical hydrogeology basics as a separate discipline for preventive medicine and water management specialists will increase a priority of human health protection when choosing and using groundwater as drinking water source.

KL-14

MEDICAL GEOLOGY AND ITS ROLE IN BROWNFIELD SITE EVALUATION AND DEVELOPMENT: WHEN WEALTH GENERATION OF THE PAST IMPACTS PROSPERITY OF THE FUTURE

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Brownfield sites embody large areas of previously used land and water that may contain reservoirs of hazardous substances or contaminants. Medical geological principles must be used to evaluate the health risks posed by these sites; risks which may be either exacerbated or ameliorated as a result of redevelopment or inaction.

Brownfield sites across the globe represent a complex and evolving problem for land-use planners, developers, environmental regulators, public health authorities and for the public, with many reported examples of disadvantaged communities being subjected to poor health outcomes after redevelopment. Poorly disclosed or defined liability where companies, governments or individuals' dispute responsibility, combined with an inconsistent global legislative framework are key contributors to poor health and environmental outcomes. In in an expanding global community where the development of brownfield sites presents an alluring opportunity to improve land value by reusing this "poor value"

land, it is imperative we adopt consist procedures to mitigate risk and improve environmental and hence potentially human health outcomes. Without a systematic approach to the understanding of brownfield sites contamination, their redevelopment risks impacting on whole-of-population health outcomes in the next century.

We investigate the Goldfields region of Victoria as an example of the complexity of jurisdictions, health outcomes, confounding factors and ignorance to illustrate the need for holistic and globally contextualised rehabilitation and redevelopment strategies. We present data to illustrate this complexity and the issues associated with inaction.

KL-15

MATHEMATICAL MODELLING OF BIOSPHERIC REGULATION OF THE CARBON CYCLE IN CENTRAL ASIA IN THE CONDITIONS OF GLOBAL CLIMATE CHANGE

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Both climate and the environment changes in Central Asia are primarily related to desertification. Areas of Central Asia, including Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and Afghanistan, belongs to the "rare forested" areas. In recent decades, the Central Asian region has experienced a significant warming that led to violations of the hydrological cycle, as well as changes in ecosystem functions of plant communities. The data on the seasonal dynamics of carbon in desert and semi-desert of plant communities in Central Asia were insufficient in recent years. Existing studies tend to overestimate the content of carbon in dry land ecosystems. The deserts and semi-deserts of Central Asia are relatively large, dynamic, and still poorly quantified carbon pools that are likely to play an important role in the global and regional climate change. The degradation of natural resources, including land, fresh and marine waters, forests and biodiversity threatens the lives of many people. An absorbent environmental function is manifested through the processes of decomposition and recycling of nutrients, purification and filtering of air and water. When the load exceeds the allowable, the system's ability to perform these functions is reduced.

This threatens human health due to the consumption of water from contaminated sources, inhalation of air pollution and agrochemical pollution. Actual measurements and laboratory experiments cannot function without the mathematical modelling of the carbon cycle, in the sense that a lot remains unclear to this day. Mathematical models allow us to reduce the data of different measurements in a single three-dimensional model and determine how these changes correspond with some existing concepts and theories. Only global models allow us to carry out computational experiments, forecasts of various development options. The authors use this singular mathematical model of global carbon dioxide cycle in the biosphere with a spatial partition of land and ocean.

To study the regional impacts of global warming and land use in Central Asia, the authors calculated the change of phytomass, humus and the total amount of carbon under the influence of industrial emissions of CO_2, tropical deforestation and erosion of humus associated with unsustainable land management. The calculations were made for the period of 1860-2060 on a spatial model of the global carbon cycle Computing Centre of RAS.

KL-16

SPATIAL VARIATION IN SOIL GEOCHEMISTRY AT REGIONAL, FIELD AND MICRO SCALES: NEW OPPORTUNITIES AND CHALLENGES

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This presentation discusses the latest understanding of spatial variation in soil geochemistry at various scales, the uses of advanced spatial analysis techniques to quantify the variation, as well as the new challenges which go beyond academic research. Spatial variation in soil geochemistry have been found at all the sizes of regional (in square kilometers), field and micro scales (in square centimeters). The techniques of local statistics, hotspot analysis and spatial correlation are explained and applied to soil geochemistry. One of the focuses is the use of local index of spatial association (LISA) and its applications in urban geochemical studies in Galway, Ireland and London, the UK. The LISA is a useful tool for identifying pollution hotspots and classifying them into spatial clusters and spatial outliers. The results were affected by the definition of weight function, data transformation and existence of extreme values. It is suggested that all these influencing factors should be considered until reasonable and reliable results are obtained. The new opportunities have arisen from the current concept of "big data", but the challenges for stronger "data analytics" are emerging. While the assumptions for the use of parametric statistical methods are widely known, attention is needed for the requirement of spatial autocorrelation when spatial distribution maps are produced based on spatial interpolation. Furthermore, when the geochemical study results are actually applied in environmental management and agricultural practices, political and socio-economic factors are playing an important role, going far beyond academic research!

ORAL PRESENTATIONS
SECTION: OCCUPATIONAL HEALTH ISSUES (OH)

OH -01

MERCURY CONTAMIATION TO THE ENVIRONMENT AND HEALTH IMPACTS BY SMALL AND LARGE SCALE HG MINING ACTIVITIES IN CHINA

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China currently is one of the largest mercury (Hg) consumers and Hg producers worldwide. From the perspective of the global plate tectonics, Guizhou province is situated in the center of the circum-Pacific mercuriferous belt. Therefore, Guizhou was one of the world's important Hg production centers. So far, at least 12 large and super-large Hg mines have been discovered in the province. Currently all large scale Hg mining activites in Guizhou were completely stopped, but small scale Hg mining activites are still on-going. The Xunyang Hg mine situated in Shaanxi Province is presently the largest active Hg mining district in China. We have conducted detailed studies to investigate Hg contamiantion to the envirnment and health impacts to local inhibitants at both large scale Hg mining and small scale (artisanal) Hg mining areas.

Our study revealed a significant contamination of Hg in soil, sediment, water, and rice in both Hg mining areas in Guizhou and the Xunyang Hg mining district. The highest concentrations of Hg in riparian soil, sediment, water and rice were found at the areas in the vicinity of the Hg retorting and mining sites. Moreover, GEM concentrations in ambient air exhibits a local spatial pattern indicating Hg^0 emission during the process of cinnabar ores retorting. Elevated concentrations of MeHg in rice also were found. The sources of MeHg in rice mainly derived from the soil MeHg, which is likely related to the deposition of GEM. High concentrations of THg in surface water and stream sediment are mainly constrained by the calcines introduced during the retorting activity, which represents the major source of Hg contamination to the local ecosystems in the region. The mining waste piles in the study region must be appropriately disposed of and the mine runoff from those calcine piles should be properly treated and not be used as irrigating water to the paddy field. Our study showed that artisanal Hg miners exposed to high levels of Hg vapor and urine Hg concnetrations in Hg miners were two to three magnitudes higher than the control groups. Our data showed a serious adverse effect on renal system for the smelting workers. The workers were exposed to mercury vapor through inhalation, and the exposure route of Me-Hg was through intake of rice. Meanwhile, rice consumption is the primary MeHg exposure route for the local population in Hg mining areas.

OH -02

POTENTIAL HEALTH EFFECTS OF POLLUTION OF SOILS AND DUSTS AROUND METAL RECYCLING FACTORIES IN SOUTH-WESTERN NIGERIA

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Metal Recycling Factories (MRF) are developing on a massive scale as Nigeria embraces metal recycling as an alternative to imported steel products. These MRF have become point sources for introducing Potentially Toxic Elements (PTE) into environmental media surrounding them. This work was undertaken to ascertain the constituents of the wastes (Slags and dusts) generated from these factories in order to ascertain potential health effects this may have on the human populace within the area.

One hundred and fifty samples (30 slags, 60 soil and 60 dusts) were collected for this study. The samples were analysed for elemental constituents using the inductively Coupled Plasma Optical Emission Spectrometry. Potentially Toxic Elements, PTEs were selected for further evaluation using geochemical and geo-statistical models. The residents of the area were also interviewed on what their perceptions of the activities of the recycling plants are on their health conditions.

The elemental result showed the following concentration range in (mg/kg) for selected metals: Pb (21.0-2399.0), Zn (56.0-4188.0), Cu (10.0-1470.0), Ni (6.0-65.0ppm), V (31.0-134.0), Cr (21.0-1737.0) and Cd (Below Detection Limit, Bdl-18). The spatial metal distributions maps showed that soils and dusts from areas in close proximity to the factories have extreme concentrations of the selected PTE. The slag also revealed extreme values for metals. All the values obtained in sampled media close to the factories exceeded all prescribed guideline standards. Respondents revealed that they suffer from Breathing related disorders and that the quality of inhalable air in their community had deteriorated tremendously. They also confirmed that the slags are currently being utilised for filling up foundations of building and roads providing additional pathway for introduction of the PTE into the environment from the suspended materials generated from mechanical breakdown of the slags.

The current practice by the factory had impacted negatively on the quality of environmental media with consequent potential health effects on the inhabitants in the vicinity.

OH -03

THE IMPACT OF POTENTIALLY TOXIC ELEMENTS ON THE HEALTH STATUS OF RESIDENTS LIVING IN HISTORICAL MINING AREAS, SLOVAK REPUBLIC

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Impact of potentially toxic elements (PTE) on the health status of population of the Slovak Republic has been studied in two historical mining areas with ore extraction from Middle Ages (the Middle Slovak Neovolcanics, the Slovak Ore Mts.) and one historical mining area with more than hundred years brown coal mining (Upper Nitra region). The contents of PTE were analysed in groundwater/drinking water and soils. The health status of resident population was evaluated based on 43 health indicators classified according to the international classification of diseases (ICD, 10th revision), including mainly those indicators characterizing mortality on cardiovascular and oncological diseases. In these areas the health status of population living in municipalities with increased PTE contents (As, Pb, Zn, Cu, Cd, Hg and Sb) was compared with that in adjacent municipalities showing low PTE contents. A total of 138 contaminated and 155 non-contaminated municipalities of similar socioeconomic, natural and geochemical-geological character were compared. PTE contents in soils of polluted municipalities reported considerably increased levels – between 2 to 10 times higher in contrast to non-contaminated municipalities. On the other hand, PTE contents in groundwater were almost identical in both contaminated as well as non-contaminated areas. Based on the assessment of the health status of population (using 43 health indicators), no significant difference in the health status of population in contaminated and non-contaminated municipalities has been reported. Based on the statistical analysis (Pearson, Spearman) and calculations of artificial neural networks no significant relationship between values of 43 health indicators and PTE contents was documented. We can conclude that if groundwater used for drinking purposes show no PTE contamination, the local population inhabiting these historical mining areas might be at much lower risk than has been, in general, reported so far.

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OH -04

SARCOIDOSIS IN TERMS OF MEDICAL GEOLOGY

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Sarcoidosis is a disease of unknown etiology, primarily affecting the lungs and mediastinal lymph nodes. Incidence of sarcoidosis in the Tomsk region has grown 3 times during 15 years and is not uncommon in practice of pulmonologists. It is logical to assume exposure external factors coming from the environment through the respiratory tract.

The aim of the work was to study the relationship between geochemical factors and the incidence of sarcoidosis in Tomsk and its region.

Methods: Sarcoidosis incidence has been studied according over a 20-year period (401 patients). The proportion of patients with occupational hazards was 11.2%. This fact forces to assume the influence of environmental factors.

The incidence rate of sarcoidosis for patients without unhealthy working conditions has been determined per 100000 of populations and was compared to the geochemical data: 1568 measurements of 23 chemical elements (Na, Ca, Sc, Cr, Fe, Co, Zn, Br, Rb, Ag, Sb, Au, La, Th, U, Hf, Se, Hg, Ce, Sm, Eu, Yb, and Lu) were made by the neutron activation analysis in the dust-aerosol и soil within the agglomeration: Tomsk-Seversk-Tomsk rural district. The incidence of sarcoidosis with recurrent course was investigated additionally.

Sarcoidosis highest incidence was found on the territories exposed to anthropogenic factors: in Seversk 67.3 (nuclear fuel industries), Octyabrsky district of Tomsk 56.8, northeastern part of Tomsk rural district 109 (petrochemical industry, nuclear fuel industries). In these areas the incidence rate was significantly higher compared to the mean findings in region – 42.6 (χ^2 = 7.9-11.6; $p < 0.05$). In Seversk recurrent forms of sarcoidosis were significantly higher – 20. 6 versus 10.2 in Tomsk (χ^2 =7,94; $p < 0,01$). The incidence in the mainly agricultural districts was minimal and equaled 23.5.

The correlations have been found between: the sarcoidosis incidence and the Na content in the dust aerosols ($r = 0.9$; $p < 0.05$), Ce in the soils ($r = 0.9$; $p < 0.05$); recurrent forms of sarcoidosis and Lu in soils ($r = 0.8$; $p < 0.05$), Cr content in the soils of these territories ($r = 0.65$; $p < 0.05$).

Geochemical and anthropogenic factors affect the regional heterogeneity of sarcoidosis and predominate over occupational hazards in the Tomsk region. It is possible that the implementation takes place by the influence of trace elements which have shown the correlations: Na, Lu, Ce, Cr. The above data indicate the disease should be considered from the standpoint of medical geology.

OH-05

CHEMICAL COMPOSITION OF THE PLACENTA BIOPSIES AS AN INDICATOR OF ENTERPRISE TECHNOGENIC IMPACT ON THE ENVIRONMENT

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Introduction. Under the conditions of urban environment technogenic impact the living organism is constantly exposed to multiple effects of diverse factors. Tomsk as a modern industrial city is not an exception. Changing in the organs and tissues chemical components leads to alteration which create complications, pathological processes and illness. The barrier systems of the living organism are intended for its defense from negative environmental impact. Each of the organ systems functions as a barrier in its own way. In this paper we consider functioning of the placental barrier included in the reproductive system.

The reproductive system is a marker and biological indicator of the environment state, as adverse environmental factors have a significant impact on the state of the mother-placenta-foetus system, in which the placental tissue holds a central position. On the one hand, the placenta implements relations between the mother and the foetus, on the other hand, it plays an exceptional part in protection of the foetus from negative impacts. Chemical analysis of organs and tissues, the function of which is to reduce migration ability of chemicals by accumulating them, as placenta, enables us to draw conclusions about the state of the environment and its technogenic transformation.

Research materials and methods.

Research subject. The research subject is the biopsic material of women 25-41 ages, living in Tomsk (10 samples in total).

Sampling and research methods. The research is based on the materials collected in 2012 by staff members of the Geoecology and geochemistry department of Tomsk polytechnic university and by staff members of the pediatric faculty of the Siberian state medical university. For sample assaying we used the method of instrumental neutron activation analysis (INAA) in the analyst was A.F. Sudyko, senior researcher. Compared to the others, this method has a number of advantages, including capability to detect chemicals content in a wide range (from n.1 to n.10–6%). INAA allows to determine the content of a large number of elements (Na, Ca, Sc, Cr, Fe, Co, Zn, As, Se, Br, Rb, Sr, Ag, Sb, Cs, Ba, La, Ce, Sm, Eu, Tb, Yb, Lu, Hf, Ta, Au, Th, U).

Results and discussions. Chemical elements contained in the placenta were normalized to average grade of all sample and obtained coefficients were summed up. The quantity of selected chemical elements minus one was deducted from obtained sum, according to the method of the calculation of the total pollution index for the environmental media. The calculation of the total pollution index for the women placentas, living in the territory of other Tomsk districts help to regionalize the Tomsk city territory. Leninsky and Kirovsky districts were highlighted as more polluted. The less calculation of the total pollution index was found in the sample from the Sovietsky and Octyabrsky districts. Our results is consistent with results of studying of chemical elements contamination in soils and aerosols in the urban territory. According to the evaluation of ecological and geochemical state of Tomsk pursuant to the study of soils and dust aerosols, Leninskiy and Kirovskiy districts are highlighted as anthropogenically loaded. Thus, the reason of high concentration (in comparison with other districts of the city) of chemical elements in the placental tissues of women, living in Leninskiy and Kirovskiy districts, is that these districts are ecologically unfavorable. The boiler houses and suburb, located in the northern part of the city, are the sources of slag particles, ash, resulting in concentration of Na, Ca, Fe, Zn, Cr, Co in the placenta.

OH-06

HIGH MO CONCENTRATIONS IN AREAS WITH COAL-COMBUSTION RELATED ENDEMIC FLUOROSIS: EMERGING METAL TOXIN?

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The adverse health impacts of cadmium (Cd), fluorine (F) and molybdenum (Mo) have been received high environmental concerns, however, little was known for Mo's impact in the endemic fluorosis region. Our research reported for the first time that the geological original Mo might be a serious hidden toxin in the coal combustion endemic fluorosis areas. A case study revealed the enrichment of Mo in a fluorosis-affected rural area in the Three Gorges region, SW China. The concentrations of Mo were 6.8–309 mg kg^{-1} in local carbonaceous siliceous rocks, 11.8–304.1 mg kg^{-1} in stone coals, 8.2–17.9 mg kg^{-1} in coal balls, 4.8–170.5 mg kg^{-1} in gangues, 2.6–72.2 mg kg^{-1} in arable soils and 0.3–46.8 mg kg^{-1} in local food crops, respectively. It is notable that Mo in urines of local residents was 376.8 ug L^{-1}, much higher than the controls. The pH values in Mo-rich arable soils were 5.4 ± 1.0, indicating high bioavailable fraction of Mo, and local crops were easily absorbed Mo from soils. In addition, the local Mo-rich coals were used for cooking, heating and drying harvested crops, through which Mo could emit from coals, then absorbed in drying crops and indoor inhaled by local residents. Consumption local crops might lead to excessive intake of Mo, resulted in tooth and bone damages. Therefore, the naturally occurring Mo in coal combustion endemic fluorosis areas represents a previously unrecognized metal toxin, which merit attention with respect to control the endemic problem.

OH-07

THE IMPACT OF GEOLOGICAL FACTORS ON PREVELANCE OF TYPE 2 DIABETES IN THE REPUBLIC OF BASHKORTOSTAN

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Study of the interrelation between geological conditions, microelement composition of the area and diabetes prevalence has been carried out on the territory of the Republic of Bashkortostan (RB). Results of assessing 1042 soil samples on the content of 45 chemical elements (Be, Sc, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Br, Rb, Sr, Y, Zr, Nb, Mo, Cd, Sn, I, Cs, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, W, Tl, Pb, Bi, Th, U) by ICP-MS method (mass spectrometry with inductively coupled plasma), which were represented in the report by L. Krinochkin and A. Shkarin, have been further analysed (2011). Type 2 diabetes prevalence has been estimated according to 2010–2014 diabetes records in RB. More than 80 000 patients with diabetes were registered in RB over this period. To mitigate man-made factors, the population of 8 industrial centres of RB was excluded from the statistics. 2,189,026 people, i.e. 53.83% of the RB population including 38,819 patients were counted in the statistics.

The average diabetes prevalence was 1773 cases per 100 000 people. Minimum rates of 906 and 1036 per 100 000 were registered in two districts within the Urals, and the maximum was in the district of western part of RB – 2845 per 100 000 people. The mapping of the diabetes prevalence enabled us to mark out 3 clusters – a group of districts with high rates of diabetes in the west (western cluster), as well as two other groups with relatively low rates in the north (northern cluster) and in the Urals zone (Uralian cluster). In the western cluster (27 districts with the population of 1,153,523 people) the diabetes prevalence accounted for 1931 per 100 000 people, which is 1.4 (p=0,000071) and 1.7 (p=0,000004) times higher than in the northern and the Uralian clusters respectively. In the northern (11 districts with the population of 271,921 people) and Uralian (6 districts with the population of 278,992) clusters the diabetes prevalence was registered at 1334 and 1155 per 100 000 people.

Comparative analysis of 45 chemical elements in 3 clusters was implemented to identify patterns of trace elements distribution in the region. Assessment of 45 elements in 472 samples of the western cluster, 224 samples of the nothern cluster and 346 samples of the Uralian cluster revealed reduction of iron and beryllium in the western cluster compared to the nothern and Uralian ones. Thus, in the western cluster average content of iron and beryllium in the samples amounts to 2563.8 and 0.346 mg/kg, while in the nothern cluster –l5176.9 and 0.631 mg/kg (with p=0.0148 and p=0.0001 respectively), and in the Uralian cluster – 4444.9 and 0.571 mg/kg (with p=0.000144 and p=0.0001 respectively).

Decrease of type 2 diabetes prevalence in the nothern cluster was associated with the zone of carbonate rocks, characterized by high availability of minerals contained in them. Relatively low prevalence of type 2 diabetes was observed in the Southern Urals, where high concentration of tectonic faults, magmatic and metamorphic rocks tend to raise the concentration of trace elements in the soils. The observed beneficial effect of higher concentration of iron and beryllium on the diabetes prevalence suggests possible protective effect of these elements against the desease and shows the necessity of more profound research into the role of these elements in the regulation of carbohydrate metabolism.

OH-08

THE POTENTIAL ENVIRONMENTAL & HEALTH IMPLICATIONS FROM BAUXITE TAILINGS DUST: A PILOT STUDY IN JAMAICA

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The production of alumina liberates waste known as bauxite tailing; which can be enriched with a suite of potentially harmful elements (PHE). This study aims to investigate the PHE contamination of soils and potential health implications due to the close inhabitation to bauxite tailings. Environs situated around a 6km radius of a red mud lake were divided into Zones A (0-2km), B (2-4km) and C (4-6km). 65 subjects participated in a health survey, via interview questionnaire between all zones. 1 red mud sample and 35 Soil samples were collected within these zones. Geochemical and Radiological analysis of samples were executed via XRF and Gamma Spectrometry, while questionnaire dataset was subjected to tabulation and graphic display of interpretation. It was observed that Fe was the highest major element concentration, within the Mud Lake and displayed enrichment within surrounding soils with increasing distance towards the red mud tailings. The Bauxite tailings consisted suite of Major (Fe >Ca > Al> Ti > Si > Mn >Mg > P), Minor (S> V > Cr >Ce> Zr > La> K), Trace (Sc, Pb, Sr, Cu, As, Sn, Cd) and radioactive elements (U,Th, K).The most prevalent disease identified was Respiratory/ENT, followed by Metabolic and Oncological. Furthermore, the youngest cohort (<25y.o) experiencing Respiratory/ENT and the eldest (>70) primarily experiencing oncological and neurological implications. The reposition of red mud lake dust has attributed to the PHE contaminant enrichment with increasing trends towards the lake. Also, there was notable health implications associated with closer inhabitation near the lake.

OH-09

PROBLEMS USING MERCURY IN LOCAL MINING, PASAMAN DISTRICT OF INDONESIA

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The Geological Agency of the Ministry of Energy and Mineral Resources has been research of mercury pollution in mining and medical geology since 2010. The spread of mercury due to gold mining has occurred, especially of local mining in Pasaman District . Samples were taken from hair, urine, plants, and fish as well as health data and analyzed for the mercury content. Interviews were taken with the 20 respondents that the hair and urine samples were taken from the majority of respondents had little formal education. The age of the respondents with a range of 20 to 65 years old. Result of the Hg analysis in the fish, water, rice, and vegetables are as follows (Hg in ppm): rice 0,013 – 0.035; vegetables 0,054 – 0.062; fish 0,037 – 0.90; water 0.001 – 0.0062. The hair had 0.028 – 0.84, urine 0.053 – 39.62. The observed Hg levels in urine detected exceeded normal levels, and several people who exceeded the maximum levels had health problems. It is necessary to analyze the health risk to the communities around the gold mining areas.

OH-10

TO THE PROPOSAL OF MEDICAL GEOLOGY RESEARCH ON THE TERRITORY OF KAMCHATKA PENINSULA (RUSSIA)

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The presented proposal is dedicated to the staging of interdisciplinary research in geology and health on the territory of the Kamchatka Peninsula (Russia), which contains volcanic and seismic activity. The proposal was approved and recommended for practical implementation by IMGA Executive Committee.

The initial stage of unsystematic research on geology, ecology and health in this region was finalized in 2005. Negative tendencies in the health status of population were revealed on the basis of questionnaire surveys conducted among 454 residents of Ust'-Kamchatsk, a small coastal settlement facing the Pacific Ocean. Conducted research has shown the low status of health of the population, who live next to active volcanos. The obtained results showed that effects on human health were not associated seismic and volcanic activities or products, in spite of the evident symptoms of health disturbances of the population. Among them we could name respiratory system and lung diseases, cardiovascular diseases, dyspnea, headache, insomnia, different nasal and skin lesions, as well as new-onset neoplasms among children, which could be further explored as health problems caused by geogenic factors. Primary factors of the population health status deterioration were described as "climatic" and "social" ones.

The main target of the proposal is to start systematic medical geology and social studies in the Kamchatka region on the basis of new data obtained by medical geologists from IMGA and IMGA Chapter Russia-N.I.S. Novelty of the planning research approach is concluded in realizations from the social and medical questionnaire survey conducted among the population of the Kamchatka region. The population lives in small settlements and the city of Petropavlovsk-Kamchatsky, where they are under the influence of volcanic products, and environmental as well as climatic factors which are negatively geogenic and affect human health.

Introducing the ideas and achievements of modern medical geology to the authorities of the Kamchatka region is one of the most important steps in the realization of the general target and objectives of the proposal. The target and tasks of the presented proposal were first reported in April 2015 at a special meeting organized jointly by the headquarters of the Committee on Social Development of the Kamchatka Territory Regional Parliament, Institute of Volcanism and Seismology for Far East Branch of the Russian Academy of Sciences (IVS FEB RAS, Petropavlovsk-Kamchatsky), and Russian Geological Society (ROSGEO). The further activity and finance basis of the proposal were discussed in October 2015 with participation of members of the Kamchatka Territory Regional Government. As a result, the Regional Working Group on Medical Geology was created.

At the moment, however, research work on the proposal has not been started because of a lack of money in the local budget. In accordance with the statistics data published in Annual State Report on Status of the Population Health in the Kamchatka Territory (2015), the impairment of lung disease status, such as pulmonary emphysema, occurred in a cohort of teenagers (age 17 y.o.) of Ust'-Kamchatsk. This fact demonstrates an indirect symptom of disease closely linked with the multiplicative effect of geogenic and other environmental factors, such as volcanic ash fall and volcanic gases. This conclusion must be confirmed during special research aimed at the identification of damaging factors such as geogenic or social origin, namely tuberculosis and pernicious habits of the population – smoking, alcoholic deterioration and etc.

OH-11

LOCALIZING CRYSTAL-SITES OF LONG-TERM RADICAL FORMATION IN WEATHERED CHRYSOTILE ASBESTOS

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Chrysotile-asbestos [$Mg_3Si_2O_5(OH)_4$] is a fibrous mineral used in construction industry for most of the last century. Upon inhalation fibers induce asbestosis, lung carcinomas and pleural mesotheliomas. Apart from low clearance rates, chrysotile induced injuries can be linked to its inherent fibrous morphology and surface chemistry. Fe is the most abundant redox-active metal in chrysotile and is substituted during petrogenesis into the structure of chrysotile: Ferrous and ferric Fe enter Mg-octahedra, whereas exclusively ferric Fe enters Si-tetrahedra (Fe^{3+}[4]). Oxidants like H_2O_2 interact with Fe on the fiber surface and induce Fenton-like redox reactions, which generate reactive hydroxyl radicals with a high potency to damage biomolecules.

Under physiological and environmental conditions, chrysotile dissolution rates vary as a function of pH. Moreover, dissolution rates are accelerated by iron-specific biogenic ligands like desferrioxamine-B (DFOB). In dissolution studies at the physiological pH=7.4 we demonstrate by ICP-OES, EPR spin trapping and Mössbauer-Spectroscopy that the outermost Mg-layer of the fibers dissolves quickly within days, exposing a slowly dissolving Si-layer which hampers further dissolution. We found that the Fe-content of the quickly dissolving Mg-layer subsequently precipitates into Fenton-inactive Fe-hydroxides, whereas Fe^{3+}[4] in the Si-layer remains Fenton-active for several weeks. The radical forming potential of the low abundant Fe^{3+}[4] (7% of bulk-Fe) equalled ≈60% of the one of the whole octahedral Fe-content in the outer Mg-layer, and decreased to nearly background by complexation of Fe^{3+}[4] by DFOB. Therefore, we conclude that Fe^{3+}[4] is presumably the dominant site of long-term radical formation in chrysotile dissolving under physiological and environmental conditions.

SECTION: URBAN MEDICAL GEOLOGY: INTEGRATING GEOLOGIC AND ANTHROPOGENIC PROCESSES (UMG)

UMG-01

DISTRIBUTION AND HEALTH RISK ASSESSMENT OF HEXACHLOROCYCLOHEXANES (HCHS) IN URBAN SOILS WITH VARIOUS TYPES OF LAND USE IN BEIJING, CHINA

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The concentrations of hexachlorocyclohexanes (HCHs) were investigated for urban soil samples collected from different types of land use in Beijing of China, including business area, classical garden, culture and educational area, large public green space, residential area, and roadside area. The results showed that HCH concentrations ranged from 0.32 to 136.43 ng/g, with a geometric mean of 3.46 ng/g. The HCH concentrations in classical garden and large public green space were much higher than that in the other types of land use, which was due to the usage of HCHs to protect vegetation in classical garden and large public green space. Source identification showed that HCHs was mainly derived from historical HCHs (including technical HCHs and Lindane) as well as the long-range atmospheric transportation of HCHs. Generally, HCH concentrations showed a decreasing trend from the city center to the suburb, and it increased with the age of the urban area. HCHs concentrations were negatively correlated with pH and positively correlated with total organic carbon and black carbon contents in soils. Health risk assessment with CalTOX and Monte Carlo analysis showed that health risks mainly came from inhalation exposure and dermal uptake pathways, and the total risk values were lower than the acceptable health risk value (10^{-6}). The sensitivity analysis indicated that the reaction half-life of HCHs in soil, fraction dermal uptake from soil, exposure duration, and organic carbon fraction in soil significantly contributed to the variance of the health risk.

UMG-02

URBAN GEOCHEMISTRY OF AFRICAN MEGACITIES

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Following the dawn of the environmental epoch in Africa some four decades ago, a plethora of studies have been conducted in the Continent's major urban centres to determine the effect of multiple sources of contamination and pollution of the air, water and soil environment. Toxic metal contamination, organic pollution, smog, acid mine drainage (AMD), acid rain, greenhouse gas accumulation and release of teratogens (e.g., ionising radiation) are the most widespread legacies of an often uncontrolled growth that has deeply changed the geochemical character of these urban environments. For the megacities of Cairo, Lagos and Kinshasa, we now have a mass of documented data on the migration pathways, uptake dynamics and health impacts on humans of geochemicals emitted through mining and ore processing operations, burning of fossil fuels, industrial and manufacturing activities, human and industrial waste disposal practices, and vehicular traffic emissions. In this paper, we illustrate the role of urban geochemistry in mitigating the damages, by systematizing and analyzing the assembled data (such as the nature of soils, stratigraphy, intensity of operation of surficial geochemical processes, groundwater flow- and contaminant transport mechanisms, patterns of atmospheric circulation) for use in designing appropriate measures for clean-up and monitoring of polluted areas.

UMG-03

CORRELATIVE RELATIONSHIPS BETWEEN THE PROPERTIES OF BRICKS MADE WITH FLY ASH

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Fly ash is released in large quantities by burning coal in thermal power plants,. Live health is threatened by the storage problems of these fly ashes. This waste can now be used as a component in many products. However, it can be used only in small quantities in most cases, thus preventing fly ash efficiently from being a threat to live health can not be possible. The construction sector is growing faster than many other sectors, and a large amount of fly ash can be used due to larger consumption of the products used in this area. Therefore, properties of bricks manufactured with two different types of fly ash by volumetric replacement fired at three different temperatures were investigated.

Correlative relationships were established among the poperties obtained from experimental study to determine the consistency between these properties. When two fly ash types were considered together, a weaker correlation was achieved. On the contrary, stronger correlation was provided when fly ashes were taken individually. This result showed that each fly ash type exhibited different behavior when sintered at different temperatures.

UMG-04

GEOCHEMICAL ASSESSMENT OF FATE AND NATURE OF POTENTIALLY TOXIC ELEMENTS IN SELECTED NIGERIAN CITIES

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Most Nigerian cities have grown into urban settlements without requisite planning leading to deteriorating quality of environmental media. This work involves the geochemical assessment of usually impacted environmental media (soils, sediments and dusts) from some Nigerian cities and determining the Potentially Toxic Elements, PTEs (Cu, Pb, Zn, Cr, etc.) contents and the speciation of such metals in order to assess their bioavailability. Geochemical Maps were prepared on base maps derived from a combination of city maps and satellite imageries in a GIS format. Samples were collected, prepared and analysed using established protocol.

Results from the study revealed varying degree of concentrations for all the analysed PTEs with more densely populated and industrialised cities revealing elevated levels of PTEs. The generated geochemical maps also showed vivid relationship among spatial distributions of these PTEs, the type of underlying geologic materials as well as the effects of the various anthropogenic activities within the urban environments. *Hotspots* were identified to be areas with huge population, routes with huge traffic concentrations and snags, isolated waste dumps sites as well as industrial layouts. The generated maps thus become veritable information tool for planning, monitoring and policy formulation as well as basis for evaluating potential impacts on human health.

UMG-05

PROFESSOR T. G. ILYINA CONTRIBUTION IN FORMATION OF MEDICAL GEOLOGY FUNDAMENTALS

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Doctor of Medical Science, Professor Tatyana G. Ilyina, was broadminded authority on ophthalmic surgery. She belonged to the third generation of family of doctors. Her broad-based knowledge and unconventional thinking let her be ahead in many aspects of her profession. She had acquired a wealth of knowledge and original ideas as well as ways of their implementation long before the studies on environmental factors impacts such as earthquakes on the organ of vision was started.

Professor T.G. Ilyina
(1920–2003)

The result of her investigations based on observing and treatment of patients who suffered from glaucoma were especially successful in 1960-s.

One of T.G. Ilyina's prioritized research areas was the studying of patients who have been affected with long-term stress-inducing factors related to the powerful Tashkent earthquake (1966). She was the first researcher who revealed the fact of intensive changes in intraocular pressure (IOP) over the whole six-month period of the meizoseismal earthquake among patients who had glaucoma or were under observation due to glaucoma-prone. The changes were caused by central nervous system functioning under stress conditions and coincided in time with the strongest crust tremors. Intraocular pressure had been reduced in the majority of glaucoma patients. Due to overlapping of many factors (the multiplicative effect), the IOP had been steadily increased, so the process was decompensated. This unusual phenomena is rarely observed in everyday life and it can be explained as the result of a sudden general mental and physiological stress, which can lead to extreme disturbances of aqueous humour flow.

Since 1963 T.G. Ilyina became the first ophthalmologist who applied radioactivation analysis of essential and trace elements, including halogens, in ocular tissues affected by various pathological conditions. A practical application of radioactivation analysis in ophthalmology discovered unsurpassed opportunities of the studying of metabolic processes in healthy and pathologically changed human eye tissues. This method facilitates the research of particular changes that can be specific to certain medical entities. The analysis also serves as a basis for therapy targeted at the recovery of disrupted metabolic processes of essential and trace elements in the case of various pathological conditions in the eye. The total number of elements in humorous ocular tissue affected by glaucoma has been diminished. So the glaucomatous process seems to cause the disruption of the metabolic process in the tissues of an affected eye.

Also T.G. Ilyina observed influence of seasonal change on intraocular pressure and eye hydrodynamics of glaucoma patients and people with suspected glaucoma. During winter months (especially in the mornings) intraocular pressure was higher; production of aqueous humour and its outflow were increased. Meanwhile during summer months there was an opposite trend: intraocular pressure was lower, production of aqueous humour and its outflow were decreased. Clinical observation and experimental studies conducted by T.G. Ilyina have indicated that hyperthermia and dietary regime influenced the status of IOP.

The research carried out by T.G. Ilyina discovered new opportunities for the study of environmental impact on the human eye and what kind of pathological processes could occur in it.

UMG-06

ORAL BIOACCESSIBILITY OF POTENTIALLY TOXIC ELEMENTS (PTES) IN URBAN AREA OF BELFAST

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Since the industrial revolution, urban environments have experienced significant changes due to the release of many Potentially Toxic Elements (PTEs) and their accumulation in topsoil. Belfast, the largest city in Northern Ireland faced an intensive process of industrialisation, being historically recognised for linen production and shipbuilding. A recent study (1) demonstrated a relationship between historical development zones and the presence of PTEs, that suggests the origin of PTEs in Belfast are of both geogenic and anthropogenic. In some areas of the city, concentrations of PTEs (including As, Cd, Cr, Ni, Pb, V and Zn) exceed current "Suitable 4 Use Levels" (2) for the protection of human health. However, not all these contaminants in soil are bioavailable to humans, therefore oral bioaccessibility testing is used to refine the risks posed to human health by measuring the contaminant fraction that is released in the digestive tract. A subset of 100 samples from across the metropolitan area of Belfast was selected from the Tellus archive held by Geological Survey of Northern Ireland (GSNI). This subset was chosen to include soils overlying the main bedrock formations, a wide variety of contaminant concentrations and different land uses. The Unified BARGE Method (UBM), an in-vitro method which simulates the human gastrointestinal tract and is validated against in-vivo studies for As, Cd, Pb, and Sb(3) was used to undertake bioaccessibility testing on selected samples. The outcomes of this research are intended to refine the risks posed by PTEs to the human health and avoid unnecessary remediation.

UMG-07

MINERALOGY OF HUMAN KIDNEY STONES

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The study of pathogenic organic-inorganic aggregates formed in the human body is one of the main tasks of medical mineralogy. Investigation of minerals and formation conditions of the urinary system stones allows to reveal the physiological solution components and microorganisms inhibiting and initiating crystallization of minerals in the urine. It provides a scientific basis for the development of biotechnology preventing lithiasis, including methods of urolithiasis prevention using known pharmacological and vitamin remedies, food supplements and mineral waters of appropriate composition. All kidney stones have an intense zoning regardless of the mineral composition and method of formation: phase zoning, zoning on the organic substance, etc. This demonstrates the extreme volatility of stone formation process, and the degree of this instability is enhanced from calcium oxalates and uric acid stones to phosphate and then to polymineral stones. Large-scale fluctuations in mineral composition, structure and content of organic components reflect variations in external conditions of stone growth related to functioning of the body (composition, pH, supersaturation of urine). Experimental data obtained from the systems modeling composition of physiological solution show the effect of crystallization medium parameters on the lithiasis. Moreover, the physiological solution parameters are not the equally affect as crystallization of various mineral phases, as the nucleation process, aggregation and crystallization of a single mineral phase. For instance, amino acids inhibit aggregation and crystallization of calcium oxalates and phosphates, but initiate its nucleation. The presence of bacteria and protein media contributes to changing the pH of the solutions and significantly affects the phase composition of human renal stones.

Variable and non-stoichiometric composition of minerals is another indicator of non-stationary conditions of kidney stones formation. Non-stoichiometry of calcium oxalates results from variations in quantities of disorderly distributed water molecules within the crystal structure. Variation in composition of calcium and magnesium phosphates is caused by substitutions at all the crystallographic sites. Maximal concentrations of impurity ions in biominerals are mainly limited by the content of these ions in the physiological solution. Non-stoichiometry of apatite and brushite is due to the presence of the vacancies at Ca-sites, and that of struvite is due to the vacancies at the Mg-sites.

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UMG-08

CHARACTERIZATION OF SOLID AIRBORNE PARTICLES IN INDUSTRIALIZED CITIES – A CASE STUDY OF WESTERN SIBERIA (RUSSIA)

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The cities located in Western Siberia (Russia) have high levels of industrial development and high levels of air pollution. The anthropogenic sources are generally concentrated in the residential areas and contribute considerably to the total amount of particulate contaminants in the air, which have an adverse effect on human health. However, there are no sufficient published data regarding to the characterization of physical and chemical properties of solid airborne particles (SAP) in the cities of Western Siberia. Therefore, it is very important monitoring, characterizing and quantifying SAP in the urban fabric of cities containing heavy industries. Snow cover is well known as an efficient scavenger of SAP and, thus an effective indicator of urban atmosphere pollution.

The current study is aimed at assessment whether SAP could be traceable in snow deposits near particular anthropogenic activity in the cities of Western Siberia for the identification of anthropogenic emission sources and SAP potential affect on human health. We characterized SAP deposited in snow in cities with different anthropogenic activities, i.e. oil refinery (Omsk, Achinsk), chemical industry (Kemerovo), machine construction (Omsk, Yurga), cement manufacture (Topki), petrochemical industry (Tomsk), construction industries (Tomsk, Yurga), coal-mining (Mezhdurechensk) and nuclear-fuel cycle complex (in 15 km from Tomsk). Additionally, fossil fuel thermal power plants are located in each city of Western Siberia. The characterization of SAP deposited in snow was performed by SEM-EDS, X-ray diffraction and laser diffraction particle size analyzer. Most attention was paid to identification and characterization (morphology, size and element composition) of metal-bearing particles as they could cause adverse effect on human health. For example, rare-earth-bearing particles were identified around coal-fired thermal power plants, oil refinery plants and brickworks. Moreover, sulphates, sulphides, particles composing of toxic metal oxides, intermetallic compounds, rare-earth element-rich spheres and U-oxides were firstly identified around coal-fired thermal power plants. The samples collected near cement manufacture plant were composed of particles associated with Fe-Ca-oxides and Ca-rich spheres with impurities of Fe, Zn, Mg. The existence of U-oxides and graphite in the samples around nuclear-fuel plant could indicate its possible impact on the environment. The identified phases in SAP deposited in snow can be used as markers for source identification. Most of the identified individual particles were referred to inhalational and respiratory ones indicating their potential effect on human health if inhaled by inhabitants.

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SECTION: ENVIRONMENTAL GEOCHEMISTRY (EG)

EG-01

SOIL CARBONATE MINERALS AND FOOD SAFETY: A FIELD INVESTIGATION FROM THE YANGTZE RIVER DELTA, CHINA

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It is well known that Ca^{2+} has a protective effect on metal uptake by the plants. Nevertheless, the mechanisms through which liming materials affect the bioavailability of heavy metals in soil remain poorly understood. Field investigations are rather limited. The objectives of this study were to obtain a quantitative estimate of Ni and Cd accumulation in winter wheat as affected by soil carbonate leaching losses in field conditions and to address the interrelationships between soil pH, carbonates, and plant uptake of heavy metals. The Yangtze River delta in China was chosen as the study area, which is an alluvial flood plain with concentrated industry and economy. Our results indicate that the carbonate concentration of soils in the Yangtze River delta region has been noticeably decreasing due to human-introduced acidification over the past 30 years, promoting plant uptake and accumulation of heavy metals from the acidified soils. When soil carbonates were severely leached to a concentration < 1% in soil, the grains of winter wheat grown in the acidified soils showed three times as much Ni and twice as much Cd concentration relative to the wheat grains harvested from carbonate-containing soils. The leaching of soil carbonate is the prelude of soil acidification and is an invisible threat to food safety. The findings suggest that soil carbonates play a critical role in heavy metal transfer from soil to plants, implying that monitoring soil carbonate may be necessary in addition to soil pH for the evaluating soil quality and food safety.

EG-02

MERCURY IN AMAZON RAINFOREST SOILS, BRAZIL

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Mercury is largely distributed in different ecosystems of the Amazon region, Brazil. Several human groups in the region are known to be exposed to mercury. Here we investigated the role played by the Amazon rainforest to capture mercury from post-industrial troposphere. Chemical composition of the northern portion of the Tapajos National Forest soil was determined in samples from eleven soil profiles. Major oxides and Hg concentrations in soil and parental rock were determined by X-ray fluorescence spectrometry and by Zeeman AAS, respectively. The bedrock contained 146 ng/g Hg whereas the soil presented an average content of 241 ng/g Hg. Furthermore, enrichment factors of Hg in relation to the parental bedrock were calculated assuming aluminum as immobile element. The lower soil layers presented mercury enrichment in the range of 29-98% in comparison to the bedrock. The upper soil layers presented mercury enrichment of 4-24% in comparison to the samples from lower soil layers. Mercury in soil was highly correlated with Al, Fe and Ti but no significant correlation was observed between Hg and soil organic matter contents. All results pointed to mercury retention in Amazonian rainforest soils because of the combined action of rock weathering processes and continuous input of metal from the atmosphere. This contribution is estimated to be between 31 and 46% of the total Hg concentration in the upper soil layers. The results highlight the role of rainforests as a barrier for a number of substances associated with suspended atmospheric particulates.

EG-03

SANITARY FUNCTIONS OF SOIL

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Sanitary soil functions make it safe for human habitation. They are usually associated with the ecological condition of soil biota and plants, as well as with the presence of pathogenic organisms or content of toxic substances. Some pathogens spend part of the life cycle in the soil, therefore, represent a direct danger to human health. Their impact is enhanced in the urban environment due to the alkalization of soils. However, the role of the soil in public health is not limited to environmental niches, it is much wider. Sanitary soil functions are connected with the surface of soil particles. Namely soil surface participates in the formation of immobilized enzymes, adhesion of microorganisms, metabolic reactions and processes of mobilization or immobilization of soil heavy metals and other pollutants. Moreover, soil mineral components themselves catalyze processes of humus formation. Oxides and hydroxides of Mn and Fe catalyze the redox reaction of decomposition of inorganic and organic compounds. Manganese oxides accelerate the detoxification of infectious prion particles. On the other hand, clay minerals, as catalysts, increase by hundreds of times, the toxicity of prions. Thus, soil minerals may be catalysts as to reduce or increase the toxicity of pollutants. Adsorptive properties of the soil matrix are involved in the binding of contaminants and regulation of their mobility in the soil. Mobile forms of metals in the soil are a potential risk factor for human and animal health. They get into their bodies on environmental migration ways: soil – plants – animals – humans and the soil – water – people route. Currently, the proportion of human health outcomes attributed to environmental has increased significantly, in some cases up to 40%. Soil is a potential time bomb as a result of long-term accumulation of pollutants. Its sanitary function becomes just as important as its biosphere function and fertility in the development of civilization.

EG-04

DISTRIBUTION OF GERMANIUM IN SOILS IN THE SOUTHEAST AND PART OF THE NORTHEAST OF BRAZIL AND ITS IMPORTANCE FOR HUMAN HEALTH

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Organic germanium (Ge) has been highlighted in recent years, with properties to increase immunity and stimulate cicatricial processes, in the prevention and treatment of cancer, being that in Brazil, although it is not officially recognized by the organs responsible for public health, has been successfully used by orthomolecular medicine.

The Germanium helps normalize the function of T cells and B lymphocytes, exerting profound influence on the immune system. The size of the germanium sesquioxide allows its rapid absorption and transport through the membranes facilitating the diffusion of oxygen by cells and tissues. It can enhance the immune system, stimulate the production of interferon, and promote antitumor activity. Interferon's most important function is to augment and stimulate the body's production of natural killer (NK) cells, which directly combat cancer cells.

Various plants can be used to combat as a disease, such as a mushroom shelf, garlic, moss bandai, aloe vera, ginseng, comfrey, among others. Considering that the germanium content in the plants varies according to their availability in soil, it is presented below the results of Ge in samples of soil B horizon (25x25km-0,177mm-aqua regia-ICP/MS) in parts of the northeast regions states AL-PB-PE-CE and midwest MS state and in the southeast states of SP-RJ-MG-ES.

The distribution of the Ge in the northeast, an area of 329,782km², with 486 soil samples, presented values (mg/kg) of ≤0.05 to ≥0.20 and median of 0.05, with the highest values of 0.10 to 0.20, representing 7% of the total samples. In the southeast and midwest, a distribution of Ge in an area of 1,283,745km², with 1904 soil samples, presented values (mg/kg) ≤0.01 to ≥1.7 and median 0.05, being that the highest values 0.10 to 1.7, represent 6% of the total samples. Preferably the germanium occurs in soils originated from basic rocks (basalts, amphibolites).These results are similar to those found in Europe with values (mg/kg) of 0.02 to 0.26 and median of 0.035, USA 0.01 to 2.1, in Portugal <0.1 to 1.3 and well below China 1.2 to 3.2.

These results in soils may influence future research in regions where Ge values are high, to identify plants that absorb this element and that can be used by nutrological medicine.

EG-05

HEAVY METAL DISTRIBUTION OF STREAM SEDIMENTS IN GÜRKUYU SB MINERALIZATION (GEDIZ-KÜTAHYA, NW TURKEY)

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The Gürkuyu village is located approximately 23 km southwest of Gediz (Kütahya-Turkey) and 35 km east of Simav (Kütahya-Turkey). This village is located near the ophiolitic rocks of Dağardı mélange and Sb mineralization. In the region, at the base, Precambrian Kalkan formation represented by migmatite and biotite-bearing gneiss is situated. The Budağan limestone unconformably overlies the Kalkan formation. These units are tectonically overlain by Upper Cretaceous Dağardı melange.

The ore mineral paragenesis from Gürkuyu Sb mineralization near the Pınarbaşı village includes antimonite, pyrite, senarmontite, valentinite, orpiment and realgar. In the ore petrographical analysis from Kocaağıl stream sediments, chromite, magnetite, pyrite, pyrrhotite, chalcopyrite and covellite are observed. In sediments collected from Kocaağıl stream located near Gürkuyu village, the average contents are 10.45 wt.% Fe_2O_3, 11.9 ppm Cu, 4.4 ppm Pb, 57.7 ppm Zn, 9.3 ppm As, 111.6 ppm Co, 0.01 ppm Hg and 1748.5 ppm Ni. Orpiment and realgar are arsenic sulfide minerals and toxic effects of arsenic are widely known. Geochemical and mineralogical studies indicate that the Kocaağıl stream sediments have high values in Co and Ni according to soil standards. As a result, the people living in the nearby environment are effected by mentioned heavy metals.

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EG-06

ENVIRONMENTAL GEOCHEMISTRY IN STREAM SEDIMENTS FROM THE PINARBAŞI PB-ZN MINERALIZATION (GEDIZ-KÜTAHYA, NW TURKEY)

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The Pınarbaşı village is located approximately 8 km northwest of Gediz (Kütahya- Turkey) and 50 km east of Simav (Kütahya-Turkey). This village is located in magmatic province. One of the characteristic feature of this granitoidic and volcanic province is the presence of widespread associated hydrothermal activity contains significant accumulations of precious and base metals (Cu, Mo, Fe, Pb, Zn, Au, Ag, etc.).

The ore mineral paragenesis from Pb-Zn mineralization includes magnetite, chalcopyrite, galena, sphalerite, pyrite, fahlore, bornite, hematite, covellite, chalcocite, digenite, cerussite, smithsonite, anglesite, jarosite, malachite and orpiment in Pb-Zn mineralization near the Pınarbaşı village. In the ore petrographical analysis from stream sediments, chromite, magnetite and pyrite are observed. In sediments collected from Seçyeri stream located near village, the average contents are 7.3 wt.% Fe_2O_3, 137.3 ppm Cu, 658.6 ppm Pb, 387 ppm Zn, 136.4 ppm As, 1.10 ppm Cd, 10 ppm Co, 0.2 ppm Hg and 79.4 ppm Ni. In sediments collected from Sarısu stream located near the village, the average contents are 5.5 wt.% Fe_2O_3, 77.6 ppm Cu, 132.4 ppm Pb, 63 ppm Zn, 3.9 ppm As, 0.2 Cd, 3.6 ppm Co, 0.01 ppm Hg and 11.7 ppm Ni.

Geochemical and mineralogical studies indicate that the Seçyeri stream sediment closer to Pınarbaşı Pb-Zn mineralization are rich in Pb, Zn, Cu, As, Co, Cd, Hg and Ni contents. Both stream sediments have high values in Cu, Pb, Zn, As and Ni according to soil standards. As a result, the people living in the nearby environment are effected by mentioned heavy metals.

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EG-07

HEAVY METAL DISTRIBUTION IN THE SOUTHERN MERAM REGION (KONYA-TURKEY), WHICH IS A NEWLY URBANIZATION AREA

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Meram is one of the central districts of Konya, Turkey's geographically largest city and rapidly urbanized. Metamorphic, magmatic and sedimentary rocks formed from Paleozoic to the present are crop out in the study area. These rocks were discussed in two main groups such as basic and cover units. In the investigation area, soils belonging to a zonal (brown, reddish chestnut color, reddish-brown, calcareous and non-calcareous brown forest soils), intrazonal (hydromorphic alluvial soils) and azonal (alluvial and colluvial soils), ordo possessed variable thickness and structure depending on geological and lithological characteristics of climate, topography and parent material is located.

Local Cr, Fe and Ni enrichments together with magnesite deposits in Çayırbağı ophiolites are located in the northwest of the study area. In addition, crushed and flooring stone for industrial and structures are produced and current agricultural activities are ongoing in a significant part of the area.

Soil samples have average 37 ppm Co, 383 ppm Cr, 26 ppm Cu, 528 ppm Ni, 18 ppm Pb, 70 ppm Zn, And 76 ppm V. Some of soil samples reached 2010 ppm Ni, 170 ppm Pb, 4320 ppm Sr and 10.2 ppm U. Accordingly, the soils in southern Meram area exceeds allowable highest values in terms of locally Co, Cr, Ni, Cu, Pn and Zn values for many standards. These metal distributions are a risk factor for new urbanization areas and it is suggested that local governments should take some precautions.

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SECTION: ARSENIC AND OTHER TOXIANIONS IN THE ENVIRONMENT (ATE)

ATE-01

HYDROGEOCHEMISTRY AND ARSENIC MOBILIZATION IN MULTI-LAYER AQUIFERS OF THE JIANGHAN PLAIN, CENTRAL CHINA

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China is one of the most serious waterborne endemic arsenicosis affected area, and Jianghan Plain is a newly discovered arsenic affected area in the middle reaches of the Yangtze River, central China. Understanding the mechanism of arsenic (As) mobilization from sediments to groundwater is important for drinking water supply and water quality management in endemic arsenicosis areas. 187 sediment samples from two field boreholes (JH with the depth of 220m and YLW with the depth of 86m) and 681 groundwater samples were collected to characterize the geochemistry of multi-layers aquifer system in Jianghan Plain. The analysis results of sediment and groundwater samples indicated significantly different hydrogeochemistry between shallow aquifer (15-60m) and deep aquifer (> 60m). The shallow sediments possessed an average As content of 9μg/g, which was mainly associated with reducible iron-oxides, and the As content in the groundwater was up to 2330 μg/L. The deep sediments possessed an average As content of 55μg/g, which was mainly associated with As bearing pyrite and sulfides, and the highest As content in the groundwater was about 100 μg/L. The long-term monitoring of water chemistry and batch cultural experiments indicated that the shallow aquifer was recharged by surface water and atmospheric precipitation, and the organic carbon introduced by these recharges could activate the As associated with reducible iron-oxides in the shallow sediments. These results could provide insights into the As mobilization mechanism in multi-layers aquifer system.

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ATE-02

SPATIAL DISTRIBUTION AND RISK ASSESSMENT OF AS AND METALS IN SEDIMENT OF KOCACAY RIVER IMPACTED BY HISTORICAL PB-ZN MINE WASTES

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The distributions of As and metals (Cu, Pb, Zn, Cd, Co) in surface sediments and water of Kocacay river, impacted by the historical Pb-Zn-Ag mine wastes, , were determined to evaluate the level of contamination. Besides being the most important irrigation and agricultural water source Kocacay River feed the Lake Manyas know as bird heaven and hold great importance for public in the region. The ecological risk assessment of arsenic and metals in the sediments were evaluated by using the Sediment Quality Guidelines (SQG) of the United States of Environmental Protection Agency (USA EPA), contamination factor (CF), pollution load index (PLI), geoaccumulation index (Igeo) and enrichment factor (EF). Background values of the metals subjected to the study were determined on the sediment core taken from the region. The contamination level of sediments was correlated with the distance from the wastes and the highest contamination level As and metals were determined in the sediments near the mine wastes. The CF values of As, Cu, Zn, Pb was >6 in the impacted sediments, which demonstrates a very high contamination. Consistently, PLI values showed that the impacted sediments were heavily polluted in terms of As, Pb, Zn and Cu and moderately polluted by Co and Cd. The SQG value of As (>8) and Cu, Pb, Zn (25-55) in sediments near the waste indicate heavy and moderate pollution, respectively. The mean EF values for As, Cu, Pb and Zn were >1.2 in the sediments of the Kocacay River, indicating dissolution and transportation of the metal from the mine wastes along the river. The SQG values and current contamination level of As and metals in the sediments suggest that chronic exposures would be expected to cause harmful effect on sediment organisms and in turn food chain.

ATE-03

MERCURY ISOTOPES LINK THE SOURCE AND BIOMARKERS IN HUMAN MERCURY EXPOSURE

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Methylmercury (MeHg) is a highly toxic pollutant and human are exposed to MeHg mainly through fish and consumption. The mercury (Hg) isotopes are good tools to trace processes and sources of Hg in the environment. Prior studies in human populations reported a consistent ~ +2‰ increase in δ^{202}Hg values between fish and hair of fish consumers but without mass independent fractionation (MIF). In Hg mining areas, rice are the main source of MeHg exposure and both rice and vegetables contribute to human inorganic Hg (IHg) exposure. In this study, we measured Hg isotopes in the food (rice and vegetables) and in human biomarkers (hair, blood, and urine). The δ^{202}Hg values were very similar between rice and vegetables and between blood and urine. We observed an increase of +1.69‰ in δ^{202}Hg values from rice and vegetables to blood and urine, while an increase of +2.75‰ from rice and vegetables to hair. There were nearly no MIF (~0‰) in rice ,vegetables, and urine samples. The Δ^{199}Hg values were +0.05‰ and +0.13‰ on average in blood and hair samples, respectively. Our previous study indicated that MeHg fractions in the rice samples were enriched in the heavier isotopes of δ^{202}Hg and higher Δ^{199}Hg than the IHg fraction. In this study, the %MeHg in rice, blood, and hair samples increased from 16.6% to 37.4% and 60% on average. The increases of δ^{202}Hg and Δ^{199}Hg values from rice to blood and hair samples indicated the mixture of MeHg and IHg in human body. The Hg isotope studies can be used as good tools to trace the source of human Hg exposure and metabolic process of Hg in human body.

ATE-04

GEOGRAPHICAL CLUSTERING OF URINARY STONE DISEASE IN CHINA: A GEO-ENVIRONMENTAL PERSPECTIVE

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The prevalence of urinary stone disease (USD) is increasing across the world and exhibits a distinctive characteristic of geographical distribution. We investigated the geographical clustering and major geo-environmental factors for USD prevalence in China. The average USD prevalence was 6.50% in China, which is lower in North China and significantly higher in South China. A map of USD prevalence in different provinces of China was presented, high risks of USD are found in southern China clustered in coastal provinces such as Fujian and Zhejiang and karst regions such as Sichuan, Chongqing, Guizhou, Guangxi, Guangdong, Hunan, and Hubei. The geographical distribution map of urinary stone composition shed light on the role of geo-environmental factors on USD genesis. We noticed that calcium phosphate or hydroxyapatite stone often occur around the phosphate mines, and the stone composition of karst regions is usually carbonate apatite. A possible explanation is that phosphorus released from phosphate mines by weathering or mining processes could be enriched in the soil and aquatic environment surrounding the mines, and that carbonate concentrations are commonly high in the environment of karst regions, both of which promote the formation of phosphate/carbonate type stones via the food chain. Additionally, excessive sweating due to high air temperature and low urinary volume due to scant water intake are jointly responsible for the increasing USD prevalence in hot or warm climate and seasons. Water and soil environment influence the quality and composition of drinking water and food, thus affecting stone formation. The increase of Ca^{2+}/Mg^{2+} ratio (in meq) in drinking water, the high content of calcium in local plants grown on karst soils, and the intake of high oxalate food might contribute to the high prevalence in South China. This study indicates that USD could be endemic, and geo-environmental factors should be critical in USD etiology.

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ATE-05

GEOGRAPHIC VARIATION BETWEEN ARSENIC IN DRINKING WATER AND THE OCCURRENCE OF CHRONIC KIDNEY DISEASE: A NATIONWIDE POPULATION-BASED STUDY IN TAIWAN

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Arsenic may affect the function of proximal convoluted tubules and glomerulus, but epidemiological data are limited. We conducted a nationwide cohort study in Taiwan, where the prevalence of end-stage renal disease (ESRD) is among the highest in the world, to evaluate the associations between exposure to arsenic in drinking water and the occurrence of chronic kidney disease (CKD) and its progression to ESRD. Using data extracted from the Longitudinal Health Insurance Database of the National Health Insurance in Taiwan, we constructed a cohort aged 40 years or older and identified patients of CKD newly diagnosed between January 1, 1998 and December 31, 2010. Arsenic levels were assessed on the basis of a nationwide census survey conducted by the Taiwan Provincial Institute of Environmental Sanitation. The data were available on 311 townships, covering about 85% of the townships in Taiwan. After adjusting for sex, age, income, comorbidities, we found residents of areas with arsenic levels ≥50 μg/L in the drinking water had a hazard ratio (HR) of 1.10 (95% confidence interval [CI]: 1.08-1.12) for CKD and an HR of 1.07 (95%CI: 1.01-1.14) for ESRD. We have also identified the endemic areas of arsenic exposure and constructed maps of arsenic levels using the geographic information system. We concluded that a high arsenic level in the drinking water was a risk factor for developing CKD and ESRD, independent of most documented risk factors. Intervention programs should be implemented in endemic areas of exposure to reduce the risks.

ATE-06

USE THE PHOSPHORUS AND OTHER FERTILIZERS. IS IT DANGEROUS?

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Many scientists believe that the planet Earth has entered into a new geological era. Conclusive evidences of significant human impact on the atmosphere, oceans, and wildlife have been published. In particular, the biogeochemical cycles of phosphorus and nitrogen were violated. As the result, the content of P and N in soil and water has increased and rate of freshwater body eutrophication has increased.

P content in the biosphere and its biogeochemical cycle have been declared as one of the planetary boundaries [1]. It means that an uncontrolled release of human-made P compounds into the environment may result in disastrous consequences for humankind. For example, there is evidence for direct positive effects of N and P on bacterial growth and, accordingly, total bacterial biomass is very strongly correlated with concentrations of total phosphorus in freshwater and marine ecosystems. Enhanced nutrient loading alone might also influence the abundance, composition, virulence and survival of pathogens that are already resident in aquatic ecosystems. For example, increased N and P availability enhances the replication rate of aquatic viruses. Biological waste disposal activities such as manure applications to cropland can simultaneously increase the loading of P, N and potentially hazardous coliform bacteria to surface waters [2].

To assess the impact of chemicals on the environment a model has been elaborated. The matrix algebra based approach is used as a tool for modelling and an estimation of chemicals in different environmental media (water, air, soil, biota, etc). For the evaluation of the phosphorus system we used a linear donor-controlled mass balance model.

The results of model application for the estimation of the P content in fresh waters of the Russian Federation regions are presented in Fig. 1. The concentrations were calculated using data on the mean water volumes in the regions.

The calculated results show that P loading is most characteristic of regions located in the European part of the country, which matches the ecological situation related to the eutrophication of water bodies in this territory, as well as some regions of the Siberian and Far Eastern Federal Districts.

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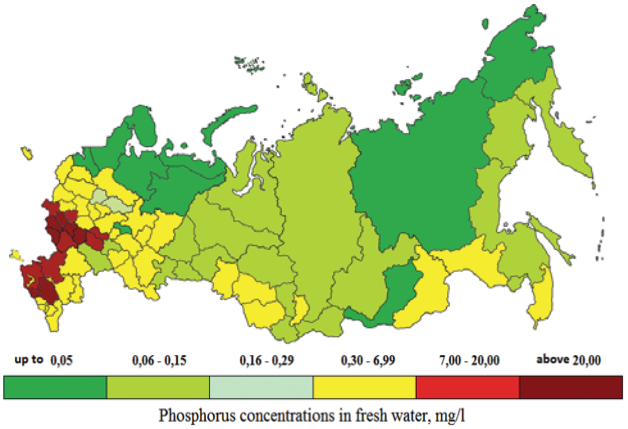

Figure 1. Estimated phosphorus concentrations in fresh water in RF regions, mg/l

ATE-07

BROMINE IN THE ENVIRONMENT AND ITS IMPACT ON HUMAN HEALTH

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For the first time a relationship between the composition of the environment and living organisms' state was shown by V. I. Vernadsky. Nowadays we have large knowledge about deficiency and excess of chemical elements and their relationship with human health. However, despite a wide range of information existing, the influences of some elements are still poorly understood. Bromine (Br) is one of these elements.

Br is a trace element and one of those that is more likely to pose a risk to human health, playing an important role in the appearance and development of various diseases. According to literature sources, high concentrations of the element were observed in various tissues and organs of people suffering from uremia, dilated cardiomyopathy, sickle-cell anaemia (hereditary disease), breast cancer, Alzheimer's disease. However, no data about the evidence of bromine intake and these diseases was shown. Bromine can also have an effect on reproductive functions, reducing fertility and the viability of offspring. Besides, it has been identified as toxic.

In our research, bromine was studied in different environmental media in some regions of the world (France, Russia…). According to the results of INAA, the highest levels of bromine are observed in all the environmental media, including peoples' organs and tissues, near the petrochemical enterprises and the enterprises of the nuclear fuel cycle. For example, 434 mg/kg, 162 mg/kg and 619 mg/kg of bromine was determined in the blood, hair and thyroid, respectively, of people living near the enterprise of nuclear fuel cycle. We assume that the most part of this bromine has an anthropogenic origin. Results obtained are hundreds of times higher than data described in literature sources. Therefore, this issue is of a great attention. The need to study this element and its possible effects on people health is obvious and beyond doubt.

ATE-08

ARSENIC IN GROUNDWATER OF DAGHESTAN REPUBLIC

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Introduction. The given arsenic-related research has established that the population of about 500 thousands of people are at risk. In the northern districts of Daghestan republic the groundwater is used by population as drinking water. Water samples analysis showed that groundwater contains arsenic above the WHO-recommended value of 10μg/L. The concentrations of As in water samples ranged from 10μg/L to 50 μg/L. The natural As is associated here with the peculiarities of the chemical composition of the water-bearing plateaus and people have no alternative sources of drinking water.

Biological samples (hair) analysis clearly showed that the body burden of As was close to the limit level of 1,000 μg/kg that is considered to be a toxic level of As in hair.

Long-term exposure to As from drinking water can cause cancer, that's why it has been classified as carcinogenic to humans by International Agency Research of Cancer (Group 1) and by the United States Environmental Protection Agency (Group A) (IARC, 1987; US EPA, 2001). The cancer health risks results were found to be higher than of permissible value of $1x10^{-6}$. For the exposed population annual population cancer health risks ranged from 1 to 95 additional cases of possible occurrence of cancer. The results of this study revealed areas with high levels of As in drinking water and determine the exposed population to the implementation of risk mitigation measures.

Materials and Methods. Water samples were collected from the arsenic-contaminated ground water in the north districts of Daghestan Republic. Biological (hair) samples were collected from the villagers of high arsenic-contaminated village, because the concentration of As in hair samples serves as an indicator of the body burden of arsenic.

Water and hair samples were analyzed for As by flow-injection hydride generation-atomic absorbtion spectrophotometry (FI-HG-AAS). During the analyze total As was determined in samples.

Cancer health risk for population was evaluated using risk assessment method.

Results. The northern districts of the Daghestan are contaminated by high levels of natural As. 53,9% of population use drinking water with the level of As 10-40 μg/L. Groundwater with the high concentration of As (400-500 μg/L) used by 3% of the northern districts population. The level of As in the water is detected 20 times or more in 12 villages with the total population of about 16 thousands of people.

Area	The level of arsenic in drinking water, μg/L	Population
1	10-40	167134
2	50-90	16985
3	100 – 190	108147
4	200 – 300	9023
5	400 – 500	8444

It has been shown that the lifetime individual cancer risks were at the minimum concentration (10 μg/L) – 4,3E-4; at maximum concentration (500 μg/L) – 2,1E-2, respectively, with a mean of 140 μg/L – 6,0E-3. The lifetime individual cancer health risks results were found to be high and not permissible for population. The annual cancer health risks for population were from 1 to 95 additional cases of possible occurrence of cancer.

The result of this research reveals the high level of danger of using groundwater by population as drinking water.

ATE-09

THE MAIN DIRECTIONS OF THE ENVIRONMENTAL JUSTIFICATION FOR THE DEVELOPMENT OF ELANS AND JOLKINSKS COPPER-NICKEL DEPOSITS

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Spatial combined Elansks and Jolkinsks deposits of copper-nickel ore formed within long-lived tectonic node, it manifests itself in crystalline bedrock, sedimentary cover and in a modern landscape. Modern structural line maximum tension of the crust control figure the network of river systems. Geological characteristics of the region and its Geodynamics are the main cause of the current complex geochemical environment here. At depths below 250 meters in aquifers appear low salt and salty water, brines are below. They have a radon in soil that 3-d near the well reaches more than 20 000 Bk/m3 (ceiling sensitivity RRA-01 m -01) only on Alpha activity of maximum permissible concentrations from 2 to 50 exceeded times.

The results of the monitoring of the ecological-geological territory:

- spout deep chlorine-bromine highly mineralized waters with General mineralization up to 35 g/dm3 accompanied by gases including combustible and radon. Soils and sediments in places these waters contaminated by chemical outputs include high volume activity of radon values and total alpha and Beta activity.
- sorbate problem wells is very relevant. This is due to their location in floodplains. Wellhead in times of floods are flooded, which contributes to the spread of ploshadnomu contaminants within floodplains rivers Zavala, Khoper and Yelan.
- important element of the environmental justification for the development of Elan-Elkinsks field is a forecast of the transformation of the chemical composition of major aquifers of fresh and mineral waters. Special consideration must be given system design, protection against radon of ecosystems at various levels of the organization.

ATE-10

HIGH AS AND F CONCENTRATIONS IN DRINKING WATERS OF SOUTHERN PAMPEAN PLAIN, ARGENTINA—HEALTH IMPACT STUDY

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The Claromecó fluvial basin is situated in the southern Pampean Plain, Argentina. This region, composed mostly of Neogene and Quaternary volcanoclastic loess, shows one of the highest groundwater As concentrations threatening serious problems to human health. Fluoride is also co-occurring exceeding the WHO suggested value of 1.4 mg/L. The volcaniclastics are postulated to be the main source of As and F in groundwaters that result from the dissolution of volcanic glass shards as well as other minerals (e.g. fluorapatites). Amorphous Fe oxy-hydroxides also play an important role in these processes. Results show that almost all samples studied exceed WHO limits for As and F reaching maximum values of 144 μg/L and 4.7 mg/L respectively. Furthermore, higher As and F concentrations are in shallow groundwaters and decrease in concentration with depth. An increase in both the elements, in sediments and drinking waters, is observed downward into the southern basin toward the Atlantic coastline. Only two towns within this study area are provided with water treatment facilities, while the rest of the population, that include rural schools (that have their own drinking water wells) are lacking access to safe waters and are poorly informed about these issues. In the southern basin multiple cases of fluorosis are diagnosed in children. No toxicological background is present in the communities to link cancer cases with As impact. This fact enhances the need of more toxicological studies in the area and public policies to systematically inform the existence of these issues and thereby promote remediation strategies.

ATE-11

INTERCONNECTIONS OF CHEMICAL COMPOSITION OF ANTHROPOGENIC CARBONATES AND HUMAN HEALTH DATA

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Anthropogenic carbonates, also known as "limescale", forms in household conditions in the heat exchanging equipment (mostly kettles) when boiling water. In our opinion, such deposits could stand as an indicator of long-term drinking water quality (months or even years) as long as most people drink Ca-Mg-HCO_3^- water. Therefore, the goal of our current investigation is to attempt to find interconnections between chemical composition of drinking water limescale and general and specific incidence.

As research area, we chose Pavlodar Oblast (Kazakhstan). There we collected 207 samples of anthropogenic carbonates from local citizens and revealed content of 28 chemical elements (Ag, As, Au, Ba, Br, Ca, Ce, Co, Cr, Cs, Eu, Fe, Hf, La, Lu, Na, Rb, Sb, Sc, Sm, Sr, Ta, Tb, Th, U, Yb, Zn). Further, we get official medical data on public health and morbidity rate. Both chemical composition of the limescale and medical data were compared.

Comparative analysis reveals that all the studied districts in Pavlodar Oblast can be divided into three groups according to correlation of limescale's chemical composition and morbidity rate. The highest variables of morbidity rate are stated in areas with elevated concentrations of REE, Th, U. In opposite, districts with low content of chemical elements in the limescale are characterized with low morbidity rate.

Furthermore, the significant negative correlation was established between Ca and blood and alimentary systems diseases. Content of REE, Th are in positive correlation with diseases of apparatus, alimentary systems, neoplasms and congenital malformations, deformations and chromosomal abnormalities.

Therefore, the element composition of the anthropogenic carbonates could stand as an possible indicator of morbidity rate of diseases that are associated with drinking water.

ATE-12

DRINKING WATER (GROUND AND SURFACE), IRON OVERLOAD AND LIVER PATHOLOGY

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Background. Several diseases have been caused by contamination of surface and groundwater.

Aim. The aim of the present work is to investigate the impact of iron overload in drinking water on liver pathology.

Materials and Methods. Samples of drinking water, blood and true cut liver biopsies were taken from selected inhabitants, who attended in some Dakahlia governorate hospitals. Those inhabitants (16 patients) from Mit-ghamr and Aga districts were suffering from liver disorders (had hepatitis C) and 4 patients had chronic cholecystitis from Mansoura district as control cases. Measurement of iron level in water samples was carried out by the use of

an atomic absorption spectrophotometer, analyzed for serum iron level with a micro lab 200 spectrophotometer.

Results. The mean value of iron in surface water is lower than the permissible limit of Egyptian ministry of health (EMH) and World health organization (WHO). However, the mean value of iron in groundwater samples is higher than that permissible limit and than those of surface drinking water. Comparison between iron level in drinking water and human blood samples shows positive relationship. The control group depended on drinking surface water and had normal liver function tests, whereas the patient group that depended on drinking groundwater had abnormal values in liver function tests. These data suggest that the polluted iron drinking water is the reason for the liver disorder of the patients. Siderosis was apparent among those patients drinking polluted iron water in comparison to control cases. The siderosis appears to be responsible for resistance to treatment of HCV and progression of fibrosis.

Conclusion. The accumulation of iron in liver leads to fibrosis. Iron depletion therapy could interfere with fibrosis development and possibly reduce the risk of hepatocellular carcinoma (HCC).

SECTION: OCCUPATIONAL HEALTH ISSUES AND MEDICAL PROBLEMS OF MINING AREAS (MA)

MA-01

SPATIAL DISTRIBUTION AND RISK ASSESSMENT OF AS AND METALS IN SEDIMENT OF KOCACAY RIVER IMPACTED BY HISTORICAL PB-ZN MINE WASTES

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The distributions of As and metals (Cu, Pb, Zn, Cd, Co) in surface sediments and water of Kocacay river, impacted by the historical Pb-Zn-Ag mine wastes, , were determined to evaluate the level of contamination. Besides being the most important irrigation and agricultural water source Kocacay River feed the Lake Manyas know as bird heaven and hold great importance for public in the region. The ecological risk assessment of arsenic and metals in the sediments were evaluated by using the Sediment Quality Guidelines (SQG) of the United States of Environmental Protection Agency (USA EPA), contamination factor (CF), pollution load index (PLI), geoaccumulation index (Igeo) and enrichment factor (EF). Background values of the metals subjected to the study were determined on the sediment core taken from the region. The contamination level of sediments was correlated with the distance from the wastes and the highest contamination level As and metals were determined in the sediments near the mine wastes. The CF values of As, Cu, Zn, Pb was >6 in the impacted sediments, which demonstrates a very high contamination. Consistently, PLI values showed that the impacted sediments were heavily polluted in terms of As, Pb, Zn and Cu and moderately polluted by Co and Cd. The SQG value of As (>8) and Cu, Pb, Zn (25-55) in sediments near the waste indicate heavy and moderate pollution, respectively. The mean EF values for As, Cu, Pb and Zn were >1.2 in the sediments of the Kocacay River, indicating dissolution and transportation of the metal from the mine wastes along the river. The SQG values and current contamination level of As and metals in the sediments suggest that chronic exposures would be expected to cause harmful effect on sediment organisms and in turn food chain.

MA-02

UPTAKE OF METAL(LOID)S BY CABBAGE (BRASSICA OLERÁCEA L.) AND CHEMICAL RISK OF CONSUMPTION IN CONTAMINATED SOILS FROM TUNGSTEN MINES IN PORTUGAL

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Metal mining and mineral processing might be the source of trace metals in soils, being the reservoir for heavy metals (HM) and metalloids, which pose serious environmental problems due to their potential toxicity and persistence in the environment. Panasqueira and Borralha mines, the biggest tungsten mines in Portugal, are characterized by the presence of sulphide mineralization including arsenopyrite, pyrite, pyrrhotite, sphalerite, chalcopyrite and stannite at Panasqueira; and molybdenite and bismuthinite and absence of arsenopyrite in Borralha. As a result of increasing anthropogenic activities, HM pollution in soils, plants and the atmosphere have resulted in a growing environmental problem affecting food quality and potentially the health of the local population. An important concern for assessing human health risk is the uptake of soil contaminants by plants and their consumption by humans. A study was undertaken using soils, outdoor dusts, cabbage and rhizosphere soils. The strong relationship between metal concentrations in soils and vegetables and the results obtained through the determination of enrichment factor, pollution index, ecological risk index and bioconcentration factor revealed that the consumption of vegetables is not free of risks in these areas. The health risk assessment tells us that vegetables grown in the vicinity of these two mining areas potentially pose a significant health risk to local populations. Based on the values determined, soils and outdoor dusts from Panasqueira and Borralha present different behaviors, with respect to some of the studied metal(loid)s, and in an attempt to justify these differences, mineralogical studies of soils and dusts are currently being carried out.

Enrichment Factor (EF) – Contribution of anthropogenic sources to surface soils	**EF As**	**EF Cd**	**EF Cr**	**EF Cu**	**EF Pb**	**EF Zn**
Borralha soils (n=77)	6	16,6	1,1	**156,1**	4,7	3,1
Panasqueira Soils (n=126)	14,5	4	1,4	3,4	1,6	1,6
Borralha outdoor Dusts (n=7)	1,6	0,3	0,4	6,7	1,1	1,3
Panasqueira outdoor Dusts (n=34)	**92,7**	3,4	0,5	18,8	1,1	3,6
EF<2 deficiency to minimal; 2<EF<5 moderate; 5<EF<20 significant; 20<EF<40 very high ; EF>40 extremely enrichment						
Pollution Index (PI) – ratio metal concentration in soil and reference value	**PI As**	**PI Cd**	**PI Cr**	**PI Cu**	**PI Pb**	**PI Zn**
Borralha soils (n=77)	2,2	1,8	0,4	**45,9**	1,9	1,3
Panasqueira Soils (n=126)	**6,6**	0,6	0,6	1,4	0,9	0,9
Borralha outdoor Dusts (n=7)	0,3	0,3	0,2	1,8	0,7	0,8
Panasqueira outdoor Dusts (n=34)	**26,1**	**6,2**	0,4	**9,3**	1,0	4,3
PI<1 no contamination; 1<PI<3 slight contamination; 3<EF<5 moderate; PI>5 severe contamination						
Ecological risk index (RI) – HM concentration, ecological effect, environmental effect and toxicology	**RI As**	**RI Cd**	**RI Cr**	**RI Cu**	**Ri Pb**	**RI Zn**
Borralha soils (n=77)	**3457**	**25527**	137,1	**38638,3**	**1162,5**	154,6
Panasqueira Soils (n=126)	**16508,2**	**12720**	329,5	**1920,7**	**899,3**	178
RI<150 low; 150<RI<300 moderate; 300<RI<600 considered ecological risk; RI>600 very high ecological risk						
Bioconcentration factor (BCF) – mobility of HM from rhizosphere soils into different parts of the plant (orange values 1<BCF<10)	**As**	**Cd**	**Cr**	**Cu**	**Pb**	**Zn**
Borralha cabbage stem (n=7)	0,092	0,336	0,287	0,146	0,007	0,524
Borralha cabbage root (n=7)	0,1885	0,4180	0,7825	**1,1034**	**6,5454**	**2,0380**
Borralha cabbage leave (n=7)	0,0600	0,3310	0,1903	0,1583	0,0052	0,4343
Panasqueira cabbage stem (n=28)	0,008	**1,816**	0,038	0,050	0,003	0,298
Panasqueira cabbage root (n=28)	0,037	**1,152**	0,385	0,709	0,092	0,510
Panasqueira cabbage leave (n=28)	0,009	**2,804**	0,050	0,148	0,012	0,356
BCF<1 no metal; 1<BCF<10 metal accumulation; BCF > 10 hyperaccumulation						
Health Risk Index – human exposure to HM	**As**	**Cd**	**Cr**	**Cu**	**Pb**	**Zn**
Borralha Adults (body weight 60 kg)	**1,221875**	0,1011443	0,558957	0,1764486	0,0345025	0,1466166
Borralha Childrens (body weight 32,7 kg)	**1,5076453**	0,1247998	0,689685	0,2177162	0,0425719	0,180907
Panasqueira Adults (body weight 60 kg)	0,9262976	0,0879925	0,253103	0,0913177	0,0557075	0,0887721
Panasqueira Childrens(body weight 32,7 kg)	**1,1429387**	0,108572	0,312298	0,1126749	0,0687363	0,109534
HRI>1 assume exposed population not safe						

MA-03

IMPACT OF HEAVY METALS CONTAMINATION BY ARTISANAL GOLD MINING AT JATIROTO VILLAGE, WONOGIRI DISTRICT, CENTRAL JAVA, INDONESIA ON STREAM SEDIMENT

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The research area was located in at Jatiroto Village, Wonogiri District, Central Java, Indonesia. The aims of this work was to investigate the rate of heavy metals including mercury (Hg), arsenic (As) and lead (Pb) around gold mineralization and traditional mining area. The data obtained in this research were collected from several locations as follow: veins/ore minerals, tailings, and stream sediments. The metals concentration was measured by ICP AES. The result was then plotted on the map in order to study the distribution of metals in research area. The concentration of all metals was founded naturally in host rock, and only elevated level of mercury was found on tailing and stream sediment samples. The highest level of mercury on stream sediment was found at very near with traditional mining are and ore mineral processing area. Based on this research, the level of As and Pb were found in rock due to mineralization process. On the other hand, the elevated level of mercury from other sample were dominantly caused by traditional mining activity. This high level of mercury concentration will have a serious impact to the environment and human health.

MA-04

POPULATION MORBIDITY DUE TO LIQUIDATION OF COAL DEPOSITS IN UKRAINE

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Donetsk and Lviv-Volyn coal basin of Ukraine are distinguished by critical state of the environment, as they are the oldest regions of the underground mining method, where environmental problems were accumulating over decades as a result of defective technologies usage, mining at large areas (thousands of square kilometers) and depths (up to 1.5 km) accumulation of large amounts of solid and liquid wastes on the surface.

Coal fields decommissioning and coal mines closing within the Donetsk coal basin is accompanied by such environmental problems: violation of hydrogeological regime of coal mining regions; pollution of groundwater and surface waters by mineralized mining waters; exclusion of areas to accommodate waste dumps and other waste; pollution of natural environment with coal mining waste; deformation, subsidence and Earth's surface underflooding above mining works; pollution of environmental objects with greenhouse and radioactive gases; air pollution with dust and gaseous substances from the surface of rock dumps, including when they are burning; underflooding, salinity and land degradation, including agriculture; deterioration of living conditions of the population in coalmining regions; increased morbidity.

One of the progressive consequences of environmental conditions deterioration in the Donetsk coal basin is an increase in population morbidity, reduced life expectancy and population quantity (up to 1.3–1.5% per year). In particular the mortality rate exceeds the birth rate by 2.8 times in the Donetsk region.

Environmental problems are acute also for Lviv-Volyn basin, where they acquired a massive character: area subsidence, including residential areas, due to low depth (410–550 m) working out of multiple layers (capacity of each one – 0.8–1.4 m), lack of mortgage works, complete collapse of roof workings; flooding, underflooding and waterlogging of soils (today these processes cover an area of approximately 90 km^2);

Soil subsidence under waste accumulators, heaps, mining water pipelines, causing regular accidents; underworking of water intake in the region (Boriatynskyi, Mezhyrichanskyi et al.), which can lead to contamination of the Cenonian aquifer – productive horizon of drinking fresh groundwater of the region; presence of empty rock dumps in the basin and coal mine drainage.

The content of fluorine in all water intakes within Chervonohrad mining region changes from the norm to 2–2.5, sometimes – up to 3.8 mg/dm^3, also there is a low level of calcium (16–34 mg/dm^3) and very high content of sodium, potassium (Na + K – 212–130 mg/dm^3) and strontium (5.95 mg/dm^3). Thus the lowest content of calcium in the water of the Cretaceous aquifer is within Sosnivskyi water intake.

Very low calcium content and significant excess of sodium, potassium, strontium and fluoride in drinking water create favorable conditions for the development of hypoplasia and fluorosis. This situation is generally typical for other intakes in Chervonohrad mining region.

All the mentioned above indicates that the elimination of economic activity at mining enterprises does not guarantee the termination of impact on the environment and public health and in some cases even complicates the situation. The reason for this is the absence of an integrated approach to address the economic, technological, environmental and social problems of mining enterprises liquidation.

That's why mine closure should be conducted in a way to avoid negative effect on the environment and health of population living in these areas.

MA-05

MOLECULAR, ISOTOPIC AND GENETIC COMPOSITION OF HUMAN GALLSTONES: A GEOMEDICAL STUDY

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Bacteria in the greater environment are seen to be responsible for a variety of concretions i.e. Stromatolites, oolites and calcium carbonate concretions. The structure and shape of their concretionary product is closely linked to the nutrients available in their immediate environment. Their environments can be ascertained by studying the molecular and isotopic structure of their fabricated products. It is believed that doing a similar study on human gallstones – as a possible by-product of bacterial metabolism, may yield similar information as to why gallstones form and the reason for their various morphologies/shapes. Long standing debates about the likelihood of biogenic or abiogenic processes developing various concretions in the natural environment are a regular point of contention when dealing with biomineralisation. The most notable of these debates centres on oolites, calcium carbonate nodules and, more recently, calcifications and lipid concretions in the human body. Although the current research has edged towards a more biogenic view with the former two topics, those involving the human body are only at the beginning of such debates. The objective of this study is to identify possible analogues between the human microbiome and the environment that lead to biomineralisation/concretionary structures within these systems. We will aim to investigate whether particular bacterial species are implicated in the crystallisation/accretion of gallstones in the gallbladder. We will compare these results with Oolites; calcium concretions found abundantly in various environmental contexts where bacterial precipitation of the calcium oxalate matrix is well understood. We hope this novel approach will reveal clues to the mechanisms behind lithogenesis of gallstones in the human body.

MA-06

VOLCANIC GAS-ASH INTERACTION: AN IN VITRO STUDY OF RESPIRATORY HEALTH HAZARD

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Volcanic plumes are complex environments composed of gases, aerosols and ash, where various chemical and physical reactions occur over a spectrum of temperatures and timescales. Commonly, soluble salts are formed, which adhere to ash surfaces, and are transported on the ash. Human exposure to inhalable volcanic ash following an eruption is a health concern, as it can result in acute adverse respiratory health effects, and we hypothesise that these salt coatings may be a cause, at least in part, of lung irritation. The aim of our study is to gain a first understanding of the effects of salt-laden ash particles on respiratory health, using a 3D human lung model in vitro. To recreate chemical reactions between pristine ash surfaces and hot volcanic gases, analogue substrates (i.e. pulverised synthetic volcanic glass and natural pumice) were used in a novel Advanced Gas-Ash Reactor (AGAR). Rapid adsorption of SO2 at temperatures above 500°C results in the formation of surface anhydrite (CaSO4) in these experiments. A sophisticated multicellular lung model was then exposed to salt-laden and control glass and pumice particles for 24 hours. Cell cultures were subsequently assessed for biological endpoints including cytotoxicity, oxidative stress and (pro-)inflammatory response. Following particle exposures, cytotoxicity and cell morphology were unchanged and negative effects were also observed for the ability of investigated particles to induce a (pro-)inflammatory response. It is envisaged that findings of this study will serve for a better understanding of the potential respiratory risk posed by salt-coated volcanic ash in populated areas.

SECTION: RADIOACTIVITY, RADIO GEOECOLOGY AND HUMAN HEALTH (RRG)

RRG-01

HIGH NATURAL RADIOACTIVITY IN THE SOILS AS A REASON OF RADIOECOLOGICAL PROBLEMS

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Introduction. There are several provinces on the globe that have high natural radioactivity in soil. The elevated contents of natural radionuclides in the soils lead to high concentrations of radon, which, in turn, causes radioecological problems. Scientists have proven negative effects on human health associated with high average doses of radiation. Epidemiological data of cancer morbidity and mortality are available which, however, require considerate interpretation.

Purpose. We give an overview on radiogeochemical and mineralogical features of soils and comparisons of epidemiological and radiogeochemical maps in Chinese Guangdong province (CGP) and in French Auvergne region (FAR).

Material and methods. Our research include detailed surveys of chemical composition of 37 soil sampales from CGP and FAR by result of instrumental neuron activation analysis (INAA), results of gamma-spectrometric soil analysis, the vertical distribution of radionuclides in the soil profile, the results of mineralogical analysis by using electron microscope Hitachi S-3400N.

Results and discussion. The preliminary gamma-spectrometric soil analysis shows that they are characterized by thorium radioactive nature (Th-190 Bq/kg; U (in terms of Ra) -120 Bq/kg; K-150 Bq/ kg) in soil of CGP.

The soil of CGP and the soil of FAR were studied using INAA. It was revealed that the average content of Th in soil of CGP amounts 45.33 g/t, U – 7.04 g/t. As for FAR soil, the soil research revealed that the content of U in soil amounts 6.44 g/t, but Th – 4.6 g/t. In the clay fractions of CGP soil phosphates with heavy and light rare earths, monazite, zircon, xenotime were identified.

Conclusion. There is high radon hazard in CGP, the maximum value reaches 1199 kBq/m^3. Study by French scientists shows that on FAR is increased activity of radionuclides (> 150 Bq/m^3).

According to B. Bølviken (2001) the highest incedence of nasopharyngeal carcinoma (NPC) is found in CGP. Comparison of the epidemiological maps for NPC with maps showing the contents of radionuclides in soil, reveals that the areas with the highest NPC rates in CGP also have anomalously high contents of radionuclides. Even though associations alone cannot prove any causal relationships, they may lead to the generation of etiological hypotheses, which can be tested, by case control studies or other epidemiological methods.

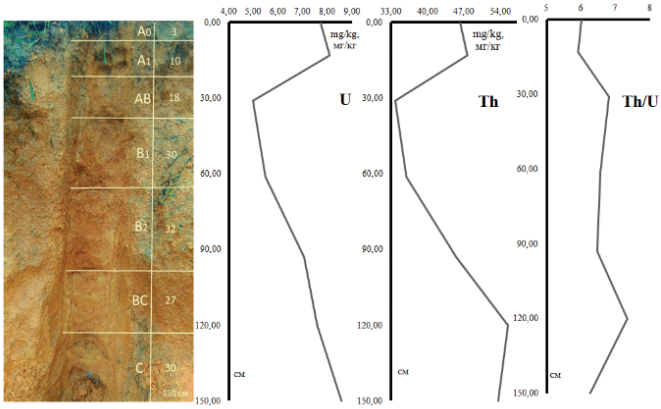

Fig. 1. Soil profile and graphs of U, Th, Th/U distribution (mg/kg) by INAA

RRG-02

MINERALOGICAL AND GEOCHEMICAL COMPOSITION OF HUMAN BODY ASH RESIDUE AS REFLECTION OF ENVIRONMENTAL FACTORS

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It is obviously, that human, as a part of ecosystem, is closely connected with the environment. Besides, numerous studies of last decades prove the fact that composition of human organism reflects the impact of natural and technogenic environmental factors as well as the composition of the environment. Since the population of urban areas is increasing every year, it is extremely important to estimate the impact of urban ecosystem on the human and heath. Due to such need it was set the objective to assess the influence of some Russian cities at the element and mineral composition of the human body. To get new knowledge in this field the Department of Geoecology and Geochemistry of Tomsk Polytechnic University is studying such material as human body ash residue (HBAR), which has been sampled in different Russian cities. Ash residue is the crematory material remaining after the human body has been burnt at the temperature of 900-1100 °C. The data are obtained by such accurate methods as INAA, ICP-MS, X-ray analysis and electron microscopy. A long-term study of this material shows that the human body ash residue of every studied city has specific geochemical features reflecting geochemical characteristics of the habitat in certain cases. Geochemical and mineralogical features of HBAR, which were sampled in different cities, are presented below.

Table 1. Geochemical and mineralogical features of human body ash residue

City	Geochemical features (high accumulation)	Mineralogical features
Novokuznetsk	Se, As, Si, Zn, P, Sr, Mg, Pr, Nd, Al, Ca, Dy, Th	
Novosibirsk	Au, Cr, Ba, Gd, Co, La, Fe, Sb, Sc, Na, Ag	Monazite, mineral phase of Au.
Yekaterinburg	Br, Nb, Cd, Pb, Sr, Rb, Ni, Ba, Hf, K, V, Na, Ag, W, Cs, Cr, Ga, Sc, U, Ti, La, Ce, Sb	Mineral phases of Co, Pb, etc.
St. Petersburg	Tb, Lu, Ti, Ag, Cu, Zn, Mn, Sb, W, Ce, Na, K, Rb, Ga, Ba, Fe, Mo, Co, Br, Nb, Sm, Cr, Ni	Mineral phases of Nb, Sr, etc.
Rostov-on-Don	Ta, Yb, Eu, La, Hf, Pb, Ag, Rb, Cr, Ce, Zn, Ba, Sc, Tb	Mineral phases of different metals
Norilsk	Cs, Zr, Sm, Al, Ho, Y, Gd, Dy, Pr, Nd, Ce, Cd, Tb, Lu, Sr, P, Mg, U, Sc, V, Ca, Hf, Ga, Rb, Nd	Monazite, zircon, mineral phases of Cu, Ni, Cr, Sn, Nd, Sb, Au, Pt, etc.

RRG-03

ANOMALOUS CONCENTRATIONS OF RADIONUCLIDES IN GROUNDWATER OF EDE AREA, SOUTHWESTERN NIGERIA: A DIRECT IMPACT OF METAMICTIZATION?

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An assessment of groundwater in areas underlain by pegmatite around Ede, southwestern Nigeria was carried out to determine the concentration of Potassium (40-K), Uranium (238-U) and Thorium (232-Th) radionuclides. In the earlier work, it was established that zircons in these pegmatites have suffered high degree of metamictization that has enhanced continuous released of radionuclides into the environment since the time of emplacement of the pegmatite host rock to the present. The purpose of this work is to determine whether or not there is corresponding increase in the concentration of radionuclides in groundwater in the study area.

Fifteen (15) groundwater samples were collected from wells and boreholes for analysis. Ten (10) samples were collected from Ede, two each from nearby communities of Iddo and Ekuro, and one from Iwoye where the bedrocks are not pegmatites. The analysis was carried out using the Sodium Iodide scintillator detector (NaI [Tl]) at the Centre for Energy Research and Development (CERD), Obafemi Awolowo University, Ile-Ife, Nigeria.

The results show varying concentrations of the radionuclides in the water samples. Activity concentrations of Potassium 40 (^{40}K) indicated an average of 17.149 Bq/L for samples from Ede, 9.265 Bq/L for Iddo, 6.6Bq/L for Ekuro and 21.21 Bq/L for Iwoye. The Uranium series had an average of 13.64Bq/L for Ede, 13.49Bq/L for Ekuro, 11.685Bq/L for Iddo and 12.04 Bq/L for Iwoye. Thorium series had an average of 11.182Bq/L for Ede while an average of 7.79Bq/L, 9.025Bq/L and 12.25Bq/L respectively were from Iddo, Ekuro and Iwoye.

The radionuclide concentrations in groundwater in these areas are largely above World Health Organization permissible limits. The high radionuclide concentrations recorded for Ede is probably due to release from pegmatites while those for other communities could be as a result of lateral mobility of ground water and these ions in the region.

Undoubtedly, the high radionuclides in the groundwater in Ede area are possibly connected with metamictization that has affected zircons and related minor minerals in pegmatite of that area. There is thus the need to carry out systematic studies of the radionuclides concentrations on regional scale in the area and these could lead to investigating on both short and long terms medical effects on animals and humans in these areas. There is also need to purify the ground water in this area for domestic and industrial uses. This study also shows the need to carry out properly and detailed chemical and radioisotope investigations before harnessing underground water in areas underlain with pegmatites or related rocks.

RRG-04

AREAS WITH A HIGH CONTENT OF RADIOACTIVE ELEMENTS AND SOME MEDICO-BIOLOGICAL PROBLEMS IN THESE AREAS

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There are areas on the globe with high radioactive formations (rocks, ores, soil, water), caused accumulation of U, Th, decay products and isotope K-40. Squares of these regions vary from few km^2 (U and Th mining areas, water sources) to many thousands of km^2 (districts of alkaline and

acid magmatic rocks: Transbaikal in Russia, the Massif Central in France etc., the soil formed on radioactive rocks: soil of Guangdong province in China, soil of Minas- Gerais State in Brazil, soil of Niue Island, beach sands of Kerala states in India and Azov sea sands).

Specific geochemical halos were formed in the regions with such type of natural formations. These halos can be revealed via the accumulation level of U, Th, and decay products (Ra-226, Rn-222, Rn-220), also via the degree of air ionization, water radiolysis. As a result of increased concentrations of radionuclides the specific biogeochemical province are formed in these areas (the Lake Issyk-Kul province in Kyrgyzstan, South-Chinese province, Transbaikal province etc.).

There is the migration of radioactive elements and accompanying elements, which is carried out by the trophic chains: rocks – soil – water/air – living organisms, observing the laws of migration, scattering, and accumulation. In cases of fairly high concentrations of radioactive elements the negative impacts on biota and humans can be detected.

Such examples were known before the discovery of radioactivity when effects of human exposure were observed but could not explain. For example, the disease of "Mountain spirits" in the ore zones in the Czech Republic and Germany, where miners had died from a mysterious sickness (actually, from lung cancer). It was thought that there are places unfavorable for human habitation. Today, these places can be called geopathogenic zones. The parameters of these zones can be estimated, for example, with the activity of radium or radon in the soil, air, water or food.

It is proven, in the areas with a high content of radionuclides the increased morbidity and mortality from thyroid cancer, nasopharyngeal carcinoma, leukemia, lung cancer, and sarcoma can be observed. The manifestations of these factors of human exposure are always a complex process.

The objective indicators for the identification of such effects are the using of biological markers (the presence of specific types of micronucleus, chromosomal aberrations). They have a significant deviation from the background (stochastic) levels in some areas.

RRG-05

DETERMINATION OF NATURAL RADIO ACTIVE ELEMENT CONCENTRATION IN THE TERRA-ROSA OF MINIM-MARTAP DISTRICT AREA

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The Minim-Martap district is a bauxite mineralized zone in the Adamawa region of Cameroon. It is host the biggest Bauxite deposit in the country and possibly one of the largest in the world. It hosts about 40,000 inhabitants and its economic activity is Agriculture (such as – growing of food crops and animal husbandry) and it is free from industrial activities. However, the area is set to be a mining site for bauxite in the near future as exploration is ongoing.

Acute respiratory infection is one of the major causes of mortality and morbidity in the area. The infection is common among children and elderly people and usually results from the inhalation of polluted air by natural radioactive elements (CAL, 2010).

To this effect, the radioactive element (K, U and Th) content of Terra-Rosa samples in this zone was analyzed for possible risk to the inhabitants. The samples of 11 different locations collected from Cameroon were prepared at Akdeniz University by drying, grinding and homogenization, sieving through a 0.063 micron mesh and analyzed by the ACME Analytical Laboratories, Ltd using methods LF700 (for K) and LF100 (for U and Th). K had concentrations ranging from 0.01 – 0.3 wt% with a mean of 0.2 wt % and Std. of 0.1. U ranged between 2.8 – 7.4 ppm with a mean and Std. of 4.92 ppm and 1.42 respectively; while Th ranged from 19.8 – 33.2 ppm with mean and Std. of 27.15 ppm and 4.30 respectively.

Th and U are a multiple of 3.67 and 1.76 times respectively, higher than the average mean value while K is lower by a multiple of 0.16. The gradient ratio of the slope of Th/U, K/U and K on Th were 4.13, 0.03 and 0.02 respectively. Indicating a slightly higher value for Th/U, that needs further investigation to determine possible radionuclide activities. Correlational relationship between the concentrations of U and Th versus K; and U versus Th were 0.614, -0.256 and 0.521 respectively.

The high anomaly of the thorium in the study area may be one of the causes of health problems by the radioactive, needs to be further investigated.

RRG-06

WHICH ENVIRONMENTAL FACTOR IS CORRELATED WITH THE LONG-TERM MULTIPLE SCLEROSIS INCIDENCE TRENDS: ULTRA-VIOLET B RADIATION OR GEOMAGNETIC DISTURBANCE?

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The actual nature of the environmental risk factor(s) of multiple sclerosis (MS) is still subject of debate. Received ultra-violet (UV) B radiation and geomagnetic disturbances both are solar-terrestrial phenomenon. Insufficient received UV is regarded the main environmental risk factor (RF) for MS in vitamin D deficiency hypothesis (VDH). Nevertheless, geomagnetic disturbances (GMD) have also been proposed recently as a potential trigger for MS in the GMD hypothesis. The aim of this study was to investigate which of these mentioned RF is correlated with long-term ultra-decadal MS incidence. For conducting this study, three sets of data including long-term MS incidence data, long-term GMD data and long-term local received UV data were needed. The PubMed was searched to find studies with reported "annual incidence of MS" for at least 20 consecutive years, from high latitude European countries. Accordingly, six published reports including long-term incidence reports of the United Kingdom 1990-2010, Denmark 1950-89, Tayside County (Scotland) 1970-99, Nordland County (Norway) 1970-2009, the Orkney islands (Scotland) 1941-82 and the Shetland Islands (Scotland) 1938-85 were selected for this retrospective time-series study. Ap index data, as the main GMD index, were extracted from Goddard space flight center and geomagnetic indices database of National Geophysical Data Center. Two sources were used for obtaining long-term local received UV data: the PROMOTE UV record and the COST 726 project. Possible lead-lag relationships between mentioned variables were evaluated by cross-correlation analysis for lags between 0 and 5 years. Significant positive correlations between Ap (GMD index) and MS incidence was seen in Orkney (at lag of 2 year: r_S= 0.41, p<0.05), Tayside county (at lag of 1 year: r_S=0.37 p<0.05), Denmark (at lag of 3 to 4 years: r_S= 0.37, p<0.05) and The UK (at lag of 0 to 1 year: r_S= 0.49, p<0.05). No correlation was found between the received UV and MS incidences in the studied locations. This study found significant positive correlations between alterations in GMD with long-term MS incidence in four out of six (66%) studied locations. In contrast, received UV alterations were not correlated with MS incidence in the studied locations. Based on the results, this study supports the GMD hypothesis about MS and indicates that GMD may potentially be the main environmental RF for MS. This new hypothesis deserves to more be considered by MS researchers.

SECTION: SOILS IN MEDICAL GEOLOGY AND ENVIRONMENTAL GEOCHEMISTRY (S)

S-01

GEOCHEMISTRY AND THE LIFE OF HUMAN SOCIETY

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During formation of various types of living organisms they have developed a kind of "habit" to accumulate some form of chemical elements distributed in the geological environment at homeland. First, in terms of trace elements which are distributed in the lithosphere extremely heterogeneous. Gradually, such a "habit" it became a genetic trait that determines the nature of life. The development of adaptive reactions of living organisms to geochemical conditions of the environment and certain concentrations of chemical elements in it is the most important characteristic of the organization of the biosphere.

The active centers of many enzymes are metal ions, which determine the characteristic features of living organisms, primarily that of the highest mammals, in particular humans. A wide range of metalloenzymes detects the passage of many physiological processes, and it is safe to assume that the occurrence of certain biochemical differences in ethnic groups and their behavioral characteristics are related to the geochemical characteristics of the geological environment in their homeland.

However, based on the principles of geochemical isomorphism, the ion of any element, especially with its lack in the environment, later can be replaced by an ion of another element which is close to him in size, charge and nature of the chemical bond. A wide spectrum of possible isomorphic substitutions leads to a decrease, and often stop of the activity of some enzyme, and, consequently, to disruption of physiological processes in the human body, that is to change of its behaviour and even disease. Isomorphic substitutions of chemical elements in living tissues, associated with the variability of the geochemical composition of the living environment are an important factor in determining a person's vitality.

In the urban environment, especially in large cities, there is an accumulation of many trace elements in the water, air, soils. The general indicators of the variability of chemical composition of the environment are soils and sediments of water reservoirs. Therefore, their geochemical study and correlation with statistics on morbidity is one of the priority areas of environmental geochemistry and medical geology.

Radioactive isotopes are the important geochemical aspect of the conditions of life. Considering that ionizing radiation is an important mutagenic factor that is evident even over a short period of time, during millions of years in parts of the lithosphere which was highly rich in radioactive elements and could cause mutagenic effects, the Homo sapience may have formed the background of quiet evolution of primates. It can be assumed that the influence of radioactive elements in combination with other geochemical characteristics is also manifested in the development in certain geological territories of ethnic groups with different genetic traits and behavioral characteristics. From the point of view of the problems of the modern world, the most dangerous is the possibility of isomorphic substitution between biophile elements which involved in physiological processes and man-made radioactive isotopes.

In General, the impact of geological-geochemical peculiarities of the environment on the life of society can be formulated as follows. The relationship of all processes that shape our planet applies and to the biosphere and the noosphere as spheres of the Earth as the results of endogenous and exogenous natural and natural-technogenic processes on our planet. They display at different levels of development of human civilization – from the emergence of Homo sapiens, ethnogenesis, the evolution of human society up to the viability of individuals.

S-02

FACTORS CONTROLLING THE POTENTIAL OF ARSENIC OF SOILS WITHIN KONYA SETTLEMENT

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In many studies As, Cd, Cr, Hg, Pb and Ni were certainly accepted as toxic element however some elements such as Mn, Be, V, Al, Zn, Mo and Se are included among the toxic elements in some studies. In this study, factors controlling the distribution of arsenic of the soils around the Konya settlement area have been evaluated. According to parametric and multi-variate statistical analysis eight factors controlling the element distribution. The first factor has caused a 35.03% change in soils, second factor 17.32%, third factor 9.96%, fourth 6.95%, fifth 5.58%, sixth 4.8%, seventh 3.89%, and the eighth one has caused a 3.64% of total variation. Arsenic distribution is controlled by the third and the seventh factors. The third factor shows that the minerals, forming based on the young volcanic activities, belonging to hydrothermal mineralization have disintegrated and that the toxic metals have been released. The seventh factor shows that the toxic metals have been released within a solid waste storage facility and some former military activities. Arsenic is used as a pesticide in agriculture while it is used in defense industry, so arsenic distribution in the area of investigation has been examined depending not only on natural geological factors but also on anthropological activities resting on agricultural, military and defense industry.

S-03

GEOCHEMICAL ASSESSMENT OF HEAVY METALS IN WETLAND SEDIMENTS FROM AROUND MARYLAND AREA OF LAGOS, SOUTHWESTERN NIGERIA

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Wetlands are sinks for heavy metals thus they are important in ascertaining the pollution status of a catchment area. This study was designed to investigate the sources and contamination level of some heavy metals with depth in wetland sediments from Maryland, Lagos.

Eight core samples were obtained from the wetlands and each were subdivided into six at 5cm intervals. The samples were dried, prepared and analysed using ICP-MS for elemental determination while the mineralogical constituents were determined using XRD. The physico-chemical parameters (pH, TDS and EC) of the samples soaked in deionized water were also determined. The pollution status for the selected metals was evaluated using Enrichment Factor, Geo-accumulation index, Contamination Degree and Pollution Load Index. Metal associations were determined using Correlation and Factor analyses.

The results revealed that the metal load for Pb, Cu, Zn and Cd surpasses their natural background value, thus the area is said to be polluted with these metals. This is attributed to indiscriminate waste disposal from households, commercial activities and agricultural effluents from the catchments. The current status of the wetland sediments is of concern as these wetlands are used for dry seasons cultivation of vegetables and other crops. The possibility for the bio-absorption of these metals by these crops is huge thus introducing a pathway for the metals into the food chains. The consumption of these food products could trigger adverse health effects such as disruption of vital body organs. Thus, an immediate intervention to ameliorate the pollution in this area is imperative.

S-04

IMPACT OF FLY ASH DISPOSAL ON SOIL AND GROUNDWATER QUALITY IN PARTS OF CENTRAL GANGA PLAIN, INDIA: A CASE STUDY

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The present study focused on the effect of fly ash disposal on agricultural soil and ground water quality for domestic and irrigational purposes around Harduaganj Thermal Power Station (HTPS) Aligarh, India.

The disposal of fly ash can bring about extensive changes in surface and ground water quality and cause soil pollution that can potentially adversely affect public health and land use practices. Systematic ground water sampling (n=27) was carried out to assess major ion chemistry. The chemical and physical parameters of groundwater samples, e.g., pH, electrical conductivity (EC), total dissolved solids (TDS), cations (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}) and anions (Cl^{-}, HCO_3^{-}, SO_4^{2-}, NO^{3-}) were analyzed. The results exhibit the slightly alkaline nature of the water with alkalis as the dominant cations and $Cl^{-}+SO_4^{2-}$ in abundance over bicarbonate amongst the anions. There is a strong correlation between TDS and other major ions such as Mg^{2+} (r = 0.51), Na^{+} (r = 0.64), K (r = 0.61) and HCO_3^{-} (r = 0.73)., In this study area, four major hydrochemical facies have been identified as, Ca^{2+}-Mg^{2+}-SO_4^{2-} type, Ca^{2+}-Mg^{2+}-HCO_3^{-} type and Na^{+}-Cl^{-} -SO_4^{2-}-type. According to Gibb's ratio 1 & 2, most of the groundwater samples are characterized as rock dominance, which suggests the chemistry of groundwater of the area is mainly influenced by the interaction between aquifer lithology and groundwater. To identify the changes in soil mineralogy caused by fly ash disposal in the vicinity of thermal power plant, bulk XRD analysis has been carried out on agricultural soil samples (n=10). Soil XRD spectra showed negligible changes in soil mineralogy because of fly ash. Based on the analytical results, irrigational quality parameters like sodium adsorption ratio (SAR), residual sodium carbonate (RSC), base exchange index (BEI), meteoric genesis indices (MGI), Kelly's index (KI), magnesium hazard (MH) and permeability index (PI) have been calculated, which indicate that the groundwater is mostly suitable for irrigational purposes.

S-05

ACCUMULATION OF HEAVY METALS (NI, CU, CD, CR, PB, ZN, FE) IN THE SOIL, WATER AND VEGETABLES COLLECTED FROM MIGORI GOLD MINES VICINITY, KENYA

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Heavy metals are reported worldwide as bio accumulatable as well as bio transferrable by both natural and anthropogenic sources such as mining and agriculturally activities. The contamination of soils and drinking water by heavy metals is a major worldwide crisis threatening both the environment and mankind health. There is urgent need to address the heavy metal contamination in the environment because heavy metals above their normal ranges are extremely toxic to both plant and animal life including human beings. This paper reports on the estimation levels of heavy metals in edible leafy vegetables, water and soil of Migori mining area, Suna Sub- County, Migori County, Kenya. Water samples were collected at random from the surface streams and River Migori in Migori gold mines area. About 42 samples of water and 42 soil samples were collected at random in the small scale gold mining area. Four different types of common edible vegetables namely: Kale (*Brassica oleracea (acephala)*), Spinach (*Spinacia oleracea*), Amaranth (*Amaranthus cruentus*) and *Solanum* spp (African nightshade) were also collected from the same study area. Heavy metals in water, soils and common edible leafy parts of vegetable samples were analyzed for lead (Pb), cadmium (Cd), chromium (Cr) zinc(Zn), copper (Cu), iron (Fe), nickel (N). The samples were processed in Kenyatta University, Biochemistry Laboratories, before shipment to ACME LABS Vancouver Canada for metal analysis. Results showed that concentrations of Cd, Cr, Fe and Pb in water samples were recorded above the permissible limits set by WHO while Zn and Cu were recorded below the permissible limits and no concentration of nickel was recorded in water samples. Concentrations of heavy metals in soil were also compared with WHO standards for heavy metals, and were observed above the permissible limits except Zn which was recorded below the permissible limits set by WHO while edible leafy vegetables 'heavy metal concentrations showed extremely high levels with Fe > 10,000mg/kg. The study established that there is heavy metal contamination in the environmental media and this poses a grave situation for the consumers of the vegetables and other possible food stuffs grown on the soils. The research besides recommending educational awareness for the residents, recommended and started bioremediation using local plants.

S-06

IMPORTANCE OF HUMIC ACID FOR THE DIVERSITY OF MICROORGANISMS INVOLVED IN THE BIODEGRADATION OF PENTACHLOROPHENOL IN SOILS

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Pentachlorophenol (PCP) as a 'priority pollutant' is widespread in soils, water and sediments, as well as in humus and other living organisms, and this compound remains a critical environmental concern because of its accumulation and negative impact on human health. Soil microorganisms play crucial roles in the fates of PCP, and understanding the behavior of these microorganisms is critical for the bioremediation of PCP-contaminated area. Humic substances (HSs) are ubiquitous in soils, and can be reversibly oxidized and reduced through acting as redox mediators, to participate in microbial metabolism and impact a direct effect on the biodegradation of organic pollutants. However, the roles of HSs on specific microbial taxa that are responsible for PCP degradation remains unclear. In this work, the effect of three humic acids (HAs), extracted from forest (CBHA), paddy (PSHA) and peat (YNHA) soils, respectively, on the microbial community involved in PCP anaerobic mineralization were investigated by stable isotope probing (SIP) and high throughput sequencing methods. The results showed that all HA samples accelerated the biotransformation processes of PCP, in which the highest rate was obtained when with the HA extracted from the peat soil. The Illumina sequencing revealed that *Desulfovibrio* and *Clostridium* were the dominant function bacteria for PCP dechlorination. In the followed further degradation and mineralization of PCP, HAs had a substantial effects on the diversity and abundance of microbial communities and several phylotypes were enriched in the ^{13}C heavy fractions compared to the ^{12}C heavy fractions. Without HA, *Methanobacterium* and *Spartobacteria* exhibited great increase in ^{13}C heavy fractions. *Methanosarcina*

and OP11 were found to be the dominant PCP degraders in microcosms when amended with CBHA, whereas, *Burkholderia* and *Methanobacterium* were the key PCP degraders in PSHA and YNHA-amended experimental microcosms. These findings provide scientific supports for developing *in situ* bioremediation technologies for the HSs-rich soils contaminated by PCP.

S-07

COMPARATIVE CHEMICAL ANALYSIS AND MINERALOGY OF THE SOILS EATEN BY UNGULATES IN SIKHOTE-ALIN AND CAUCASUS MOUNTAINS

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Introduction. Geophagy, or purposeful consumption of mineral substances, has been well-studied and documented among humans and animals worldwide (Young, 2010). The use of mineral licks has been marked among numerous species of mammals, especially ungulates (Rice, 2010). Currently, there are several biological explanations for this phenomenon, but all of them are overlooked by geological aspect of the problem.

Therefore, this investigation focuses on comparing chemical and mineral composition of soil-samples from mineral licks located in Sikhote-Alin and Caucasus Mountains and geological substantiation of possible reasons for it.

Methods and Materials. Samples of licked soil were collected in two places: Sikhote-Alin Biosphere Reserve and Caucasian Biosphere Reserve. Investigated areas have different climatic conditions and geological structure, but despite this, both reserves contain mineral licks visited by Siberian stags (*Cervus elaphus xanthopygus*) and Mountain goats (*Capra caucasica*), respectively.

Chemical and X-ray tests of soil-samples were conducted in the laboratories of Geological Faculty of Moscow State University and the Pacific Institute of Geography of the Russian Academy of Sciences.

Results and discussion. Investigations were able to identify similar features of consumed soils from both of studied areas:

1) Presence of plenty natural adsorbents, such as zeolites, clays and silica.
2) Soil-samples are characterized by a high content of trace elements (under the leadership of the light lanthanides).
3) All analyzed soil-samples contain low levels of water-soluble sodium salts.

In this way, it'll be reasonable to assume two hypotheses of geophagy in studied areas: 1) *adsorption*- the consumption of mineral adsorbents for detoxification; 2) *microelements* – consumed soil is attractive because of the high amount of microelements in its composition.

Conclusion. The formation of mineral material, consumed by animals, arises in the process of bedrock's physical, chemical and biological weathering. Bedrock's composition (which depends on geology and climate of studying areas) will determine the final chemical and mineral composition of consumed soils and their attraction for animals.

Suchwise, mineral licks present an essential condition for the existence of wild animals and take a significant part in ecosystems.

S-08

PLANT UPTAKE OF AU IN AGRICULTURAL SOILS AMENDED WITH AU NANOPARTICLES OR HAUCL4: ROLE OF SOIL GEOCHEMISTRY

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There are major uncertainties related to the fate of engineered nanoparticles (NPs) in soils. Recent studies suggest that the availability of NPs in soil cannot be fully explained on the basis of common soil-solution partition processes as for ionic metals.

In this study a pot experiment with 3 agricultural soils of variable properties (pH=4.6-6.9; OC=1.1-7.2 %; clay=2-15 %; 500g of soil per pot) was performed to identify the degree to which Au from AuNPs or $HAuCl_4$ solution added to soils under environmentally relevant conditions (i.e. aerated soils) was available for plant uptake.

Pots were amended with a suspension of AuNPs ([Au]=18.5 mg L^{-1}) or $HAuCl_4$ solution ([Au]=18.4 mg L^{-1}) and kept for 30 days at constant moisture content (70 % of WHC). After this, seeds of *Lactuca sativa* were planted. Plants were grown for 21 days after 50 % emergence of the seedlings in the control pots. Emerged plants were harvested, dried and analysed for total Au concentration (OECD 208 guideline).

All pots were equipped with probes for pore water sampling. The soil-pore water distribution of Au added to soils were monitored throughout the experiment. At the end of the experiment, soils from pots were separated in 2 sub-samples (0-5 and 5-10 cm depth), dried and analysed for total Au concentration.

In this presentation results obtained for AuNPs amendment will be compared to those obtained for Au added to soil in ionic form. Differences in the distribution of Au in the soil profile and in the uptake of Au from soil by plants will be reported. The effect of soil properties as well as of non-equilibrium processes will also be discussed.

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SECTION: WATER AND HUMAN HEALTH (WHH)

WHH-01

MACRO- AND MICROELEMENT COMPOSITION OF GROUNDWATERS OF THE REPUBLIC OF BELARUS AND THE POPULATION HEALTH: PROSPECTS FOR SCIENTIFIC RESEARCH AND SANITARY REGULATION

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The evaluation of Belarus water resources had shown that in the future there is a possibility for universal provision of the population with quality and safe ground drinking water. As a result the main challenges in this regard are not only due to the natural groundwater characteristics but mostly due to anthropogenic pollution in the water treatment process and transportation through water pipes. In the last years one more aspect – provision of the population with not only safe but also physiologically valuable drinking water became a point for consideration.

Despite drinking water is not a major source of essential elements its added value into the total macro- and micronutrients contribution has been significant scientifically proven and worldwide recognized fact. Even their relatively minor intake with drinking water may play a crucial protective role because these elements present in water as free ions and easier absorbed in comparison to that from food. The lack of essential elements, low mineralization and hardness of drinking water can contribute to eczema, coronary heart disease, hypertension and other diseases development. At the same time, with the right approach, drinking water may help to compensate macro- and micronutrients lack occurring due to malnutrition, contribute to the hypertension, cardiomyopathy and other diseases prevention, help to restore the body after strenuous exercise or work in high temperature conditions.

The aim of this work was to assess the main macro- and micronutrients composition of drinking water supplied to the population in the different regions of the Republic of Belarus. Evaluation of the drinking water chemical composition was carried out based on the results of laboratory researches, retrospective data of laboratory and state sanitary control of drinking water from centralized drinking water supply systems.

It was shown that mineralization of drinking waters is found in the range from 50 to 600 mg/l, most often in the range from 250 to 480 mg/l. The vast majority of water belongs to hydrocarbonate class, calcium group. At these waters calcium and bicarbonate ions are the major components (respectively 36 % and 48 % to the total salts quantity). The calcium content in drinking water varies from 10 to 140 mg/l (mostly in the concentrations 65 – 80 mg/L), the magnesium content – from 1 to 40 mg/l (mostly in the concentrations 15 – 20 mg/l). The prevalent anion in the drinking water is bicarbonate, its content vary from 50 to 450 mg/l (the most common value 170 – 280 mg/l). Chloride and sulfate ion contained in the concentrations up to 10 mg/L, maximum concentrations in natural waters – 50 mg/L. The drinking waters mineralization decreases from north to south of the country. It was not revealed of clear link between mineralization and total hardness of water in the sources and depth of wells and type of aquifer. The content of toxic metals and non-metals in drinking water (aluminum, nickel, arsenic, mercury, cobalt, zinc, lead, chromium and copper) was detected significantly below hygienic standards; manganese concentrations often close to the MPC (maximum 0.09 mg/l while the standard is 0.1 mg/l). The information database including information about macro – and micronutrients content in drinking water ground sources was developed.

On the basis of the obtained results, taking into account literature data, the existing developments in this area, the physiological importance of basic macro – and microelements, as well as the potential uptake of specific elements with water the criteria of physiological value of drinking water (total mineralization, total hardness, calcium, magnesium, potassium, bicarbonate) and additional (content of fluoride ion) were developed and approved in SanPiN. The differentiation of drinking water ground sources in accordance with these criteria was conducted at country level. The algorithm for selection of ground drinking water sources taking into account criteria of drinking water physiological value was grounded.

WHH-02

HYDROGEOCHEMICAL CHARACTERISTICS OF GROUNDWATER IN MENTEŞ WATERSHED AND ENVIRONMENTAL IMPACTS (YAHYALI- KAYSERI-TURKEY)

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In this study, the effect of the iron deposits, located in Menteş watershed on the ground waters was investigated. The study area is located in the Seyhan river main basin. The Menteş watershed covers an area of 43 km^2 with an annual average precipitation of 460 mm/year. The study area comprises Precambrian metaclastics, Lower Cambrian quartzite, Middle Cambrian recrystallized limestone, Ordovician metaclastics, Miocene conglomerate and recent alluvium. Recrystallized limestones are main aquifers within the studied area. To determine aquifer parameters totally 15 groundwater samples were taken from springs and wells in dry and wet seasons, T, pH and EC values were

measured in-situ and the major anion – cation and trace element analysis were done. Temperature of the waters ranged from 7oC and 19 °C; pH values ranged from 7,26 and 8,7; EC values ranged from 47,3 µS/cm and 642 µS/cm. The cation and anion sequencing of the water samples are mostly in rCa> rMg > rNa > rK and r HCO_3> rSO_4 > rCl form, respectively and this sequencing indicate that the groundwater are predominantly located within the limestone and dolomite. $\delta_{18}O$ (‰–10,93 – ‰-8,27) and δ^2H (‰-64,18 – ‰-54,58) values show that waters are meteoric origin. The major anion and cation values of the water samples are below the drinking water limit values (TS 266 and WHO). Trace element analysis covering 66 parameters were analyzed by ICP-MS method and more than 30 elements including Hg, Cd, Th and Ag stayed in below detection limits. As, B, Co, Cr, Cu, Mo, Ni, Pb, Sb, Ti, U, V, W, Zn, Se and other elements' values are low enough to be ignored. The obtained results showed that ground waters located in Yahyalı iron mine fields and its close vicinity have drinking water quality and they do not affect by the mining activities.

WHH-03

GEOLOGICAL ENVIRONMENT AND GROUNDWATER QUALITY, A KEY TO SOCIAL DEVELOPMENT: THE BINOMIAL SOUTHERN EDGE OF THE DUERO BASIN SPANISH CENTRAL SYSTEM, SPAIN

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It is a social challenge to establish the link between the geological and health environment and the laws that govern this relationship to improve the quality of life and the relationship of Man with his environment.

Groundwater is one of the means that best establishes this relationship. As an example, a sedimentary basin associated to fissured aquifer is presented: the binomial southern edge of the Duero Basin-Spanish Central System. The geology, and especially the structure of fissured aquifers recharging laterally and from the basement sedimentary basin, control groundwater quality of groundwater in the basin, especially in terms of concentrations of Potentially Toxic Geogenic Trace Elements (PTGTE). Distribution of As, V, and Cr in the groundwaters of the Duero Basin is regulated mainly by structural factors and particularly by inputs of cold-hydrothermal waters flowing through fractures of the basement.

Hydrogeotoxicity from different PTGTE compromises the use of groundwater for drinking purposes, so that several administrations have stopped tapping waters unsuitable for human consumption or have opted to use alternative water resources. This case demonstrates the need to manage water resources appropriately, taking into account the control of the natural environment in their quality. Alongside an assessment of the geological environment, natural resource management must integrate ethical and social aspects into its decisions, including human security, social inequality or poverty.

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WHH-04

CORRELATION BETWEEN WATER EEDS LEVELS AND OCCURRENCE OF PCOS IN CHENGDU, CHINA

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Object: To investigate the relationship of water EEDs level, serum EEDs level, and PCOS prevalence in 3 districts of Chengdu. Methods: Surface water samples of river, Random samplings of population (12-44 years old women) and human serum were collected from Qingyang, Jinniu, and Wuhou Districts of Chengdu. EEDs were detected by GC-MS. The diagnosis of PCOS was based on the 2003 Rotterdam criteria. All data was analyzed with SPSS 21.0 statistical software. Results: The water EEDs levels, serum EEDs levels and PCOS prevalences had the same trends, i.e. all are highest in Wuhou District, followed by Jinniu District, and lowest in Qingyang District. There is a trend that with the increase of the total levels of different EEDs in water, the concentrations of serum EEDs and the prevalence of PCOS increased also in the three districts, although the difference of prevalence of PCOS and serum EEDs levels among the three districts is not statistically significant (P>0.05) (see Table 1).

Table 1. The prevalences of PCOS and concentrations of water EEDs and serum EEDs in three districts, Chengdu

	Qingyang	Jinniu	Wuhou
Prevalence of PCOS	6.5%	8.8%	9.2%
∑PAEs in water(ppb)	0.076	0.306	0.432
∑PAEs in serum(ppb)	18.0	17.4	20.8
BPA in water (ppb)	0.004	0.005	0.014
BPA in serum(ppb)	1.25^{-5}	1.25^{-5}	1.38^{-5}
∑PBDEs in water(ppb)	$1.59*10$	$1.56*10$	$1.88*10$
∑PBDEs in serum(ppb)	23.5	38.1	38.3

Conclusion. There is a trend that with the increase of water EEDs, the concentrations of serum EEDs increased, and the prevalence of PCOS increased, even the trend is no statistically significant. We might speculate that EEDs in the water might be absorbed into body and lead to increased levels of serum EEDs, and finally lead to increased risk of PCOS. However, we need to expand the sample size to confirm this conjecture.

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WHH-05

GEOCHEMICAL AND PETROGRAPHICAL INVESTIGATIONS IN STREAM SEDIMENTS FROM THE PINARBAŞI PB-ZN MINERALIZATION (GEDIZ-KÜTAHYA, NW TURKEY): IMPLICATIONS FOR THE PUBLIC HEALTH

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The Pınarbaşı village is located approximately 8 km northwest of Gediz (Kütahya-Turkey) and 50 km east of Simav (Kütahya-Turkey). This village is located in magmatic province. One of the characteristic feature of this granitoidic and volcanic province is the presence of widespread associated hydrothermal activity contains significant accumulations of precious and base metals (Cu, Mo, Fe, Pb, Zn, Au, Ag, etc.).

The ore mineral paragenesis from Pb-Zn mineralization includes magnetite, chalcopyrite, galena, sphalerite, pyrite, fahlore, bornite, hematite, covellite, chalcocite, digenite, cerussite, smithsonite, anglesite, jarosite, malachite and orpiment in Pb-Zn mineralization near the Pınarbaşı village. In the ore petrographical analysis from stream sediments, chromite, magnetite and pyrite are observed. In sediments collected from Seçyeri stream located near village, the average contents are 7.3 wt.% Fe_2O_3, 137.3 ppm Cu, 658.6 ppm Pb, 387 ppm Zn, 136.4 ppm As, 1.10 ppm Cd, 10 ppm Co, 0.2 ppm Hg and 79.4 ppm Ni. In sediments collected from Sarısu stream located near the village, the average contents are 5.5 wt.% Fe_2O_3, 77.6 ppm Cu, 132.4 ppm Pb, 63 ppm Zn, 3.9 ppm As, 0.2 Cd, 3.6 ppm Co, 0.01 ppm Hg and 11.7 ppm Ni.

Geochemical and petrographical studies indicate that the Seçyeri stream sediment closer to Pınarbaşı Pb-Zn mineralization are rich in Pb, Zn, Cu, As, Co, Cd, Hg and Ni contents. And both stream sediments have high values in Cu, Pb, Zn, As and Ni according to soil standards. As a result, the people living in the nearby environment are effected by mentioned heavy metals.

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WHH-06

IMPACT OF THE WATER WHICH LACK ELEMENT OF IODIUM AGAINST PUBLIC HEALTH IN BALONG AND JAMBON PONOROGO EAST JAVA PROVINCE OF INDONESIA

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Data and information as well as the literature, in the Subdistrict of Balong and Jambon Ponorogo, East Java province, there is a village call Karang Patihan with four hamlets, namely Tanggungrejo; Krajan; Bibis and Bendo, residents in the village of such a fraction suffer diseases is iodium deficiency. Morphology the area found on the slopes of the hills more than 40%, so estimated minerals needed by the human body is a lot of erosion by streams of rain water, as well as its location is isolated from the urban areas so that the distribution of nutritious foods often have difficulty.

The results of the analysis samples of water that comes from the well, river water and spring water are as follows: wells, (SG-1; SG-2; SG-3; SG-4; SG-5) is = 26 ug/Lt. in the drilling (SB-1) is = 44 ug/l. river water (AS-1; AS-2) is = 0 ug/l and spring water (MA-1) was also = 32 ug/l, all elements of the content of Iodium less than 50 ug/l. Where as the needs of iodium per day for health is = 150 – 200 ug/l.

The results of the information from the local Health Department, the diseases shortage of Iodium Dsn Tanjungrejo is 61 people; cronics 4 people. Dsn. Krajan is 8 people; cronics 1 person. Dsn Bibis. Is 8 people; cronics 1 person; Dsn. Bendo is 6 people; the cronics 1 person, and the total is = 89 people.

To improve the quality of health care for the local population, improvement of nutrition and extra salt iodium to be given regularly by the local Health Department so that the next generation of the society will live more healthy and prosperous.

WHH-07

EXPOSURE TO LEAD AND CADMIUM VIA PRIVATE DRINKING WELLS IN SCANIA, SWEDEN

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Approximately 1.2 million people in Sweden rely on private drinking wells as their sole water source. In addition to pollution from anthropogenic sources, ground water is also greatly affected by the underlying bedrock. Moreover, compared to municipal drinking water, water from private wells only sparingly undergoes treatment or quality control. In this study we investigated the presence of lead and cadmium in the water from private drinking wells outside the city of Höör in the county of Scania, Sweden. The investigated area is located within the Sorgenfrei-Tornquist zone with known fractual mineralizations of Galena and Sphalerite. Results showed that 28 of the 62 investigated households received drinking water with levels of lead and/or cadmium exceeding the Swedish drinking water guidelines. In certain cases, highly elevated levels of lead (>100 µg/L) as well as cadmium (>30 µg/L) were detected. Analysis of blood samples from highly exposed individuals in several cases showed blood lead levels exceeding the US EPA action limit of 50 µg/L, a level that has previously been shown to impair cognitive functions in children. A clear correlation could also be observed between lead concentrations in water and in blood (R^2= 0,782). This study hence demonstrates that the local geological conditions can give rise to exposure to heavy metals via private drinking wells at concentrations, which on a long term could be associated with adverse health effects.

WHH-08

IMPACT OF DEFICIT CONTENTS OF CALCIUM AND MAGNESIUM IN GROUNDWATER/DRINKING WATER ON HEALTH STATUS OF INHABITANTS, SLOVAK REPUBLIC

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This work aims to evaluate the impact of chemical composition of groundwater/drinking on health status of inhabitants in the Slovak Republic. Primary data consist of the Slovak national database of groundwater analyses (20,339 chemical analyses, 34 chemical elements/compounds) and data on health status and demographic growth of Slovak population (health indicators – HI), covering the whole Slovak territory and population (approximately 50,000 sq.km, 5,500,000 millions of inhabitants). Fourteen HI were evaluated including life expectancy at birth, potential years of lost life, relative and standardized mortality for the most common causes of deaths in the Slovak Republic: cardiovascular and oncological diseases, diseases of gastrointestinal and respiratory system. The chemical and health data were unified in the same form and expressed as the mean values for each of 2,883 municipalities within the Slovak Republic for further analysis. Pearson and Spearman correlation as well as method of artificial neural network (ANN) was used as mathematic method for environmental and health data analysis. Based on the results of calculations through ANN, the most significant chemical elements having influence on evaluated HI were identified together with their limit values. The following chemical elements/parameters in the groundwater were defined as significant: $Ca^{2+} + Mg^{2+}$ (mmol.l^{-1}), Ca^{2+}, Mg^{2+}, TDS, HCO_3^- and SO_4^{2-}. The most significant relationship between HI and chemical composition of groundwater was documented for $Ca^{2+} + Mg^{2+}$ (mmol.l^{-1}), Ca^{2+} and Mg^{2+}. The following limit values were set for these most significant groundwater chemicals/parameters: (Ca + Mg) 2.9 – 6.1 mmol.l^{-1}, Ca 78 – 155 mg.l^{-1} and Mg 28 – 54 mg.l^{-1}. At these concentration ranges the health status of Slovak population is the most favourable and the life expectancy is the highest. These limit values are about twice higher in comparison with the current Slovak valid guideline values for the drinking water.

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WHH-09

RECHARGE HISTORY AND PROVENANCE OF SALINITY IN THE AQUIFER SYSTEMS OF YUNCHENG BASIN, NORTHERN CHINA

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A combination of environmental isotopes and chemical compositions of groundwater was used to characterize the recharge history and improve the current knowledge of groundwater salinization in arid/semi-arid regions. Field investigations were conducted in Yuncheng Basin, northern China, where extensive pumping occurred for agriculture and domestic supply. Groundwater from shallow and deep aquifers was characterized by distinctive stable isotopes and ^{14}C activities. Shallow groundwater had ^{14}C activities (up to 87 pmC) and $\delta^{18}O$, δ^2H values, similar to those in rainfall sample. This gave evidence that groundwater recharge was going on. However, depleted stable isotope compositions in the deep aquifer, together with the very low ^{14}C (< 20 pmC) indicated recharge during the late Pleistocene period (~10 to 16 ka B.P.). Approximately 60% of the samples from the shallow and 35% of the samples from the deep aquifers had TDS above 1 g/L. This suggested a large-scale groundwater deterioration in this study area. Results of stable isotopes, ionic ratio, and saturation indices illustrated that the major geochemical processes responsible for groundwater salinization included dissolution of evaporates, cation exchange and evapotranspiration. Leakage from the salt lake was a local process only affecting shallow groundwater in the northern shore of the lake. As indicated by the Cl/Br ratios, $\delta^{18}O$ values and calculation from Gordon-Craig model, intrusion of an evaporated palaeo-saline water was a noteworthy factor in the formation of deep groundwater. Using a Rayleigh distillation model, we found that the groundwater chemistry in the deep aquifer was also modified by sulfate reduction.

SECTION: MINERAL AND HYDROMINERAL HEALING RESOURCES. HISTORICAL AND MODERN ASPECTS OF THEIR USE IN MEDICAL PRACTICE (MHHR)

MHHR-01

HYDROCHEMICAL AND HEALTH EVALUTION OF THE THERMAL AND MINERALIZED WATERS IN GAZLIGÖL (AFYON)

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Since the early ages, hot and mineral water resources have been used by many people to heal many diseases. Paleozoic and Senozoic aged rocks are located in the study area. The Paleozoic aged metamorphic schists cover large are and include quartzites in some places. Neogene aged sediments are unconformably over line by the Paleozoic aged metamorphic schists. Waters can be seen around Gazlıgöl. They are located along NE-SW, N-S directed normal faults. Tempratures of the springs and drill wells are in between 32-74 ^oC and discharge rates are 0,1-28 l/s and total mineralization (TDS) 3500-4000mg/l respectively. Thermal and mineralized springs have gas bubbles. As a result of the analyzes it was understood that there was no H_2S, so it should be CO_2. Gazlıgöl thermal and mineralized waters are Na-HCO_3type hot and mineral waters. According to Association of international Hydrogeologists, thermal waters can be classified as sodium-bicarbonate rich hot water. The dominant ions in the water are Na + K and HCO_3. The waters are saturated with bicarbonate. B, Mn and Fe values in hot and mineral waters exceed the limit value.

Gazlıgöl hot and mineral waters are used for health and treatment purposes. The Gazlıgöl spa is effective on the especially romatismal, gynecological and abdominal diseases. The Gazlıgöl spa has the capacity of 2000 bath/person/day. More over because of the water mineralization is high TDS value, it is very important for thermal tourism.

Balneology uses thermal waters at 38-42^0C temperature can be used for therapeutic purposes. Thermal water containing high level of dissolved carbondioxide, TDS and sulphur values are used in the treatment of skin diseases.

MHHR-02

ARSENIC BIOGEOCHEMISTRY IN HOT SPRINGS IN TENGCHONG GEOTHERMAL AREA, CHINA

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Arsenic (As) is a ubiquitous toxicant and carcinogen in natural environmentals. High concentrations of arsenic were generally found in geothermal systems. Natural discharge of geothermal fluids with high As posed potential environmental risks. Microorganisms play important roles in arsenic transformation and mobilization in geothermal fluids. However, microbially-mediated As environmental geochemistry in geothermal system has yet to be fully understood. Hot springs provide unique environments for the evolution and establishment of microbial communities and their response to various biogeochemical and metabolic processes involving hydrogen (H_2), sulfur (S), iron (Fe) and arsenic (As). In this study, arsenic environmental geochemistry mediated by microorganisms in Tengchong geothermal area of Yunnan, China, was studied with an integrated approaches including geochemistry, 16S rRNA gene Illumina MiSeq sequencing, functional gene clone libraries, Q-PCR, enrichments and isolates cultures.

In the pool of Zhenzhuquan, the remarkably high ratios of $As(V)/As_{Tot}$ (0.73-0.86) suggested that As(III) oxidation occurred at the discharge source, which were distinctly different with previous studies that As(III) was predominate in the source water of those acid sulfate-Cl hot springs. Compared to previous acid sulfate-Cl hot springs with sulfide concentrations of 2.02-12.6 mg/L, the distinctly low concentrations of sulfide (0.03-0.05 mg/L) in the pool provided a prerequisite for microbial As(III) oxidation. Clone libraries of *aioA* gene demonstrated the presence of several groups of As(III)-oxidizing microorganisms in the pool, including a few unidentified families of *Aquificae* and some postulated archaea. Furthermore, based on high 16S sequences similarity with As(III) oxidizing bacteria from geothermal and other environments, *Pseudomonas* and *Ralstonia* inhabiting the pool might be also related to As oxidation. Coupled

with iron and sulfur oxidation along the outflow channel, arsenic was substantially accumulated in downstream sediments, with As concentrations up to 16.44 g/kg and As/Fe mole ratios up to 6.72. These were significantly higher that those in previous acid sulfate-Cl hot springs (As/Fe mole ratios: 0.60 to 0.74). Previous studies documented the clay minerals in geothermal area, such as smectite and kaolinite, could host As concentrations up to 4 g/kg. Coincidentally, smectite and kaolinite were also detected in the downstream sediments of Zhenzhuquan by X-ray diffraction, which suggested that As in downstream sediments might be also adsorbed on the clay minerals, except for common iron minerals.

As_{Sum} concentrations significantly increased from 5.45 to 13.86 μmol/L along Zimeiquan outflow channel. Besides, elevated As(III) from 0 m to 4 m and subsequent decreased with a corresponding increased in As(V) from oxidation after 4m, strongly suggested that the thioarsenate at this site was first converted to As(III) and then oxidized to As(V) after the thioarsenate disappears, as has been observed in previous studies (Planer-Friedrich et al. 2009). The reduced sulfur generated from thioarsenate transformation was oxidized to sulfate as DO increased after 4 m, which led to the increase of S_{sum} from 4m to 12m. Based on the As equilibrium observed in three downstream sampling sites and the detection of thioarsenate in the pools, we calculated that thioarsenate concentrations in the Zimeiquan pools should be 5.5-8.4 μmol/L, and accounted for 39.9-60.7% of the total As. The predominant *Thermocrinis* in upstream samples was probably responsible for transforming the thioarsenate to As(III), as has been demonstrated in previous studies. In contrast, the As(III) oxidation observed downstream might be attributed to the significant appearance of *Thermus* and *Hydrogenobacter*, which are well-known As(III)-oxidizing bacteria inhibiting geothermal environments.

The arsenic oxidization gene *aioA* abundance ranged from 1.63×10^1 to 7.08×10^3 per ng of DNA, with an average of 1.52×10^3 copies /ng DNA. Based on qPCR estimates of bacterial and archaeal 16S rRNA gene abundance, *aioA* harboring organisms comprise as much as ~15% of the total community. Phylogenetically, the major *aioA* sequences in the acidic hot springs (pH 3.3-4.4) are affiliated with *Aquificales* and *Rhizobiales*, while those in neutral or alkaline springs (pH 6.6-9.1) are inferred to be primarily bacteria related to *Thermales* and *Burkholderiales*.

Two As(III)-oxidizing bacteria TCZ10 and TCC9-4 were isolated from two hot springs in Tengchong geothermal area. The strain TCC9-4 is a facultative chemolithoautotrophic bacterium, and could grow with As(III) as an energy source, CO_2-HCO_3^- as a carbon source and oxygen as the electron acceptor in a minimal salts medium. Under chemolithoautotrophic condition, 1.33 mM As(III) could be oxidized by the strain TCC9-4 in 36 hours. Temperature is an important environmental factor that strongly influenced As(III) oxidation rate and As(III) oxidase (Aio) activity. The highest As(III) oxidation rate (37.11 μM/hour) and Aio activity (0.037 U/mg) are found at the temperature of 40°C. Addition of 0.01 % yeast extract enhance the growth significantly, but delaye the As(III) oxidation. The strain TCZ10 is a heterotrophic bacterium, with temperature and pH optimum in growth being 68°C and 8.2. It can completely oxidize 2.5 mM As(III) and 5 mM As(III) in 36 h and 72 h at 68°C respectively, with an averaged As(III) oxidation rate of 76.35 μM/hour (5.72 mg/L/hour). On the basis of 16S rDNA gene sequence analysis, strains TCC9-4 and TCZ10 are identified as the genera *Anoxybacillus* and *Geobacillus* in the phylum *Firmicutes* respectively.

MHHR-03

THERAPEUTIC MINERAL WATERS OF THE REPUBLIC OF TATARSTAN. SETTLEMENT AND SPREAD PATTERNS, PROBLEMS OF THEIR USE

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The medicinal mineral water of the Republic of Tatarstan (RT), until recently, have been underexplored yet. Meanwhile, geographical location, economic, geological and hydrogeological conditions of RT provide a basis to the extension of works on prospecting, exploration and exploitation of groundwater as a curative mineral with the prospect of sanatorium and health resort construction.

By results of geological and hydrogeological studies in the subsoil of the Republic of Tatarstan it is possible to allocate 3 groups of mineral waters: the mineral waters without specific components and properties. They are associated with rocks of the upper part of geological section, have mineralization up to 4-5 g/dm^3 and more and used as drinking medicinal-table, sometimes medicinal water; the hydrogen sulphide mineral water with different concentration of hydrogen sulphide; bromine and iodine-bromine chloride sodium and calcium-sodium brines. They are frequent in the rocks below depths of 300-500 m, have mineralization of more than 150 g/dm^3 and used in the form of spa baths after dilution with fresh water.

There are 45 sanatoriums and resorts on the territory of the Republic of Tatarstan today. Historically the development of these resorts is gone with the use of these groups of waters.

21 deposits of mineral waters were explored to date. Total reserves of water amount to 3,317 thousand m^3/day. Almost all of these deposits are located in areas of large cities – Kazan, Naberezhnye Chelny, Yelabuga, Nizhnekamsk, Almetyevsk, Leninogorsk, where are large enterprises that can take on its balance sheet the development of these deposits. Today the task of involvement in the development of fields located far away from large settlements, which required significant capital investments.

A shining example of the use of private investment was the finding of Tarkhanskoe and Lukmanovskoe deposits of mineral waters in Tetyushskii district of RT. Conducted in 2011-2012 by order of the "Volga water and Co" LLC geological and hydrogeological studies allowed to identify a number of waters, which are specific not only for the regions of the Middle Volga, but for the regions of the Caucasus. Three aquifer system which confided to the Jurassic and upper Permian sediments were tested. The Jurassic sediments water are similar to "Kislovodskii" type and "Undorovskii" type and the upper Permian deposits underground water are similar to "Cheboksary" type of mineral waters, which was confirmed by the balneological conclusions. Another type of mineral water is an analogue of the "Achalukskii" type, which was produced on Lukanovskoe deposit. The main factor of formation of mineralization and chemical composition of these types of groundwater are rocks, first of all, their mineral composition and petrochemical peculiarities.

At the present time with the means of "Volga water and Co" LLC on the deposit area a factory for bottled water filling was built. The water is sold retail.

The findings of Tarkhanskoe mineral water deposit allows for begin construction of the sanatorium and health resort complex and gives additional impuls to the development of the tourism industry in the ancient cities of Tatarstan as a Tetyushi and Bolgar.

MHHR-04

THE USE OF MINERALS IN ARAB-ISLAMIC MEDIEVAL MEDICINE: EXAMPLES FROM "THE CANON OF MEDICINE" BY IBN SINA (11TH CENTURY)

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Medical benefits have constituted one of the characteristics, adopted by Muslim scholars in the definition of minerals and their identification, as it is clearly seen in the majority of books that have studied minerals, and in many books on medicine and pharmacy, which focused on an inventory of single and compound drugs and described their compounds Properties.

In this paper, I limited myself to some extracts from a well-regarded medical source in the west: "The Canon of Medicine" by Ibn Sina (Avicenna: a very famous Muslim physician from the 11th century), and I have highlighted three important aspects of mineral uses in Arab-Islamic medieval medecine:

1. A great diversity of metals used in the synthesis of drugs as: copper, sulfate, copper sulfate, zinc sulfate, burned copper, slag silver, borax, vitriol, alum, pharaonic glass, coral, pearl, chalk, amber, halite, anhydrite, asphalts, mercury, seashell, cinnabar, lead, burned lead, lead filings, copper scrap, ceruse, litharge, calamine, azurite;
2. A large spectrum of medical specialties that use these medications as: ophthalmology, Internal diseases, urinary medicine and kidney diseases, skin diseases, ear diseases, cosmetic medicine, as well as the treatment of cancers, poisons, headache, sciatica, gout and arthritis pain;
3. And a multiplicity of medication forms prescribed: ointments, creams, bandages, snuffs, tablets or capsules, drops, powders, eyeliners, suppository and injections.

As metals health benefits and concerns form the two parts of medical geology, which represent an emergent and promising field of Earth Sciences in recent times. I stressed from "The canon of medecine" that Ibn Sina was not only interested by health benefits of minerals; but he was also aware of health problems that they can cause.

MHHR-05

NEW TRENDS IN PELOTHERAPY

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Conceptually the therapeutic interest for one type of *healing mud* called *natural peloid*, defined as a *primay peloid* or *virgin peloid* naturally maturated and applied at or nearby the natural site of occurrence, is mostly based on empirical evidences; otherwise the therapeutic interest for *peloid s.s* (*stricto sensu*), also called just *peloid*, an healing mud or muddy suspension that is artificialized through manipulation (refining and beneficiation) and maturation in an artificial environment and appropriate conditions, is based on scientific evidences and applied under medical prescription and surveillance inside *spas* or other health care facilities (Gomes et al., 2013).

These days due to environmental and sanitary reasons herewith identified m*ud therapy* based on the use of *natural peloid* is progressively losing interest in favour of *peloid therapy* or *pelotherapy* based on *peloid s.s* particularly on those called *designed and engineered peloids* (Gomes et al., 2015). *Designed and engineered peloids* easily can be manufactured using, for instance, specific mixtures of one almost monomineralic and commercial clay (e.g., kaolin or bentonite), preferably of pharmaceutical grade, with one specific mineral water (e.g., sea water and salt lake water) or natural mineral water (e.g., spring thermal water), that after undergoing manipulation and maturation could be beneficiated (for instance through the incorporation of *healing functionally active additives*, either natural or synthetic, characterized by analgesic, anti-inflammatory, anti-oxidation, anti-cellulite, anti-psoriasis, anti-acne,…properties). Due to their simple composition and controlled processing and evaluation *designed and engineered peloids* of both medical and cosmetic typologies easily can be periodically submitted to both chemical composition control (identification and quantification of potentially toxic elements or compounds) and sanitary safety control (identification and quantification of pathogenic micro-organisms). *Designed and engineered peloid* is a particular type of *secondary peloid* that can be produced inside specialized manufacture units in order to comply with therapeutic and cosmetic anticipated goals and functions, as well as with sanitary safety requirements. Some aspects and procedures found to be relevant in the preparation of *designed and engineered peloids* and some examples of their application will be disclosed and discussed.

MHHR-06

RESIDUAL SMECTITIC CLAYS FROM SANTIAGO (CAPE VERDE): ASSESSMENT OF THEIR PROPERTIES AS HEALING AND GEOPHAGIC MATERIALS

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Samples from residual clays from Santa Cruz/Pedra Badejo, on the eastern part of the island, were submitted to chemical, mineralogical and technological characterizations, with particular emphasis on those allowing the assessment of the potentialities but also the risks for application as healing clays and as geophagic materials. Local populations use, since long time ago, these clays for traditional topical and gastric treatments, without any type of scientific or technical control. The studied deposits correspond to small outcrops developed over older volcanic formations. Several analyses were carried out: grain size distribution (wet sewing and sedigraph), mineralogical composition (X-ray diffraction), geochemical (major and minor elements) analyses (X-ray fluorescence), abrasiveness, plasticity (consistency limits), cation exchange capacity and exchangeable cations, specific surface area, expandability, oil absorption and cooling rate. All the analyses had been carried in accordance with the protocols and norms followed in the Departments of Geosciences of the University of Aveiro and in the Pharmacy College of the University of Porto. The results obtained so far point to very fine materials (100% <63 μm), almost smectite pure (no quartz at all) and presenting a chemical composition compatible with the desired applications. The same can be concluded from almost all of the technological tests, showing high values for the cation exchange capacity, plasticity, specific surface area and oil absortion, and low values for abrasiveness and cooling rate. SEM/EDAX analyses were also carried out to specify the smectites, revealing dioctahedral and trioctahedral Fe rich smectites, typical of weathering of volcanic rocks.

MHHR-07

HYDROTHERMAL IN SITU MATURATION OF CLAYEY GEOMATERIALS (AZORES, PORTUGAL): ASSESSMENT OF THEIR PROPERTIES FOR PELOTHERAPY

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Caldeiras da Ribeira Grande fumarolic field includes a particular case of maturation *in situ* where sediments and mineral waters added with pluvial waters are constantly mixed in a very large pool. The peloids extracted from this boiling-mud pool are being used in a local thermal center, which exists since 1811, especially for the relief of pain associated with rheumatic diseases and for skin disorders treatment. This work aims the mineralogical and geochemical characterization of the peloids from the pool and, secondly, the establishment of a diagenetic mineralogical evolution. 11 sampling sites (inside the pool); Segmentation performed on samples that show clear visual heterogeneities; Measurement of temperature and pH in situ; Mineralogical analysis (by X-ray Diffraction – XRD); Geochemical characterization (using X-ray Fluorescence – XRF); Granulometric analysis (by wet sieving and X-ray grain size analyzer). Sampling sites are highly "diluted" and continuously affected by thermal gases originated by the geothermal systems. Temperature values were above 36ºC for the majority of samples; pH ranged between 3.5 and 5.7. XRF analysis reveals a high content on Si and Al; S is present, in most of the cases, with concentrations above 4%. Samples are quite homogeneous, with Sr, Mn, Y, Ba, Nd, La, Nb, Ce and Zr as the more representative elements (>100ppm). Mineralogical and granulometric data suggest the existence of vertical stratification on the Caldeiras da Ribeira Grande pool sediments. The uppermost layer of sampling sites present higher amount of particles with equivalent spherical diameter <63μm. This fact was also recorded mineralogically with a high content on phylossilicates on the top of sampling site column. Mineralogical associated phases are composed by primary minerals, sulphates and some iron oxides. Clay mineral phase is represented by kaolinite type. Chemical, granulometric and mineralogical results point out to an authigenic formation of phylossilicates based on trachytic rocks as outcome of the maturation process.

MHHR-08

STUDY OF HISTORICAL AND CONTEMPORARY ASPECTS FOR MEDICAL USE OF TALAYA HEALTH RESORT WATER RESOURCES IN RUSSIAN CULTURAL EDUCATIONAL FOUNDATION NAMED AFTER V.A. TSAREGRADSKY

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Introduction. Russian Cultural Educational Foundation named after V.A. Tsaregradsky (RKOF, managed by Zh.D. Kulchunova) is named after Valentin Aleksandrovich Tsaregradsky, a distinguished Russian scientist, geologist, explorer of the North-East of Russia, Soviet statesman, Hero of Socialist Labor, Laureate of the State Prize, Honorary Prospector, and a native of Samara Oblast (1902 – 1990). Tsaregradsky devoted a large part of his life from 1928 to 1954 to exploration of natural resources of Kolyma and Magadan regions, as well as to the construction and subsequent development of Talaya, a large health resort. This is an important historical aspect of the large-scale medical use of Talaya Health Resort water resources.

Purpose of the study. To study the contribution of pioneer geologists in the North-East of Russia to the geomedicine and to the development of Talaya Health Resort

Study materials. According to the literature, in December, 1928, an exploration party led by V.A. Tsaregradsky marked on the Soviet Union map the exact position of hot mineral spring at Talaya river, contributing to the further development of the area. By the middle of 1930s, Tsaregradsky and his colleagues completed a chemical analysis of the mineral water; Bathing Pavillion with a 35-room workers' dormitory was put into use. In spring of 1939, the Joint Commission of Dalstroy decided to start construction of Goryachie Klyuchi Health Resort. Geological survey of the land plot was carried out under the guidance of V.A. Tsaregradsky. In 1940, the first sample of water from the Talaya river was sent for analysis to the State Central Institute of Spa Medicine (GTsIK). In 1947-1949, curative natural factors of the future resort were investigated with assistance of GTsIK specialists. Composition and properties of Talaya water and therapeutic muds of Shchuchye and Nalimnoe lakes were studied in greater detail. At the end of the 1940s, a new balneary with 10 cabins and 6 mud therapy beds was built next to 155-room dormitories of the health resort. In 1949, Goryachie Klyuchi was renamed to Talaya Health Resort. Nowadays, it is a large health resort included into multiple lists of the most unique resorts in the world and specializing in treatment of a wide range of diseases. At the moment, scientists from Russian leading universities and international academies collaborate with V.A. Tsaregradsky RKOF. They apply the results of exploration to the development of innovative medical technologies which being used in practical medicine will result in significant conservation of natural resources combined with high efficiency of treatment of various diseases and creation of small scale health resorts in Siberia and Far North of Russia.

Conclusions. The results of the conducted studies show the important historical role of V.A. Tsaregradsky and pioneer geologists of the North-East of Russia in scientific research and medical use of Talaya Health Resort water and mineral resources, they form the basis of modern innovative research in geomedicine.

MHHR-09

CHEMICAL COMPOSITION AND SUITABILITY OF SOME TURKISH THERMAL MUDS USED AS PELOIDS

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Thermal muds have been using in many spas for different kinds of health diseases e.g. neuralgia, neuritis, polyneuritis, fractures, dislocations, etc. and cosmetic purposes since ancient times in Turkey. People use muds in different forms such as mud baths, masks and cataplasms to treat nearly all types of rheumatism as well as to cleanse and beautify of the skin. Peloid samples were taken from 19 spas, most of them well-known, in different parts of Turkey. So far, there is no standard about the chemical composition of peloids of the suitability to therapy and/or causing health risk. Mineralogical and chemical composition and their possible toxicity of the peloids were investigated and compared with some commercial, pharmaceutical, and natural clays to interpret that they have any health risk or not and potentials applications for peliotherapeutic treatments, and to make recommendations of suitability of Turkish peloids.

The studied peloids are classified as neutral to slightly alkaline, with high electrical connectivity value have high chlorine content and regarded as high conductive. Temperature of the peloids varies from 23.2 to 61 oC. The mineralogical and geochemical composition of the peloid samples were determined using X-ray diffraction and chemical analysis. Mineralogical composition is composed mainly of smectite, illite, illite-smectite, partially quartz, and feldspar, some calcite, dolomite, amorphous silica, and rarely kaolinite, halite, serpentine, and gypsum. Clay mineral content and types of samples vary and the most abundant clay mineral is Ca-montmorillonite. The major and trace element contents of the peloids are partially similar while toxic element content vary considerably. Major and trace element contents of the studied peloids are higher or lower than the commercial herbalist clay (CHC), pharmaceutical clay (PC), natural clay (NC), average clay (AV), and Canadian natural health products guide (NHPG). The toxicity of some elements (As, Cd, Co, Pb, and Sb) were compared especially pharmaceutical clay and evaluated together with other parameters. Though, the toxic elements are higher than PC in most of peloids, since these peloids have not been using for pharmacological purposes, therefore they will not be caused a risk in therapy.

Key words: Chemistry, peloid, therapy, toxicity, Turkey.

SECTION: MODERN TECHNIQUES FOR INVESTIGATION AND MONITORING OF ENVIRONMENT CONDITION AND HUMAN HEALTH (MT)

MT-01

APPLICATION OF SOLID STATE NMR AT MINERAL/WATER INTERFACE: A MOLECULAR LEVEL INVESTIGATION OF FLUORIDE REMOVAL BY NANO-SIZED HYDROXYAPATITE

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Elevated levels of fluoride (F^-) in groundwaters of granitic and basaltic terrains is a worldwide environmental problem, which affects millions of people. Hydroxyapatite (Hap) has been shown to be a strong sorbent for F−; however, the molecular level mechanisms have not been clearly addressed, owning to the lack of spectroscopic analysis. Here we provide a novel ^{19}F solid state NMR method to investigate the F uptake mechanisms by synthetic nano-sized HA. Our experiments showed that fluoride uptake mechanisms depends on pH concentration dependent. At pH 7 and fluoride concentration less than 50 mM, observation of a single ^{19}F solid state NMR peak at -103 ppm, which could be assigned to fluoapatite ($Ca_{10}(PO_4)_6F_2$), suggested that fluoride substituted the tunnel hydroxyl group in the Hap structure. At higher fluride concentration (e.g. 100 mM), two ^{19}F NMR peaks were observed at -103 and -108 ppm. This suggests the formation CaF_2 precipitates (δ (19_F) = -108 ppm). Analysis with TEM and XRD further confirmed this finding, and indicates it is crystalized. Interestingly, we found that a much lower fluoride concentration (e.g. 10 mM) would induce the formation at CaF_2 precipitates. In contrast, at pH 10, CaF_2 precipitates did not form even at fluoride concentration up to 500 mM. This is attributed to the pH-dependent stability of Hap. The substitution mechanism at certain pH and fluoride concentration clearly interpreted the re-generation mechanism of Hap for defluorination, and demonstrate that Hap is an ideal material for high-fluoride groundwater remediation.

MT-02

HARDWARE AND SOFTWARE FOR SEISMIC RADON STATION SRS-05

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One of the types of natural radioactivity is a heavy inert radioactive gas radon, which is colorless, odorless, soluble in water [1]. Radon sources are connected with uranium deposits, granite massifs and tectonic zones. Isotopes of radon actinon, radon, thoron are formed by radioactive transformations of radium and give yourself new decay chains. The risk of human exposure from radon and its decay daughter products according to the UN is 43% [2], which makes monitoring of radon actual in different environments.

Seismic radon station CRS-05 is designed for monitoring radon, thoron and other parameters of the subsoil air and air of indoors. [3] SRS-05 station bured into the subsoil can be accumulate the data of measurements in the internal memory for a long time and transfer them to a computer connected to station in time intervals free from measurements.

The goal of hardware and software complex is the expansion of communications capabilities of station such as the remote control and the transfer of measurement data. These functions are implemented through a mini computer and communications devices, providing access to the Internet network and data transmission to separate users and to server.

SRS-05 station measures the volumetric activity of radon and thoron, pressure, temperature, humidity, battery voltage, which feed the station. Battery voltage for work of the station is 10.6-13.2 V. Due to the low consumption: in measurement mode current is 500 mA, in standby mode – 100 mA, the station can operate without recharging the battery for a few weeks.

Minicomputer running under the Linux operating system. The core modules of the program are written in the Python programming language. Additional helper scripts are written in bash. The software of the complex works in three modes: obtaining data from the station without spectrum, receiving data from the station with spectrum and remote management station. For running a communications program to the station, data backup procedure and them transfer to ftp-server the apropriative scripts in a programming language and bash Linux shell had been developed. Planning and establishment of scripts launch schedule is set using a standard system utility crontab, which is a part of dynamic task scheduler included in the number of standard Unix operating system and means class of systems that is used to run jobs at a specific time.

At the end of the day the received data are archived and via the Internet is transmitted to ftp-server of the data acquisition. Internet Connection was performed using a cable system, wireless Wi-Fi net and GSM networks.

The complex is a self-contained device, does not affect the station measurement mode, allows to receive and process the data, conduct diagnostics and make decisions. Hardware and software complex was tested in basements of houses in Pitkaranta and Petrozavodsk and villages Sheltozero and Princes during 2016 year. Data of measuring of SRS-05 were successfully passed to the server of the Institute of Geology of Karelian Research Centre of Russian Academy of Sciences in Petrozavodsk.

Clay and mud, produced by rock transformation, have long been used as curable substances which have adsorptive, warming and anti-inflammatory properties. Clay, which is part of ointments, masks and nutritive additives, is used to neutralize toxins in dermal and gynecologic diseases and the malfunction of the locomotor apparatus. The mineral and organic constituents of mud deposits have a profound influence on the human organism. Their analgetic and warming effect help resist inflammatory processes of varied origin.

The mineral compositions and physico-chemical properties of curable muds and clays were analyzed and compared, using samples from some well-known deposits. Mud samples from the Dead Sea (Israel), Lake Tambukan (Northern Caucasus) and Lake Gabozero (Karelia), clays from Borovichi (Novgorod Region), Nikolskoye (Leningrad Region), Ladvinskoye (Karelia) and Tsarevichi (Karelia) and kaolin (Ukraine) deposits and cosmetic products were used in our experiments.

The substance was studied using scanning electron microscopy (Vega Texscan microprobe), X-ray phase analysis (ARLXTRA diffractometer), combined scattering spectroscopy (Nicolet Almega XP Dispersive Raman spectrometer), IR spectroscopy (Specord M 80 spectrophotometer) methods and methods for the study of thermophysical characteristics were employed.

Our study has shown that:

1. There are differences in mineral and chemical composition. Mineral microinclusions indicate the genesis of mud and clay deposits.
2. The physico-chemical characteristics provide a quantitative basis for comparing muds and clays by their ability to stay on the skin, to retain heat and to adsorb useful and remove harmful substances.
3. Addition of fine talc-bearing rock fractions to muds and clays improves their heat-accumulating properties.

MT-03

MULTIVARIATE DATA ANALYSIS OF SPECIMENS CONTAINING SILICA FUME

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Silica fume is an abundant waste in the production of silicon metals and ferro-silicon alloys. Although some precautions such as filtration and storage have been taken, it threatens the health of living by contaminating air and water due to its high specific surface area. This fact leads to some serious medical problems. However this material is very fine-grained as well as has a high amount of amorphous structure resulting in having the opportunity to be used in some areas of the construction industry. For this purpose, alkali activated specimens were produced by using silica fume as binding material.

Multivariate data analysis was undertaken to investigate the correlation between variables in the study and correlation coefficients were determined as -0,980; -0,992; 0,979, respectively, in the case of relationship of porosity, water absorption, unit weight with compressive strength. The results showed that there was a strong negative correlation between compressive strength and water absorption whereas an intense positive correlation can be pronounced between unit weight and compressive strength. Correlation coefficients were statistically significant at 1% level.

MT-04

REMOVAL OF THALLIUM FROM AQUEOUS SOLUTIONS USING FE-MN BINARY OXIDES

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In this study, Fe-Mn binary oxides, which harbor the strong oxidative power of manganese dioxide and the high adsorption capacity of ion oxides, were synthesized for Tl(I) removal using a concurrent chemical oxidation and precipitation method. The adsorption of Tl onto the Fe-Mn adsorbent was fast, effective, and selective, with equilibrium sorption reaching over 95% under a broad operating pH (3 to 12), and high ion strength ions (0.1 to 0.5 mol/L). The adsorption can be well fitted with both Langmuir and Freundlich isotherms, and the kinetics can be well described by the pseudo-second-order model. Fourier transform infrared and X-ray photoelectron spectroscopy (XPS) spectra suggest that surface complexation, oxidation and precipitation were the main mechanisms for the removal of Tl. This study shows that the Fe–Mn binary oxides could be a promising adsorbent for Tl removal.

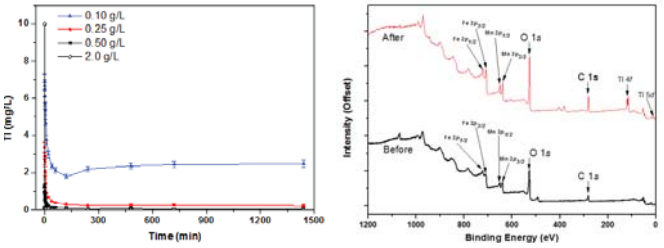

Figure 1. (a) Adsorption kinetics and (b) XPS spectra

MT-05

THE ROLE OF SOIL PROPERTIES ON THE TRANSFORMATION AND FATE OF NANO-ENABLED AGROCHEMICALS IN THE SOIL SYSTEM

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There is an increasing interest on the application of nanotechnology to develop plant protection products aiming sustainable food stocks worldwide. For example, silver nanoparticles (AgNPs) have been exploited as a fungicide or inhibitor of plant pathogens. However there are still major unknowns related to the effect of soil properties on their efficacy during field applications and also on the fate and effects of NPs added to soils.

Following the entry of manufactured nanomaterials (MNMs) in the terrestrial ecosystem, a number of potential transformations may occur depending on the properties of the MNMs and of the receiving medium. These transformations largely involve chemical and physical processes that will control their fate, behaviour, and ecotoxicity in soil as well as availability for sensitive receptors including plants, animals and human health.

In this presentation we discuss the transformation processes, mobility and potential availability for sensitive receptors of metal-based MNMs in agricultural soils in view of MNMs nano-specific properties and in view of observed effects of key soil properties on MNMs' stability in pore water (notably pH, ionic strength, organic matter, and natural inorganic colloids). Key aspects of this discussion are the role of aggregation in the retention of MNMs in the solid matrix, the increased stability of MNMs in soil solution due to binding of molecules from dissolved organic matter (DOM) and the understanding of the effect of DOM in relation to soil chemistry and to surface characteristics of MNMs. We also discuss whether classical theories of colloid stability and transport modelling can grasp the complexity of structural and chemical transformations of MNMs in soils and to fully account for the impact of soil geochemistry.

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MT-06

THE SPATIOTEMPORAL ANALYSIS OF THERMAL COMFORT AND PUBLIC HEALTH IN URBAN CENTERS OF RUSSIA

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It is obvious that environmental factors such as climate influence on public health. For example, health effects can be seen due to climate change days when waves of heat or cold are observed became more frequent. The good option to assess the impact of the climate change on public health is to evaluate the bioclimatic comfort in the cities where the specific microclimate conditions are formed.

The global experience shows more than 100 indexes that have been developed to determine the bioclimatic comfort of human. Three indexes were selected as the most commonly used in the world for the analysis of extreme events: two of them are thermal index – Heat Index and Humidex and one index of cold stress – Wind Chill Temperature. The study includes 115 cities in Russia with population over 100 000 people. For the calculation of the indexes it was used daily meteorological data (2010-2014) of climatological stations located in urban centers.

Technical implementation of the calculation of the indexes is presented in the form of an automated system based on MSVisualFoxPro. It has been created the specialized software module that downloads weather data, verifies and selects the correct values and then calculates and builds up bioclimatic indexes in tabular and graphical form.

The software allows to carry out bioclimatic indexes for each day of the year for each city as well as to display summary information for months with the total amount and proportion of days with a certain gradation indexes. Based on this study it's analyzed the thermal comfort in different cities of Russia. Changes in the frequency of extreme temperature in the daytime and nighttime were examined and conclusions about the possible health effects of the population, including changes in mortality from cardiovascular disease, were made.

MT-07

MICROORGANISMS ISOLATED FROM PERMAFROST AS FACILITIES FOR THE DEVELOPMENT OF NEW DRUGS

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It is shown on the various models that drugs derived from the bacteria isolated from permafrost have reparative and protective properties for the treatment of injuries of the experimental animals.

Earth Cryosphere can be a source of unique biological resources, which include microorganisms. Bacteria isolated from permafrost for a long time preserve their vitality in extreme ambient conditions in a state of suspended animation or hypometabolism. It is known that soil microorganisms capable of synthesizing a very large number of various biologically active substances including antibiotics, cytokinins, gibberellins, hormone-like substances. It is expected that the bacteria from the permafrost can produce specific biologically active substances that can affect the physiological and biochemical parameters of animals.

The results of research. We used strains of bacteria of the genus Bacillus, selected by us from permafrost of Western and Eastern Siberia and identified by sequencing for 16S RNA. The strains were deposited at the RCIM FGUPGosNIIGenetika.

We carried out experiments on the effect of these metabolites: to repair skin wounds of the mice; to repair experimental mechanical erosion of the corneal epithelium of rabbit's eye and on the outcome of closed brain neurotrauma of experimental rats to study the protective and reparative properties of the metabolites, derived from microorganisms. The requirements of the Helsinki Declaration of the World Medical Association, the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (number 123, 1986), as well as the order of the Ministry of Health of the Russian Federation № 267 from 19.06.03 "Rules of good laboratory practice in the Russian Federation" of humane treatment of laboratory animals were observed in all experiments.

When studying the skin wound repair rate in mice under the influence of the metabolites derived from bacteria, wound healing of the mice was 18.2% faster than that under the influence of placebo and of 9.1% faster than under the action of the drug "Solkoseril".

The study of the efficacy of treatment of experimental erosion cornea of an eye of rabbits with a preparation containing metabolites of the bacteria strain Bacillus sp. showed that a full recovery after experimental injury of the cornea occurs in 2,5 times faster than in the treatment of drug "Solkoseril".

It was shown that the complex of strain Bacillus sp metabolites in experimental closed brain neurotrauma has a marked protective effect. Mortality of animals in the experimental group was 10 times lower than in the control and reference groups.

The findings suggest that the development of pharmaceuticals based on metabolites of bacteria strains isolated from permafrost may be perspective.

MT-08

MINERALOGICAL, GEOCHEMICAL AND TECHNOLOGICAL CHARACTERIZATION OF CLAYEY COMMERCIAL COSMETIC PRODUCTS

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Clay minerals are used in cosmetics mainly as adsorbents, opacifyers and viscosity-increasing agents. Few studies were performed to study the technological properties that clays should possess to be included in cosmetic products. Important properties such as specific surface, cation exchange capacity and physical structure enables the adsorption of greases and toxins; abrasivity, cooling kinetics and plasticity are very important to the effectiveness and pleasant sensation of the cosmetic application onto the skin. The present study aims: 1) the physical, chemical and mineralogical characterization of some clayey commercial products available on market; 2) to contribute for the establishment of chemical, physical and mineralogical criteria for clays used in cosmetic products. 20 commercial products were selected, having the following product indications: healing, cleanse, absorbent, refreshing, calming, congestion-reducing, energizing. Several analyses were carried out: grain size distribution (wet sewing and sedigraph), mineralogical composition (X-ray diffraction), geochemical (major and minor elements) analyses (X-ray fluorescence), abrasivity, plasticity, cation exchange capacity and exchangeable cations, specific surface area, expandability, oil absorption and cooling rate. The results obtained so far show that almost all samples have high contents of fine fraction and are mainly siliciclastic (a few carbonated), having kaolinite or illite as main clay minerals, being smectite a minor component; in general, samples present a chemical composition compatible with the desired applications, Ca being the main exchangeable cation, followed by Mg or Na. Regarding technological properties, samples more siliciclastic and richer in clay minerals revealed lower abrasivity, higher expandability and cooling kinetics.

MT-09

PROSPECTS OF APPLICATION OF GEOINFORMATIONAL SYSTEMS FOR VETERINARY GEOLOGY

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Every organism is constantly exposed to biotic and abiotic environmental factors. Geological objects (soil, minerals, water, etc.) and factors play a great role for large group of animal diseases, listed as endemic (endemic osteodystrophy, enzootic ataxia sheep, sheep boric enteritis, white muscle disease and lack of microelements). The causative factors are geochemical and a chemical composition of soil and water of different geochemical zones. These factors affect the development of pathological processes. As a result Veterinary Geology as a new branch of veterinary medicine is being formed.

Veterinary Geology is a branch of Veterinary Medicine, which studies the influence of natural and anthropogenic geological objects and processes on animal health and quality of

animal products, and use of minerals for treatment of animals diseases. Study of the epizootic situation and the role of geological objects and processes in the animal health allow to develop successful preventive and control measures.

One way of application of geoinformational systems (GIS) is assessment of epizootology of endemic non-contagious animal diseases. This is primarily a management technology that allows to use the resources for control of these diseases.

Epizootological GIS allow collection, storage and analysis of epidemiological information with the ability to display it on maps, and reporting on the set parameters. Using GIS for survey of epizootic processes and the geography of animal diseases improves the methodology of epidemiological analysis of the past and the future.

Special GIS can show the existing relationship between the natural and socio-economic conditions, on the one hand, and animal health, on the other hand. Analysis of information about the incidence of diseases within specialized GIS makes possible to visually establish the relationship between the spread of the disease and geological conditions of the area.

In addition, the GIS contribute to environmental monitoring of pollution caused by pollutants of various origin (toxic substances, radionuclides, heavy metals) and an assessment of the environmental safety and stability of the geological environment in urban areas.

Within the International and Russian projects several epizootological databases for dangerous animal's diseases have been created in VIEV. In particular, the unique database of the anthrax cattle cemetery in Russia, which allows to evaluate the epidemiological and environmental contamination risks (Shabeikin, Gulyukin).

SECTION: MEDICAL GEOLOGY, PUBLIC HEALTH AND REGULATORY SCIENCES (MG)

MG-01

HOW TO PROMOTE MEDICAL GEOLOGY IN DEVELOPING COUNTRIES. CHALLENGES, ACHIEVEMENTS AND SUCCESS IN URUGUAY

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Medical Geology is a worldwide growing discipline dealing with the Geosciences and Health sciences. In Uruguay it became a very important approach to environmental health risk assessment, mainly for metals and metalloids exposure. In fact, Medical Geology is a recognized area of Environmental Chemistry and Toxicology at the Faculty of Chemistry from the University of the Republic (UDELAR).and in the Geosciences Area of the Basic Science Development Programs (PEDECIBA). The IMGA chapter leadership integrated geoscientists, chemists, epidemiologists and physicians in the research teams and curricular courses since 2005. The main aspects to take into account for the promotion of Medical Geology in developing countries with Uruguay´s experience, are reviewed in this lecture, in order to help our colleagues to improve the development of this emerging discipline in their own countries.- Continuous education and curricular courses for graduate and undergraduate students have been the main tools to promote and develop Medical Geology in Uruguay since 2003. Using the programs available at the University, we applied for funds to promote the discipline in seminars, short courses and regional congress sessions inviting MedGeo experts and IMGA leaders from foreign countries. Students can apply for funds for their master or PhD studies in Medical Geology in the governmental basic science development programs (PEDECIBA) and the Research and Innovation Agency (ANII). Regular meetings and conferences have been held with students, expert researchers and delegates from health, environment and geology institutions or private companies, in order to work together on projects of interest to the country, by integrating the available resources of each partner. In conclusion, the main challenge to continue developing Medical Geology skills for approaching environmental impacts and health risks programs, is by working together with experts, students and stakeholders in common projects.

MG-02

ENVIRONMENTAL GEOCHEMISTRY AND HUMAN HEALTH: GENERAL AND REGIONAL ASPECTS (IN RUSSIAN FEDERATION AND CRIMEA REGION)

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Present report summarizes the theoretical background and concepts of the methodology used to study the impact of environmental and technogenic geochemical heterogeneity of territories on public health. It also illustrates key findings of territorial monitoring at regional, subregional and local levels in Russian Federation and in the Crimean region. This approach allows to integrate environmental and medical data using key indicators for assessment of the impact of geochemical environment on public health status that is not yet realized in monitoring at different levels.

This methodology enables the use of international ecological standards (critical loads – LRTAP Convention) for early detection of priority environmental pollutants and prevention of problems that would otherwise occur due to specific natural biogeochemical features of territories, resulting in a significant resistance to anthropogenic chemical pollution.

Data collected in large-scale assessments of physiological heterogeneity of population from different biogeochemical regions in Russia and Crimea interpreting morbidity and environment dependent diseases (congenital anomalies, cancer, diseases of digestive, respiratory system, and others|), as well as reporting the functional status of humans from regions with different natural and anthropogenically modified geochemical characteristics.

The following is a brief description of sub-regional and local monitoring studies in Crimea aimed to characterize the content of certain geochemical factors in ecosystem of a given territory, intake of chemicals into the human body and their effects on the functional state of target systems of the organism to disclose the most sensitive ones.

Present methodology is a proven approach to the complex cohort biogeochemical biomonitoring and functional studies aimed to assess the degree to which the endogenous content of geochemical factors in the body determines the functional status of target systems. Such studies are considered to be the most efficient to establish a quantitative relationship between the content of chemical elements or compounds in the environment, levels in the body and the extent of a negative effect. Besides abovementioned regional standards for pollutants must consider natural migration of elements, sustainability of ecosystems as well as presence of anthropogenic sources of pollution. These guidelines should be the basis for the science-based management decisions in regional development.

MG-03

HYDROCARBON SPHERE AND SOME DISEASES ASSOCIATED WITH IT

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Actuality of the problem in the relationship between humans and geological processes. One of the powerful geological processes is the HYDROCARBON degassing of the Earth. The hydrocarbon field is the environment that is intensively mastered by mankind – the search and extraction of oil and gas resources. Hence, it becomes relevant to study both the HC sphere (poorly studied) and its impact on the health of people living and mastering it. Also, in addition, it becomes relevant because the hydrocarbon sphere is manifested in non-traidionic places-in ore deposits, in metamorphic rocks, etc. To study involves a huge amount of material, both literary, and the author's material. The analysis showed that HC sphere presented in a wide variety of phenomena, from the calm, cool, invisible, permanent, constructive to explosive, hot, spectacular, rapid, destructive. Hydrocarbons are manifested in various forms of gas: free, dissolved, adsorbed, occluded, etc. forming hydrocarbon background of crust. This background is manifested from microinclusions and to giant clusters of oil and gas. There are two large oil and gas accumulation zones in the Earth's Crust, which are the most powerful sources of toxic hydrocarbons (methane, ethane, propane, hydrogen sulphide, saturated and unsaturated hydrocarbons, polycyclic aromatic hydrocarbons, etc.), the environment that affects the biosphere. Being easily mobile HCs affect a person where the following diseases are common. In a complex of morbidity the leading place is occupied by diseases of the respiratory system and poisoning. Diseases of the digestive system, infectious diseases, skin and subcutaneous tissue disorders are also common. There are also petrol pneumonia, anemia. A number of other less common diseases-ophthalmic, etc., have also been noted. The prevailing diseases may vary depending on the region and the composition of the hydrocarbons. The carried out analysis will allow to develop preventive measures and preventive maintenance for the population living in places of intensive HC degassing of the Earth!

MG-04

MEDICAL GEOLOGY INVESTIGATION IN INDONESIA

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Indonesia is lying in the meeting place of three tectonic plates in the world, namely the Indo-Australian plate, the Eurasian and Pacific plates. The intersection of the three tectonic plates contributes to the diversity of rocks and minerals. The existence of various rocks and minerals are proven to have a positive impact on national economic growth and development over the years. However, the presence of certain rocks and minerals are believed to have an impact on public health and the environment. Investigation of medical geology in Indonesia carried out by Geology Agency under The Ministry of Energy and Mineral Resources in cooperation with the Ministry of Health since 2012. The investigational has focused on public health problems caused by both natural geological conditions and human activity. Some cases the investigation of which is the water pollution by heavy metals as a result of gold mining activities in Pasaman District. Other cases is the disruption of community dental health in Situbondo from consuming acidic water that comes from vulkanisme activity. Until now there has been a few investigation results due to the difficulty of obtaining data on disorders of the anatomy inside the body as well as verification correlation between the disturbance and the source of the impact. This constraints caused by weak of knowledge, skills and equipment. Therefore Geological Agency determined to carry out cooperation with foreign institutions that have had experience in the field of medical geology. This cooperation is necessary to accelerate obtaining investigation results which can be used as a basis for policy making in the field of public health and mineral extraction.

MG-05

DEVELOPMENT AND MANAGEMENT OF INTEGRATED MINERAL RESOURCE POLICY FOR ENVIRONMENTAL SUSTAINABILITY: THE MINDANAO EXPERIENCE, THE PHILIPPINES

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This paper would report the environmental challenges faced by stakeholders in the development and management of mineral resources in Mindanao mining region of the Philippines. The paper would proffer solutions via the development and management of integrated mineral resource framework. This is by interfacing the views of government, operating mining companies and the mining host communities. The project methods involved desktop review of existing local, regional, national environmental and mining legislations. This was followed up with visits to mining sites and discussions held with stakeholders in the mineral sector. The findings from a 2-year investigation would reveal lack of Information, Education, and Communication Campaign by stakeholders on environmental, health, political, and social issues in the mining industry. Small scale miners lack the professional muscles for a balance shift of emphasis to sustainable and responsible mining to avoid environmental degradation. Therefore, there is need to balance ecological requirements, sustainability of the environment and development of mineral resources. This paper would provide an environmentally friendly mineral resource development framework.

MG-06

EXPLORATORY STUDY BETWEEN RENAL AND GENOTOXIC DAMAGE IN COSTA RICAN CHILDREN WITH RESPECT TO GEOGRAPHIC LOCATION IN THE MESOAMERICAN NEPHROPATHY

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Few places in the world have Chronic Kidney Disease of unknown etiology: Central America, Sri Lanka, Egypt and India. In Central America and the southern part of Mexico, this disease receives a differential name called Mesoamerican Nephropathy and it has been considered one of the most important problems of public health in recent years, and more than 16,000 people have died in Central America between 2005 and 2009 according to the World Health Organization. It was investigated the worst scenario of toxicological risk of Mesoamerican Nephropathy in Costa Rica based on environmental factors related to sugarcane cultivation, such as: amount of hectares of sugar cane cultivated, hectares of sugar cane burned, environmental temperature, height of area, arsenic present in the area, social development index, relative humidity with respect to the rate of Mesoamerican Nephropathy per cantons in Costa Rica reported by Social Security Program, which through a Poisson's Multivariate Regression Model, establishes the relationship between the variables with respect to the rate of renal disease per cantons in Costa Rica; in addition by means of the Simplex Method an equation was established that allowed to determine the influence of each variable, establishing the zones statistically significant for the environmental sampling. Two cantons were determined for the sampling and also one canton as control population. The populations were compared with genotoxic assays and clinical trials such as: Single Cell Gel Electrophoresis and clinical chemistry tests of renal compromise: Cystatin C and Creatinine, with significant differences between populations studied.

MG-07

OPEN-CUT MINING: ITS DEVASTATING SOCIO-ENVIRONMENTAL EFFECTS ON COMUNITARY HEALTH

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The search for natural resources by multinational corporations has led to a growing intensity in the exploitation of indigenous peoples, whose lands are confiscated using deceptive practices employed in deals made between rich countries on behalf of the corporations' insatiable interests, part of an as-yet unstoppable process of neo-colonialism.

Open-cut mining transforms the geographical space where it is practiced, with its associated roads, bridges and other major works presented as progress, while the real socio-environmental devastation resulting from the extraction of minerals for export is understated or ignored.

The Health Promotion degree, founded by UACM in 2002 and Medical Geology founded in 2004 by the International Union of Geological Sciences, both under development, complement one another in analyzing the complex issues surrounding the extreme environmental pollution caused by the extensive use of 54 open-cut mines, and its effects on community health, throughout the nearly two thirds of Mexican territory that has been opened to mining this century, mainly to Canadian companies.

Prior to 1990, there were only 10 open-cut mines, but since that year the number has risen to 54, of which 29 mine gold, 6 silver, 8 copper and 11 iron. Foremost among them are the Peñasquito mine in Zacatecas, Cananea in Sonora and Los Filos in Guerrero.

Those most affected are workers in the mines, followed by the surrounding communities and their water supply, soil and atmosphere, leading to broad-ranging affects that touch all of society. However, few systematic studies have been carried out, due in part to the fact that Mexico's schools of medicine, with the exception of UANL, do not teach toxicology.

The effects on miners' health are widely known to be diseases typically caused by high-risk activities, such as bronchopulmonary diseases caused by breathing in mineral dust, diseases of the respiratory tract due to inhalation of gases and mineral and organic chemical vapors, skin diseases caused by allergic reaction to a range of chemical substances, various levels of poisoning and subsequent neurotoxic effects, muscle fatigue and neuropathy, as well as a range of cancers, depending on the kinds of minerals being exploited.

It can be stated that not one mine has met the requirement for providing a closure and environmental remediation plan to be put in place following the end of the mine's operations, meaning that when accidents occur, any environmental cleaning process is either superficial or non-existent.

There is a list of close to 250 diseases caused by mines, to which the metallurgic processes used, such as sodium cyanide in gold separation, must be added.

In conclusion, the changes brought about by open-cut mining have both a direct and an indirect impact on community health, transforming rural life through territorial appropriation that is presented as progress, while farmers and their families are viewed as future migrants, dispossessed of their inherited lands which are left to become the accumulated assets of corporations.

MG-08

EFFECT OF WASTE-DUMP SITES ON THE SUSTAINABILITY OF THE WATER RESOURCE ENVIRONMENT IN GBARAIN-NIGER DELTA CATCHMENT OF NIGERIA

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This paper would report on the effect of solid waste on water resource quality in Gbarain catchment of the Niger Delta Region of Nigeria. Gbarain catchment presently host two waste dump sites located along the flanks of a seasonal flow stream and perennially waterlogged terrain. This anthropogenic activity has significantly affected the quality of water resources in particular groundwater in the catchment. This has made the water resource environment toxic leading to poising of aquatic life. This contamination is via geological processes such as seepage and direct infiltration of contaminants from these landfill sites into water courses. Contaminated water resources could lead to serious environmental and human health challenges such as loss of human organs to low agricultural yields. Based on field and experimental investigations, modeling, and graphical interpretation, the results indicate heavy metal and fecal pollution in some of the ground water with escherichia coli and total coliforms exceeding the international and regional recommended limits of 0 per 100ml of sample. Land use planning, enactment and implementation of environmental laws are necessary in this region, for effective surface water and ground water resource management.

MG-09

WE USE PHOSPHORUS AND OTHER FERTILIZERS. IS IT DANGEROUS?

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Many scientists believe that the planet Earth has entered into a new geological era. Conclusive evidences of significant human impact on the atmosphere, oceans, and wildlife have been published. In particular, the biogeochemical cycles of phosphorus and nitrogen were violated. As the result, the content of P and N in soil and water has increased and rate of freshwater body eutrophication has increased.

P content in the biosphere and its biogeochemical cycle have been declared as one of the planetary boundaries [1]. It means that an uncontrolled release of human-made P compounds into the environment may result in disastrous consequences for humankind. For example, there is evidence for direct positive effects of N and P on bacterial growth and, accordingly, total bacterial biomass is very strongly correlated with concentrations of total phosphorus in freshwater and marine ecosystems. Enhanced nutrient loading alone might also influence the abundance, composition, virulence and survival of pathogens that are already resident in aquatic ecosystems. For example, increased N and P availability enhances the replication rate of aquatic viruses. Biological waste disposal activities such as manure applications to cropland can simultaneously increase the loading of P, N and potentially hazardous coliform bacteria to surface waters [2].

To assess the impact of chemicals on the environment a model has been elaborated. The matrix algebra based approach is used as a tool for modelling and an estimation of chemicals in different environmental media (water, air, soil, biota, etc). For the evaluation of the phosphorus system we used a linear donor-controlled mass balance model.

The results of model application for the estimation of the P content in fresh waters of the Russian Federation regions are presented in Fig. 1. The concentrations were calculated using data on the mean water volumes in the regions.

The calculated results show that P loading is most characteristic of regions located in the European part of the country, which matches the ecological situation related to the eutrophication of water bodies in this territory, as well as some regions of the Siberian and Far Eastern Federal Districts.

This research was supported by the Russian Science Foundation, grant 15-17-30016.

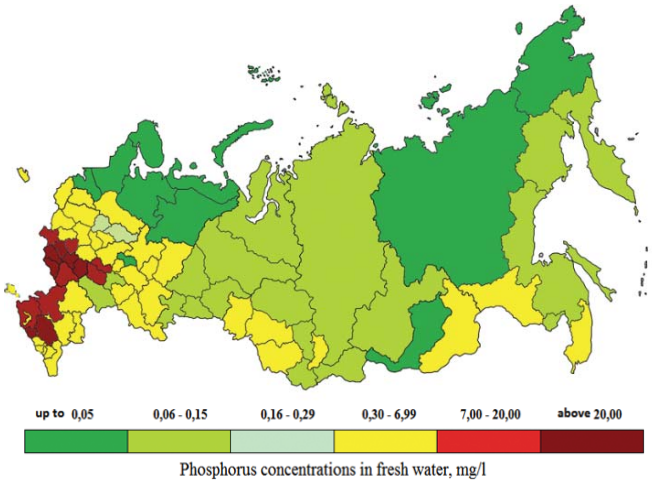

Figure 1. Estimated phosphorus concentrations in fresh water in RF regions, mg/l

REFERENCES:

1. W. Steffen et al. Science Express. 13, 347 (6223) (2015).
2. Val H. Smith, David W. Schindler. Trends in Ecology and Evolution. 24, 4 (201) (2009).

MG-10

MODELING OF REGULARITIES OF GEODYNAMIC AND GEOSOCIAL PROCESSES

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The study of temporal regularities of seismic and volcanic processes within the Pacific Ocean margin, the Alpine-Himalayan belt and the Mid-Atlantic Ridge showed the existence of two period ranges: "short", 60±10 and 120±20 years, and "long" with common period T_0≈250±25 and multiple periods $2T_0$≈450±50, $4T_0$≈1000±100 and $8T_0$≈2000±200 years. The analysis led to the conclusion that seismic and volcanic processes occurring within the three most powerful tectonic belts are manifestations of a single wave geodynamic process. The magnitude of geodynamic event was determined in the usual way – proportional to the logarithm of the dropped elastic energy for earthquakes and proportional to volume of ejected material for volcanic eruptions.

A unified database of the strongest natural disasters and social events that have occurred over the past several thousand years was created. The magnitude of catastrophic events in both cases was determined using logarithmic scale based on socially significant parameters – material damage and human casualties. Research of temporal patterns of events in this database was conducted using spectral and spectral correlation analysis of time series. The study showed that for both sets there are also two groups of periods: "short" 50±10 and 150±20 years, and "long" in the range of 210÷1650 years. In particular, there are periods multiples of geodynamic T_0: 210±20, 500±50 and 1000(850÷1100)±100 years.

As we can see the "structure" of characteristic periods of geodynamic and geosocial processes has common period T_0≈250±50 years.

The parameters that could determine characteristic periods of geodynamic and geosocial processes, could be the following values. The periods: T_E=1 day – Earth's rotation around its axis, T_M=28 days – Moon's rotation around the Earth, T_J=11.8 years – Jupiter's rotation around the Sun responsible for the characteristic period of solar activity. Characteristic geodynamic parameters: V_P=8 km/sec (V_S=6 km/sec) – "fast" speed of seismic waves in the Earth's crust and c_0=10 cm/sec – "slow" speed of rotational waves, R_0≈100 km – the size of the Earth's crust block and R_E=6400 km – the Earth radius. Following min-max periods can be formed of these parameters: $T_{min}=T_JT_Mc_0/R_0$≈30-40 years and $T_{max}=T_JT_EV_S/R_E$≈1500 years. As we can see, these two min-max values cover almost the entire possible range of the most characteristic geodynamic and geosocial periods. Furthermore the "common" period that is characteristic for both processes can be expressed as the geometric mean of two min-max values: $T_0=(T_{min}T_{max})^{1/2}$≈250 years.

Thus, the analysis results showed the existence of common regularities of geodynamic and geosocial processes that allows to model them with common positions in the framework of Aristotle-Leibniz-Mach and Cuvier concepts about the unity of the world around us.

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MG-11

THE CURRENT STATE OF MEDICAL GEOLOGY INVESTIGATIONS IN AZERBAIJAN

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Medical Geology is an ancient and re-emerging field of science that combines elements of earth science and public health. But in Azerbaijan Medical Geology as a science began to evolve relatively recently. Medical geology problems take on special significance due to the rapid growth of industry and human technogenic activity. Being a socially oriented discipline and taking into account the specific geological conditions of Azerbaijan in recent years medical geology take on the strategic importance also for our country.

The main tasks of medical geology in Azerbaijan are zoning of the territory from the position of environmental problems and studying of radiation, geochemical and ecological features of these territories. The results of these studies will help to identify and implement a set of measures for diagnosis, treatment and prevention of diseases.

One of the main problems of Medical geology in Azerbaijan is the radon safety of population. According to the International Committee on Radiation Protection 50-75% from common dose of people's exposure by natural radioactive sources comes from radon. In many countries radon is the second leading cause of lung cancer after smoking. Among the non-smokers it is a major cause of lung cancer.

Indoor radon studies in Azerbaijan were carried out for the first time in 2010-2011. In 2014-2015 the investigation of radon problem in Azerbaijan has been continued in the framework of Azerbaijan State Program (2014-2018). Measurement of radon levels in dwellings, soil, thermal waters and mud volcanoes, medical examination of population, development of actions for reducing radon risk, creation of regulatory acts, public education, etc. are the main objectives of this program.

Measured indoor radon concentrations varied in a wide range: from 20 to 1109 Bq/m^3. About 7% from total amount of measurements exceeds maximum permissible limit in Azerbaijan (200 Bq/m^3). Based on obtained data the map of distribution of indoor radon volume activity in Azerbaijan for the first time was created. The elevated radon concentrations are mainly observed in mining and folded arrays of the Greater and Lesser Caucasus and Talysh region. Results of measurements of radon concentrations in indoor air are in good agreement with data of radon content in the soil air. The content of radon in thermal waters generally isn't high, except the waters of carbon source in Talysh region, where its concentration is above the maximum permissible level accepted for drinking waters. Increased values of radon volume activity in the mud volcanoes (especially in the gases released from the griffins) have been also revealed.

During data comparison a definite correlation between high levels of radon concentration and lung cancer risk has been revealed.

MG-12

GEO-SPATIAL IMPACT ON PUBLIC HEALTH IN THE COASTAL REGION OF WEST BENGAL, EASTERN INDIA: AN APPRAISAL ON MEDICAL GEOLOGY

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The present study reveals strong influence of surface geologic materials, altitude and slope of the surface; pH, conductivity, salinity groundwater and subsurface groundwater movement on the geo-spatial distribution of chronic disease hotspots, whose varied spatial distribution imparts significant impact on public health. The coastal tract of Purba Medinipur District of West Bengal in Eastern India is characterized by the linear palaeo-sandbar/sand dunes with intervening low lying (trough) areas of clay and silt. These bars are found to act as barriers to the return of the sea water in low tide, which enters inland during high tide; effectively increasing the residence time of saline water in the coastal fringes. The spatial distribution of chronic diseases, i.e. Acute Diarrheal Disorder (ADD) and Acute Respiratory Infection (ARI) besides fever, reveals distinctive zones as disease hotspots. Interestingly, the areas showing higher incidences of ADD coincide with the areas of low ARI occurrences and vice-versa, clearly indicating anisotropic geo-spatial distribution of chronic diseases in the region. Moreover, a strong groundwater divider separates the affected regions of these two major diseases. Low surface altitude and slope, presence of clay; high pH, moderate conductivity, low TDS and moderately high salinity of groundwater demarcates the regions affected with ADD. ARI dominated areas are characterized by high surface relief and slope, abundance of sand; low pH, low conductivity, moderately low TDS and moderately low salinity of groundwater.

MG-13

GLOBAL CLIMATE CHANGE, GROUND-LEVEL OZONE AND HUMAN HEALTH

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Ozone (O3) is a well-documented respiratory oxidant. There is increasing epidemiological evidence points to extra pulmonary effects of ozone, including correlation

between ambient O3 concentrations and cardiovascular, respiratory morbidity and mortality. Increase in ozone concentration in troposphere caused by air pollution and heat waves could have an impact on population health by negative structural, functional and biochemical changes in living organisms and lead to the increase in morbidity and mortality.

In the present study, methods of the statistical correlation analysis were used to reveal a relationship between some diseases and ozone concentration in troposphere. Temporal series analysis of ambulance calls related to cardio-vascular diseases and average daily air temperatures and concentrations of tropospheric ozone were compared for summer months in 2008, 2009, 2010 years in Viatskie Poliany, Kirov Region, Russia. Temporal series analysis of ambulance calls related to respiratory system diseases and average daily air temperatures and concentrations of tropospheric ozone were compared for June–August in 2010 in Moscow City. Strong correlation between ozone concentration and the rate of ambulance calls related to cardio-vascular diseases was observed for average daily ozone concentrations above 60 μg/m^3, lasting from 13 to 16 days. The correlation coefficient was 0.62. The high levels of ozone tropospheric concentration observed in Moscow City did have a strong correlation with the rate of ambulance calls related to the diseases of respiratory system. Correlation coefficients for the hourly average maximum concentration of ozone at the ground level with community-acquired pneumonia were 0.787, and 0.808 for mortality.

We found that ozone modified temperature effects cardiovascular diseases of the population in Vyatskie Polyany during the summer of 2010. In Moscow, the acute effect of high ozone levels on mortality and respiratory diseases did show variability with the population age and was very unfavorable to the elderly group of people.

MG-14

MEDICAL GEOLOGY AND VOLCANOES

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Volcanic activity poses a hazard to human health and life in both, short and long time scales. Volcanic products such as pyroclastic flows or lahars have produced numerous fatalities worldwide in minutes or hours. Long time exposure to other volcanic products may harm the health of people and many animal and vegetal species. Gases may affect health by their toxicity (SO_2, HCl, H_2S, HF) or by displacement of oxygen from air (CO_2). Exposure to volcanic ash may cause or worsen respiratory diseases by inhalation and also produce eye and skin damage. Furthermore, toxic elements adsorbed on ash like fluoride, arsenic and heavy metals may contaminate water bodies and vegetation constituting an indirect health hazard to humans and animals. About ten thousands of farm animals were affected in the 1988 eruption of Lonquimay volcano in Chile, and about 6000 lambs died in Iceland from Hekla eruption. At Popocatépetl, México, fluoride in aqueous leachates has reached high concentrations (up to 500 mg/kg) in some of the eruptions that have occurred since the volcano reawakened in 1994. Settling of ash on potable water sources may increase fluoride levels above drinking water standards. Other elements like Pb, Mn, Tl, and Sb had also peaked at some ash settling locations in some of the recent eruptive events. Monitoring of leachate composition should thus be compulsory to protect population, particularly in a volcano that erupts frequently. Chemical analysis of leachates must rely on accessible and quick methods to provide fast results to the communities at risk and allow them to react applying adequate health protection measures. In México analysis is carried out with potentiometric and spectrophotometric methods, using equipment usually present in laboratories for water quality analysis. This facilitates chemical monitoring of leachates, making this a practical health protection practice.

POSTER SESSION

SESSION: ENVIRONMENTAL GEOCHEMISTRY AND HUMAN HEALTH (EG)

EG-01

PRODUCTS BASED ON ZEOLITE FOR ORAL USE IN A FREE MARKET IN SERBIA

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Due to their ability as absorbents, zeolites have been in focus of various researchers for several decades. More than fifty natural and a number of synthetic zeolites are currently. According to chemical composition, zeolites are aluminosilicates of calcium, sodium, potassium, strontium, barium and other cations with different amounts of water molecules. For most zeolites, distribution of Al^{3+} and Si^{4+} in tetrahedral positions is arranged. The tetrahedrons of silicon and aluminum form the rings, between which there are cavities with large cations (eg. Ca^{2+}, Na^{+}) surrounded by the dipolar molecules of water (forming hydration complexes with large radius). The size of the cavities and the channels in the skeleton of Si – Al depends on the ratio Al:Si. Zeolites with more Si atoms have higher cavities and therefore contain more water. When zeolites lose water by heating, their structure is not disturbed. The temperature of dehydration of the zeolite depends on its structure and composition. On the basis of different thermal studies of natural zeolites (eg. clinoptilolite-heulandite type of zeolite – Aliette et al. 1975; Knowlton et al., 1981), beside externally absorbed water, slightly bounded zeolitic water and tightly bound zeolitic water also exist. Dehydration of slightly and tightly bound zeolitic water generally takes place at temperatures > 75 °C to a maximum of 400 °C. Dehydrated zeolites are able to reabsorb water, and other molecules (H_2S, petroleum products...). For these reasons zeolites are widely used in petrochemical industry, as thermostable molecular sieves, for softening and purifying water, for maintaining moisture in the soil. Furthermore, zeolites are also used for the purposes of animal nutrition, as well as for human consumption, as a dietary supplement.

In recent decades, there have been a lot of products declared as zeolites for oral use in free market in Serbia. They can be found not only in pharmacies but also in health food stores. Most of these products have incomplete or non-existent declaration. The results of investigation of several commercial zeolite products purchased in pharmacies in Belgrade are presented in this paper. The samples were investigated by X-ray powder diffraction (XRD) and scanning electron microscopy coupled with energy- dispersive spectrometry (SEM – EDS).

According to X-ray diffraction clinoptilolite-heulandite type of zeolite was identifies in all samples as dominant phase. A small amount of mica, quartz, calcite and some of clay minerals are occurring in all the samples.

Beside of these phases, a minor presence of Ti-magnetite was found by SEM-EDS analysis. The morphology of zeolites is usually occurring in the form of tabular crystals (monoclinic symmetry). The particle size of all samples was very variable, in interval of less than 0.1μm to about 60 μm. Particles between 0.2 and 0.5 μm in size were found to be dominant.

EG-02

PRELIMINAR STUDIES OF ANNUAL EFFECTIVE DOSE EQUIVALENT (AEDE) DUE TO TERRESTIAL RADIONUCLIDES RECEIVED BY BARRA DE VALIZAS INHABITANTS AND TOURIST

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The Uruguayan east coast has several mineral resources, which include black sand ores in the Aguas Dulces-Valizas area. The activity concentration of ^{226}Ra, ^{232}Th and ^{40}K in sand and soil in Barra de Valizas was determinated in order to evaluate the outdoor annual effective dose equivalent (AEDE) received for the inhabitants and tourists. For the quantification of those radionuclides in sand and soil, samples were collected at a typical depth of 5 cm from the top surface layer to produce aproximately 2 kg wet weight sample. Each sample was dried at a temperature of 60ºC until a constant weight was reached, the samples were filled into 500 mL Marinelli flasks. After approximately four weeks in order to reach secular equilibrium of the ^{238}U and ^{232}Th series, samples were measured by gamma-spectrometry with a High Pure Germanium Detector GMX35P4-76-RB, 35 % efficiency and 1,75 % resolution for photopeak of the ^{60}Co. IAEA reference materials were used for efficiency calibration.

^{226}Ra was studied by the the photopeak ^{214}Bi (609.3 keV). ^{232}Th was evaluated by the photopeak of ^{228}Ac (911.1 keV) and, ^{40}K was evaluated by its own photo peak 1460.0 keV.

The outdoor annual effective dose equivalent (AEDE) was evaluated for inhabitant and tourist using the conversion coefficients recommended by UNSCEAR. They are in the range 60-100 μSv/y for inhabitants, with some values higher than the world average value of 70 μSv/y, althought always below the recommended limit set by UNSCEAR.

EG-03

MEDICAL AND GEOLOGICAL PROBLEMS OF THE NORTHERN BLACK SEA REGION

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Introduction. Geological factors causes different risks: incidence rate, traumatism, destruction of different organisms. It is a natural source of ecological risk [1]. Stage of development of geological factors determine amount of economical resources which could be spend on optimization of territory for human habitation and other economic activity. Unification of analysis of quality of resources potential of Black Sea region for different economic activity models is the main objective of this research.

Results. The unification of interdisciplinary criteria of evaluation of resources potential have been made. Author's approach to the identification of geological factors of ecological risk by the example of key sites. Potential sources of risks (natural and technogeneous) that cause human and animal diseases have been established.

Discussion. Complex research of north part of Black Sea region allow to rank investigated territories by factors of risks. Natural deficit of biophilous elements (Zn, Cu, I) in food chain have been established. The same way natural imbalance of Ca and Sr; overbalance of toxic elements (Pb, Ni and other elements) [2-4] that cause diseases of native population. Correction to the program of rehabilitation of territory with taking into account development history of region and culture of native population have been proposed.

Summary. Introduced approach allows to identify sources of risks, which determine direction of correction of program of rehabilitation of native population health on regional level. It is also regulates types of economic activity acceptance for optimal sustainable development of region.

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EG-04

ON DISTRIBUTION OF RADIONUCLIDES IN CULTIVATED ELEMENTARY LANDSCAPE-GEOCHEMICAL SYSTEMS CONTAMINATED AFTER THE CHERNOBYL ACCIDENT

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One of important scientific and practical problems of modern biogeochemistry is the study of spatial structure of geochemical fields formed by radionuclides. The main goal of our research is a detailed study of spatial distribution of technogenic radioisotope ^{137}Cs of the Chernobyl origin, and the natural isotope ^{40}K in conjugated elementary landscape-geochemical systems (ELGS). Systematic studies of spatial distribution of these radionuclides was conducted in western areas of the Bryansk Region (RF) since 2005.

The studies of 2016 were devoted to revealing distribution of radiocesium in soils of agricultural landscapes being in use after the accident but now abandoned and overgrown by ruderal vegetation. We tested a hypothesis of similarity in character of lateral distribution of ^{137}Cs in soils of conjugated ELGS of agrocenosis and the one established earlier in natural systems.

A sloping area with elevation difference of 11.83 m within 185 m was selected as a study plot. Measurement of radiocesium activity was performed along cross-section from the top point to local depression in increments of 1 m using a field gamma-spectrometer Violinist III (USA), with collimated scintillation detector (NaI[Tl]) 2.5 inches in diameter. Radioactivity measurements were accompanied by theodolite survey at every point. To verify field data and to reveal vertical ^{37}Cs and ^{40}K distribution undisturbed soil cores were taken at the selected 16 points down to a depth of 40 cm. Cores location was based on results of the field gamma survey. Laboratory gamma-spectrometry was carried out with spectrometer Canberra (USA). Spatial distribution of radionuclides in conjugated ELGS was analyzed using Surfer 11.6 software.

Obtained results showed that lateral distribution of ^{137}Cs in soils of agriculturally transformed ELGS exhibits cyclic character followed from the top to bottom of the transect similar to ^{137}Cs behavior in natural ELGS observed previously in test site «Vyshkov-2». Activity ^{137}Cs varied from 224 to 779 kBq/m² and that of ^{40}K – from 121 to 217 kBq/m². A cyclic pattern in lateral distribution in both the undisturbed natural ELGS and those transformed by cultivation was proved to be a common feature.

An absence of a remarkable radiocesium unilateral accumulation down the slope obviously reflects specific redistribution of chemical elements in ELGS, which is of both theoretical and methodical importance. The finding contributes to effective ecological monitoring and forecast of in-field anomalies formed by contaminants, herbicides, pesticides or fertilizers and helps to obtain ecologically clean agricultural production.

EG-05

ARSENIC: CONTAMINATION OF DRINKING WATER AND HUMAN EXPOSURE IN OURO PRETO, IRON QUADRANGLE – MINAS GERAIS, BRAZIL

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The contamination of watersheds by trace elements is an important environmental issue in the Iron Quadrangle of Brazil. The region has been intensely affected by gold exploitation since the 18th century and the old mines expose sulfide minerals to oxidation, releasing trace elements to surface and groundwater. Some old mines in Ouro Preto, MG, are still used by the population as water supplies. Thus, a geochemical characterization of public water supply, urine and hair was conducted in order to evaluate the extent of water contamination and population exposure to trace elements, focusing on arsenic (As). 56 urine samples and 44 hair samples were analyzed by ICP-OES and ICP-MS. The results of this investigation, as described in Table 1, have indicated that the water samples are heavily contaminated by As. This is strongly correlated to the geology of the area, characterized by high concentrations of sulphide veins with gold mineralization. However, As concentrations in urine and hair were found to be relatively low. Therefore, the statistic correlation indicates that As has not been bioaccumulated within the sampled group of the population. Nevertheless, animals, plants and soils may be contaminated in the region. Thus, further studies are recommended to better understand the environmental implications of the high concentrations of As in the water of Ouro Preto.

Table 1. Arsenic concentrations in water, urine and hair samples from Ouro Preto, Minas Gerais, Brazil

	Water (µg/L)				Urine (µg/L)	Hair (µg/g)
	Aug 2012	Dec 2012	Apr 2013	Dec 2013		
Minimum	0,109	0,045	0,058	0,152	0,13	0,03
Maximum	144,652	182,337	283,000	98,11	5,34	2,80
Mean	13,688	3,978	6,320	31,64	2,65	0,31
Standard Deviation	41,354	47,308	69,092	49,75	1,40	0,46
MCL (Maximum Concentration Level)	10µg/L (WHO, 2001)				40 µg/L (Matschullat et al 2000) (Trepka 1996)	1,00 µg/g (ATSDR 2007)
N° of samples	17	17	17	17	56	44
Samples above MCL (%)	47,0	41,2	47,0	47,0	0	4,5

EG-06

SOIL RADIOACTIVITY AND DOSE RATE ASSESSMENT IN MINING CENTERS OF ARMENIA

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This research was designed to study radioactivity of urban soils and provide a lifetime cancer risk assessment in Armenia's biggest metal mining centers: towns of Kajaran and Kapan. A pilot study of total beta activity distribution in Kajaran soils has pinpointed existence of radiation loading on the environment and human health.

To determine radioactivity of urban soils and provide a dose rate assessment for Kajaran and Kapan, pedogeochemical survey soil samples of 2005 and 2007 were used, respectively. 10 soils samples were selected randomly per a town. Activity concentrations of naturally occurring radionuclides ^{40}K, ^{226}Ra and ^{232}Th measured by gamma ray spectrometry (HPGe detector, CANBERRA).

Radium equivalent activity of Kajaran soils varies from 88.10 to 221.24, average 143.46 Bq/kg; of Kapan soils: 42.91-141.70, average – 84.98 Bq/kg, these being comparable with results of similar investigations implemented worldwide. Outdoor annual effective dose equivalent (AEDE) was calculated based on contents of naturally occurring radionuclides in urban soils consistent with UNSCEAR 2000 methods. AEDE for Kajaran varies between 8.22E-02 and 1.24E-01, averaging 5.14E-02 mSv/y. AEDE for Kapan are lower varying from 2.50E-02 to 8.26E-02, on the average 5.19E-02 mSv/y. Maximal AEDE exceed world average: 7.00E-02 mSv/y, but are beyond the limit of 1.0 mSv/y recommended by the International Commission on Radiological Protection (ICRP) for the general public. Excess lifetime cancer risk (ELCR) due to gamma emitted radionuclides in soils is assessed according to ICRP methods. The average ELCR for Kajaran is equal to world average: 0.29E-03, and is significantly lower for Kapan: 0.19E-03.

EG-07

SHIFTING CYANOBACTERIAL DIVERSITY IN RESPONSE TO AGRICULTURAL SOILS ASSOCIATED WITH DUST EMISSION

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Dust emission to the atmosphere from wind-eroded soils has many environmental impacts, including soil degradation and air pollution. Various agricultural land uses alter the topsoil properties and thus affect dust particle characteristics as well as loading of biological components into the air. In the present work, the richness and abundance of bacterial communities in topsoils of semi-arid loess that are associated with dust emissions were studied by high throughput sequencing methods, and were found to be affected by land uses: conventional agriculture, organic agriculture alternating with grazing, uncontrolled grazing activities and natural non disturbed soil. Moreover bacterial diversity was shown to be influenced by the contents of sand, CaCO3, and particulate matter in the topsoil. Of all bacteria taxa detected, cyanobacteria were found to be most strongly influenced by land use: natural and grazing lands were highly abundant with cyanobacterial reads (about 33%) whereas conventional agriculture lands and organic agriculture lands alternating with grazing contained only 7% cyanobacteria. When examining macro-aggregates in two soils (natural and grazing), approximately 44% of reads were found to be affiliated to cyanobacteria, whereas in micro-aggregates their concentration decreased to about 11%. Intensive agricultural use leads to a reduction in soil aggregation and significantly decreases cyanobacteria abundance, in turn increasing dust emission potential and loss of topsoil materials to the atmosphere.

EG-08

CANCER AND NON-CANCER RISK DUE TO EXPOSURE TO POTENTIALLY-TOXIC ELEMENTS IN CONTAMINATED GROUNDWATER ADJACENT TO AN INDUSTRIAL CHEMICAL COMPLEX (ESTARREJA, NW PORTUGAL)

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The Estarreja Chemical Complex (ECC) (NW Portugal) has had an intense industrial activity since the early 1950's, which lead to high levels of groundwater contamination. This industrial activity produced a large volume of toxic-waste solids and liquid effluents, which were disposed for decades in areas that were not prepared for such purpose. ECC is surrounded by an agricultural

area whose population historically relies on groundwater as a source of water supply for human and agricultural uses. Several rehabilitation actions were taken during the 1990's and 2000's, resulting in an important reduction of the negative environmental legacy. Hazard (non-cancer) and cancer risks due to exposure to potentially-toxic elements (PTEs) by the ECC-surrounding population where calculated considering groundwater ingestion, inhalation and dermal contact as exposure pathways. ECC-surrounding groundwater shows concentrations of Al, As, Cd, Fe, Hg, Mn, Ni, Cr and Zn several orders of magnitude higher than admissible values according to Portuguese and International legislations. Hazard indexes (HI) were calculated for exposure to these metal(loid)s by children and adults. For children and adults HI are higher than 1 for As (HI=39, HI=5, respectively), indicating a potential non-cancer risk for both age categories. The other elements showed no potential non-cancer risk, i.e. HI<1. Cancer risk was calculated for As, Cd, Cr and Ni exposures, for adults and children, and the results show cancer risk above $1x10^{-6}$ for As and Cd for both age categories, which indicates cancer risk. Cr and Ni showed no potential cancer risk.

EG-09

NEUROPSYCHOLOGICAL ASSESSMENT AND TRACE METAL CONTENT IN URINE, HAIR AND FINGERNAILS SAMPLES FROM INHABITANTS OF A CHEMICAL INDUSTRIAL REGION (NW PORTUGAL)

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The surroundings of the Estarreja Chemical Complex (NW Portugal) have an intense industrial activity with negative impact on soil, surface water and groundwater since the early 1950's, and its population historically relies on groundwater as a source of water supply for human and agricultural uses. This industrial activity produced a large volume of toxic waste solids and liquid effluents, which were disposed in areas that were not prepared for such purpose. During the 1990's, several rehabilitation actions resulted in an important reduction of the negative environmental legacy. However, we found concentrations (µg/l) of Al, Cu, Fe, Hg, Mn, Pb and Zn in groundwater well above the international and Portuguese recommended values. Less than ~10% of neurologic diseases have a strict genetic aetiology, while the majority have an unknown origin. Occupational and environmental exposures to several metals (e.g., Hg, Al, Mn, Cu, Pb, Fe and Zn) appear to be a risk factor for neurodegenerative pathologies, such as Alzheimer's disease, Parkinson dementia, etc. The neuropsychological assessment of a pre-selected population in the studied area is being performed and correlated with the content of selected metals on human biological samples. The experimental sample of this study to date has proved to consist mainly of normal subjects (40 %), followed by the condition of dementia (37 %) and the condition Mild Cognitive Impairment (18 %). This study combined trace element profile in urine, hair and nails with survey information from 100 Estarreja inhabitants to assess the extent to which the biomarkers provide exposure to metals information. Urinary levels of metal(loid)s for the participants exceed those reported in the literature for healthy people. However, the median values fall within the range of values. The exceptions are Al, Cd, Mn, and Zn. Median hair and fingernails levels (µg/g) were also elevated, particularly for Al, Pb, Hg, and Zn.

EG-10

LINKS BETWEEN CHRONIC EXPOSURE TO MANGANESE AND THE OCCURRENCE OF DEMENTIA IN MINING AREAS OF THE SOUTHERN PART OF PORTUGAL

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Occupational and environmental exposure to manganese (Mn) are suggested as a possible cause of neurodegenerative disorders. The inhalation and ingestion of Mn affects the central nervous system of mammals. Several studies reported neurological pathologies, and even deaths, induced by chronic consumption of water containing moderate to high levels of Mn. In Baixo Alentejo region (South Portugal) there are several abandoned Mn mines, related with the Fe-Cu-Zn-Pb massive sulphides deposits. Nearby these mines there are abandoned tailings deposits enriched in Mn as well as in metal(loid)s such as Cu, Pb, Zn, As, Sb, Ag, Hg and Cd, freely exposed to weathering. The concentration of these metal(loid)s in human biological samples (nails, hair, blood and urine) was determined for target and control groups. The neuropsychological condition of the individuals participating in this study was been evaluated using cognitive screening tests, for early detection of dementia. The following instruments was been administered to each participant: (1) a complete socio-demographic questionnaire; (2) general health questionnaire; (3) mini mental state examination; (4) Montreal cognitive assessment; (5) clinical dementia rating scale; (6) geriatric depression scale; (7) recall selective free and guided test. Relationships between the cognitive conditions of the individuals and Mn contents in the biomarkers were investigated using several statistical techniques. Further investigation was carried out on the exposure-biomarker association for other metal(loid)s. The exposed group has proved to comprise mainly subjects with Mild Cognitive Impairment (MCI) (36%), followed by normal subjects (34%) and subjects with dementia (30%). The analysis of RSFGT results indicate that 30% of subjects with MCI will be more likely to convert to PD or AD. Maximum fingernails Mn level (1.43 µg g^{-1}) was found in a subject with Parkinson dementia while the maximum toenails Mn level (1.38 µg g^{-1}) was found in a subject with MCI. Median fingernails levels (µg g^{-1}) were elevated for Hg, particularly in subjects with dementia (0.8), and also in MCI (0.6).

EG-11

LINKING VOLCANIC SOIL COMPOSITION AND CANCER RISK IN SANTIAGO ISLAND (CAPE VERDE)

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The topsoil of Santiago Island is enriched in Co, Cr, Cu, Ni, V, Zn, Mn and Cd relative to upper crust values. The hazard and the carcinogenic risks due to the exposure to some potentially toxic elements (PTEs) by the Santiago Island (Cape Verde) population were calculated, considering soil ingestion, inhalation and dermal contact as exposure pathways. Hazard indices (HI) were calculated for these metal exposures of the Santiago Island population for children and adults. For children HI are higher than 1 for Co, Cr and Mn. So there is indication of potential non-carcinogenic risk for children, due to the high Co (HI=2.995), Cr (HI=1.329) and Mn (HI=1.126) values in soils. For the other elements and for adults there is no potential non-carcinogenic risk. Cancer risk was calculated for Cd, Cr and Ni exposures and the results were higher than the carcinogenic target risk of $1x10^{-6}$ for Cr. A realistic assessment of actual health risks associated with PTEs in soils requires evaluation of bioaccessible metal fractions. The estimation of bioaccessibility of PTEs in Santiago soils was done using the UBM method. It is necessary to characterize the health risks of PTEs in soils through multi-pathways (ingestion, inhalation, dermal) incorporating bioaccessibility adjustments. Bioaccessibility provides an upper boundary value—that is, the most conservative value for human protection—as to what could potentially become available to the human systemic circulation and thus available for uptake.

EG-12

ECOSYSTEMIC APPROACH TO HUMAN HEALTH: A TOOL FOR ENVIRONMENTAL STUDIES

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Introduction Our Century has the task of promoting human Health in healthy communities that are environmentally sustainable as well. The Ecohealth approach is facing the challenge of improving the quality of life of men and women in countries of low income and vulnerable societies, through a new way of research, education and practice that aims at the construction of healthier communities and environments. Objective The objective of this presentation is to show briefly the work methodology in Ecohealth. Development In an Ecosystemic approach to Health, humans are placed in the center of the considerations regarding development, at the same time seeking the durability of the ecosystem of which they are an integral part. There can be no sustainable development unless all the interventions take into account the well-being of humans the same as the protection of the ecosystems. Ecohealth makes an holistic approach to the health problems of the population, because they go beyond the sole competence of the Health sector. These studies include the way societies are structured and the relations between social actors. Environmental and social factors are integrated in order to study the illnesses and to manage solutions in a participation scheme. Therefore the dynamic interaction between the different components of the ecosystems and the well-being and human health, are emphasized. Furthermore, this approach considers transdisciplinary projects (with gender analysis and participative methodology) to result in better research and improvement of human health and the environment. Accordingly, well-being and human health are part of the impact evaluation. Conclusion Ecohealth proposes a research and action approach aimed at sustainability and social and gender equity, through the decision making at various levels by politicians and social actors. With the participants of this Symposium we will share a deeper insight into the pillars of this new methodology, mainly transdiscipline, gender, research methods with concept maps, and a practical case study of Mercury in Latin America.

EG-13

LEACHING OF THALLIUM FROM EXTREMELY CONTAMINATED SOILS COLLECTED FROM GUIZHOU, CHINA

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As a highly toxic heavy metal, thallium (Tl) in the soil endangers human heath severely via being absorbed by plants or infiltrated to groundwater. Soil leaching is an effective method to remove heavy metals from soil. A batch experiment was conducted to remediate two Tl-contaminated soils close to Tl mining area(Guizhou, South of China) by using oxalic acid (OA), citric acid (CA), elhylene diamine tetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), HCl, HNO_3 and $FeCl_3$. The SEM and XRD were used to analyze the morphology changes and crystal phases of the soil before and after leaching. The results showed that oxalic acid was the best acid leaching agent with the leaching efficiency of Tl from the two soils were 75% and 95%, respectively. The optimal soil washing option for Tl was achieved at the OA eluent concentration 1 mol/L, pH 0.5 and washing time 16 h. The results showed that the main states Tl removal was. The mechanism of Tl leaching was found to involve the initial metals salts dissolution, that was pH-dependant, followed by the development of exchange reactions between the metal–OA complexes previously formed.

EG-14

IN SITU BIOSYNTHESIS OF BACTERIAL CELLULOSE HYBRIDS COMPOSITES FOR BIO-APPLICATIONS: GREEN ONE-STEP PROCESS

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Green chemistry based in only one-step arises from the need to obtain biocompatible, biodegradable and ecologically sustainable biocomposites, using new strategies which reduce more and more the use of solvents. In situ biosynthesis of new biocomposites with bioactive compounds have offered a great interest to obtain environmentally friendly and biofunctional materials for applicationsin different fields such as medicine. In this work, a simple and green route to the synthesis of new hybrid biocomposites of bacterial nanocellulose-Porto Santo's biogenic clays (BNC/BioC) using one-step in situ biosynthesis was studied. The BioC incorporation into BNC network was made during their biosynthesis by Gluconacetobacter sp. The new hybrid nanocomposites samples was investigated through specific techniques of characterization such as Attenuated total reflection Fourier transform infrared spectroscopy, field emission scanning electron microscopy, X-ray diffraction, inverse gas chromatography, energy-dispersive X-ray spectroscopy and thermogravimetric analysis. The BNC/BioC biosynthesized revealed a decrease in water absorption uptake and crystallinity due to the BioC incorporation. Besides that, it occurred changes in surface properties of the new biocomposite namely in the non-polar active sites and in the basic character due to the rearrangement of the chains of cellulose and the BioC incorporation during biosynthesis. BNC/BioC hybrid bionanocomposites reveals potential to be applied in biomedicine field due to the exhibited properties.

EG-15

IDENTIFICATION OF THE IMPACT OF IRRIGATION USING ALKALINE NA-AS RICH GROUNDWATER ON SOILS IN THE SOUTHERN CORNER OF THE DUERO BASIN (SPAIN), USING GEOSTATISTIC TOOLS

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Problems of high-As groundwater are known in the southeastern corner of the Duero Basin. In this area the occurrence and distribution of As in groundwater is controlled by inputs of cold-hydrothermal waters flowing through the faults of the fissured basement of the basin. The deep aquifer levels of the Tertiary aquifer, which are closely associated with this fractured basement and characterized by a Na-HCO3 hydrochemical facies, high pH and high As content, have been used in some sectors for irrigation. As a consequence, there have been significant drops in the piezometric levels in these sectors alongside probable soil salinization. The distribution of pH, As and Na in soils was estimated using geostatistical methods, particularly Ordinary Kriging (OK). Three scales of spatial variation were identified by means of experimental variogram. The spherical model was fitted in every case. The geochemical database studied was from the Instituto Geológico y Minero de España (IGME). The study reports relative increases in pH, As and Na in soils from sectors irrigated with deep groundwaters. This enrichment in soils may eventually result in a deterioration in soil quality and crop yields, in an area where there are already problems of hydrogetoxicity from As that compromises the use of groundwater for drinking purposes. Groundwater management options should focus on preventing and minimizing the use of these waters, because they are a continuous source of Na-As input to soils. Acknowledgments. This work was supported by the Instituto Geológico y Minero de España, IGME (projects HidroGeoTox and SoilWater).

EG-16

CHEMICAL PROPERTIES OF ILICA (KAHRAMANMARAŞ) THERMAL WATERS AND THEIR BENEFICIAL EFFECTS ON HUMAN HEALTH

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Ilıca hot spring is 70 km awa from Kahramanmaraş city centre. Thermal waters used for health start with primitive structure sand continues to day with modern hotels, rehabilitation centers and physical therapy centers. Patients who are sent to spafacilities for treatment by doctors are paid by the institution for their treatment costs.

Ilıca thermal waters in the study are a north of the tow are exposed along the east-west trending faults.Thefeatures of the source and the drilling waters are 43-45°C, debite, 4-55 l / s, Ph 7-8,5, total mineralization is 250-430 mg / l. pH is 7-9 and it is basic water. In the hot waters of Ilıca, Ca and HCO_3 ions predominate and are in the Ca HCO_3 facies. According to the Piper diagram, it is included in group 5 and it is non-carbonate hardness. This thermal waters is in the immature class of water that has not reached the equilibrium according to the Gigenbach diagram. Waters according to AIH classification Ca, Mg, HCO_3 S, is a mineral water poor acroterm waters.

Balneology uses water at 38-42°C temperature for this reason thermal waters can be used for therapeutic purposes. Thermal water contain high level of dissolved carbodioxide and S value so these water used in the treatment of skin diseases.

Ilıca kaplıcası Kahramanmaraş İline 70 km uzaklıktadır . Termal suların sağlıkta kullanımı ilkel yapılarda başlayıp günümüzde modern oteller, rehabilitasyon merkezleri, fizik tedavi merkezleriyle devam etmektedir. Doktorlar tarafından tedavi edilmek üzere kaplıca tesislerine gönderilen hastaların tedavi masrafları bağlı bulundukları kurum tarafından ödenmektedir.

Kaynak ve sondaj sularının sıcaklıkları 43-45°C, debileri, 4-55 l/s, , toplam mineralizasyonu 250-430 mg/l dir.Ph 'ı 7-9 olup bazik sulardır. Ilıca sıcak sularıdaCa ve HCO_3 iyonu hakim olup $CaHCO_3$fasiyesindedir. Piper diyagramına göre 5. Grupta yer almakta olup karbonat sertliği>karbonat olmayan sertliktir.Gigenbach diyagramına göre dengeye ulaşmamış olgun olmayan sular sınıfındadır. AIH sınıflamasına göre sular Calu, Mglu , HCO_3lı S lı mineralce fakir akroterm sulardır. Balneolojide 38-42 °C sıcaklıktaki sular kullanıldığından termal sular tedavi amaçlı kullanılabilir. Sular içindeki çözünmüş karbodioksit ve S değeri yüksek olduğu için deriden su mineral ve gazların emilimi sonucu cilt hastalıklarında tedavi edici özellik göstermektedir (Erdoğan 2008)

EG-17

IN SITU BIOREMEDIATION OF ACID MINE DRAINAGE: A LOW-COST APPROACH TO PROTECT DRINKING WATER SOURCE

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Acid mine drainage (AMD) from abandoned coal mining sites generally has low pH values and high concentrations of metals (e.g. Fe, Mn), which pose seriously risk to the downstream drinking water sources. The Aha reservoir has long been impacting by the coal AMD from Yuyou River, which is an important source of the drinking water in Guiyang, southwest China. This resulted in high contents of iron, manganese, sulfate and other heavy metal elements in the reservoir water and sediment, which has seriously influenced the local water supply quality. However, the conventional treatment methods for AMD, such as lime neutralization, have limitations of secondary pollution risk, high cost, and free of sustainability. This paper introduced a new method depends on *in situ* bioremediation process to treat AMD. This is a simple, cost-effective and more sustainable approach. A pilot system was constructed upstream Aha reservoir in 2012. The system consists of two oxidation-precipitation ponds and three microbial treatment ponds. Through long term running, the system could reduce the concentrations from 920 (inflow) to 71.6 mg/L (outflow) for Fe, from 46 to 12 mg/L for Mn, from 4905 to 3436 mg/L for SO_4^{2-}, with the removal rates are 92% for Fe, 73% for Mn, and 29.9% for $SO4^{2-}$, respectively. Overall, the approach of *in situ* bioremediation could reduce the risk of AMD in low cost and sustainable way, so as to achieve the purpose of protection of drinking water source.

EG-18

CHEMICAL CONTAMINATION IN AGRICULTURAL AND PASTURE SOILS FROM AN INDUSTRIAL SITE IN NORTH CENTRAL PORTUGAL

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The environmental impact of several chemical industries implemented at the Estarreja Chemical Complex (ECC) is felt at Estarreja municipality since the 1950s. The ECC is composed of several chemical industries which are recognized as important sources of contaminant inputs into the environment, the most important being related to past industrial activities, namely the production of sulphuric acid from arsenopyrite roasting and the activity of a chloralkali plant.

The main purpose of this study was to evaluate the sources, as well as the dispersion mechanisms of a large set of parameters (42 organic compounds and 46 chemical elements) in soils with high agricultural activity, located nearby sewage outlets. Local background was calculated from a reference site, 40 km south of Estarreja with no significant industry but a similar population lifestyle, geology and pedology. For this purpose 22 soil samples were analyzed for inorganic parameters by ICP/ES-MS and for organic compounds by CG-MS.

Organic compound concentrations in Estarreja soils are not very high when compared to the concentrations in European soils, except for PAHs in a few samples. For inorganic contamination As in 75% of the soils exceeds the Health Canadian Soil Guidelines for agricultural purposes. In the reference area these contaminants were not detected.

The results indicate that in the most critical locations the research should be extended to water irrigation and edible vegetation because contamination in soils used for pasture and/or agricultural activities may represent a potential health hazard.

EG-19

DETERMINATION OF TL(I) AND TL(III) BASED ON MICROCOLUMN SEPARATION BY ICP-MS AND APPLICATION TO TL SPECIATION ANALYSIS AT THE INTERFACE OF SOIL AND GREEN CABBAGE

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Thallium is a typical toxic element. The geochemical behavior and biological effect of Tl is closely related to its occurrence chemical form in the environment. However, little is known regarding the chemical speciation of Tl in the soil and plant. This current study is based on microcolumn of immobilized oxine selective adsorption of Tl(I) when the DTPA exist and DTPA assisted with ultrasonic and heating extract, coupled with ICP-MS detection, were successfully applied to the separation and detection of Tl(I) and Tl(III) species for soil and plant samples. The Tl speciation analyses results indicated that green cabbage mainly uptake Tl(I) from soil, and transport it into the aboveground organs. The fraction of Tl has the most environmental significance of soils also mainly exists on the speciation of Tl(I). The improved analytical method presented in this study offers an economical, simple, fast, sensitive method for separation of Tl species at trace environmental concentrations.

EG-20

EFFECTS OF VARIOUS AMENDMENTS ON MULBERRY UPTAKE CD FROM POLLUTED SOIL

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Compared with other hyperaccumulators, the economic crops have become hot research objects in the phytoremediation field because of their large biomass, strong environmental adaptability and available considerable benefits, especially mulberry. At the same time, amendments have been widely applied to assist phytoremediation. In this project, an experiment was conducted in laboratory to study the effects of various amendments on mulberry uptake Cd from polluted soil. Compared to other amendments, the citric acid treated hasthe highest Cd concentration in roots of mulberry with the maximum increased 25.8%, relative to the non-treated control. The DTPA and oxalic acid treated has the similar Cd concentration in mulberry, relative to the non-treated control. The results also show that the distribution of Cd in the mulberry tissues followed adescending order, i.e. roots> stems ≈leaves. The Cd mainly stored in the roots of mulberry, with all bioconcentration factor (BF) values of roots exceeding 1.0, up to a maximum of 5.8. This study provides a select amendment to enhance the Cd contaminated soilremediation effects using mulberry.

EG-21

BIOSORPTION AND BIOACCUMULATION OF THALLIUM BY THALLIUM-TOLERANT FUNGAL ISOLATES

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Thallium (Tl) contamination in soil exerts a significant threat to the ecosystem health due to its high toxicity. However, little is known about the effect of Tl on the microbial community in soil. The present study aimed at characterizing the culturable microbial groups in long-term Tl-polluted soils. The soils at the study site were highly contaminated with Tl derived from Tl-rich sulfide mineralization and mining activity in Guizhou Province, Southwest China. Our investigation clearly showed the existence of culturable bacteria, filamentous fungi and actinomyces in long-term Tl-contaminated soils. Indeed, some fungal groups can grow in the presence of high Tl level up to 1,000 mg kg-1. We have isolated and identified nine Tl-tolerant fungal strains based on the morphological traits and ITS analysis. The dominant genera identified were Trichoderma, Penicillium and Paecilomyces. Preliminary data showed a positive correlation between the biomass and the biosorbed Tl content. The Tl-tolerant strains were capable of bioaccumulating Tl, up to 7,189 mg kg-1 dry weight. The subcellular distribution of Tl showed obvious compartmentalization: cytoplasm >> cell wall > organelle. The majority of Tl (up to 79%) was found in the cytoplasm, suggesting that intracellular compartmentalization appeared to be responsible for detoxification. These findings further suggest the applicability of the fungal isolates for cleanup of Tl in Tl-polluted water and soil.

EG-22

OCCURRENCE OF URANIUM IN CHINESEHIGH-URANIUM COALS AND THE RELEASE BEHAVIOURS DURING COMBUSTION

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Uranium is a typical naturally occurring radioactive element in coal. The uranium content and speciation in several Chinese high-uranium coals was studied. The release and speciation transformation of uranium during coal combustion was investigated by experimental and thermodynamic equilibrium modelling. The uranium in coal mainly associated with organic matter, and the rest are occurred in the Fe-Mn oxide fraction, carbonate fraction and residual fraction. The uranium release ratio did not increase consistently with the combustion temperature increasing. The highest release ratio of uranium occurred at 500 °C. The uranium associated with organic matter is probably decomposed and released at the temperature below 500 °C. At the temperature range of 500-900 °C, uranium in organic modes is rapidly transformed into uranium oxides, resulting in the inhibition of uranium release. With the increase of temperature to 800 °C, part of the uranium oxide can react with alkaline and alkaline-earth compounds in coal, particularly calcium, forming various kinds of uranate, which will lead to the further decrease of uranium release ratio. Some of the uranates are thermal unstable and decomposed at the temperature above 1000 °C, while part of them are still immobilized in the combustion products even when the mixture was heated at 1200 °C. This study will provide valuable information for understanding the primary factors and processes that affect the release of uranium during coal combustion.

EG-23

SERUM CU/ZN RATIO IS ASSOCIATED WITH BLOOD GLUCOSE LEVEL, RENAL FUNCTION, AND BONE MINERAL DENSITY IN PEOPLE LIVING NEAR A COPPER SMELTER IN KOREA

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Introduction. Copper (Cu) and zinc (Zn) are essential metals for humans, and their serum concentrations are strictly regulated by compensatory mechanisms. However, an elevated serum Cu/Zn ratio is associated with the pathogenesis of some chronic diseases including diabetes mellitus, Alzheimer's disease, and cardiovascular disease via oxidative stress generation. This study was performed to investigate the relationships between the serum Cu/Zn ratio and blood glucose levels, renal function, and bone mineral density (BMD) in residents living near an abandoned copper refinery in Korea, a smelter that operated from 1936 to 1989.

Methods. The study included 410 residents aged ≥30 years living within 4 km of the smelter (156 men and 254 women). We simultaneously measured serum Cu and Zn levels and urinary cadmium levels. We evaluated the associations between the serum Cu/Zn ratio and various health markers using ANOVA with post hoc analysis and a general linear model (SPSS v23.0).

Results. We categorized subjects into low (<25th percentile, 1.02), medium (25–75th percentile, 1.02–1.39), and high (>75th percentile, 1.39) groups according to the Cu/Zn ratio. The serum Cu/Zn ratio was significantly, positively correlated with age, urinary blood urea nitrogen level, blood glucose levels, and low-density lipoprotein cholesterol levels and was negatively correlated with BMD T-scores and Z-scores in a dose-dependent manner. Although not significant, there was a dose-dependent positive relationship between the serum Cu/Zn ratio and urinary *N*-acetyl-β-D-glucosaminidase, β2-microglobulin (β2-MG), protein, and creatinine levels. In the general linear model adjusted for age, sex, and urinary cadmium level, the serum Cu/Zn ratio was significantly correlated with urinary protein levels, β2-MG, blood glucose levels, and BMD T-scores and Z-scores. In the present study, there were no significant differences in the serum Cu/Zn ratio by sex.

Conclusion. The findings of this study demonstrate that the serum Cu/Zn ratio is significantly associated with some markers of renal damage, blood glucose level, and impaired BMD in individuals with high copper exposure levels. Therefore, an imbalance between Cu and Zn levels may induce oxidative stress and lead to the progression of diabetes and diabetic complications. In addition, the serum Cu/Zn ratio could be a better indicator for diabetes status in humans, and zinc supplementation could be a good preventive or therapeutic method for diabetes mellitus.

EG-24

ENVIRONMENTAL GEOCHEMISTRY OF ESTUARINE SEDIMENTS IN THE SUAPE PORT COMPLEX, PERNAMBUCO, BRAZIL

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The Massangana and Tatuoca rivers estuarine system of Suape is located in the Suape Industrial Port Complex, the largest area of economic development of the state of Pernambuco. In this area two sedimentary core samples, each with three replicates, were collected. The core samples were sectioned every five centimeters, and then the subsamples were oven dried at 30°C, and subsequently disaggregated and macerated to reach a homogeneous silt particle size. Afterwards geochemical analyzes were performed on Atomic Emission Spectrometer to determine the concentration of 46 chemical elements. Fourteen of these elements (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Sc, Sn, Sr and Zn), due to their environmental relevance, were selected to conduct the geochemical and statistical analysis. The parameters obtained from the core samples were subjected to statistical analysis (Correlation Matrix, Principal Component Analysis). Individual element evolutionary graphics were also produced. The following chemical elements are worth mentioning: Ag, As, Cu, Hg, Ni and Sb. The first four elements showed concentrations between the thresholds of toxicity Effect Range Low-ERL and Effect Range Medium-ERM. The concentrations of these elements in the Suape area are above the reported concentration in other estuarine areas in Pernambuco. Thus, it is necessary to carry out continuous environmental monitoring and supervision of the Tatuoca/ Massangana estuary by the responsible government agency.

EG-25

GEOGENIC CADMIUM POLLUTION AND POTENTIAL HEALTH RISKS IN CHINA

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Cadmium (Cd) is a toxic trace element to many organisms and humans, also a carcinogen and global food contaminant. Previous studies of Cd pollution have primarily focused on anthropogenic sources, little is known on geogenic sources of Cd. However, in our study area Chengkou County, in southwest China, high Cd concentrations in environmental samples are not related to anthropogenic contamination but have natural origins related to black shale bedrock that crops out in the region.

The Cd concentrations in black shales ranged from 0.32 to 93.77 mg/kg (mean at 15.03 mg/kg), it was generally held in metal sulfides. The weathering of black shale could result in Cd enrichment and acidification of soil. Soils originating from the Cd-rich black shale generally accumulated Cd, ranging from 0.83 to 21.6 mg/kg (mean at 4.47 mg/kg). The soil pH ranged from 4.23 to 7.84, 76% of samples had pH<7 and 41% of them were lower than pH 6, indicating the acidification. Low pH may elevate the potential bioavailability of Cd in soils and lead to the enrichment of Cd in local crops. The area available for arable cultivation in southwest China is limited due to mountainous terrain; therefore, inhabitants living in the countryside have to rely on cultivation on Cd-rich soils, which may influence the safety of food stuffs, and potentially threaten the health of local residents. Therefore, more attention should be paid to geogenic Cd pollution, suitable strategies for remediation and management need further research.

EG-26

ORGANIC MATTER IN SOILS EXPOSED TO REGULAR POLLUTION BY OVERLAND RUNOFF FROM OIL-PRODUCTION SITES

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Human activity has a much more profound and extensive influence on soil formation than originally perceived. Soil as a natural functional system is formed and self-organized only in the space-time continuum of the repeating number of successive influences. The overall focus of this study was to quantify the accumulation of "lipids" in soils exposed to regular pollution by a land runoff from operational cluster oil-wells sites and its influence on the absorption properties of soil phases.

It was determined that the carbon content of the lipids can increase to 1/3 of the total carbon content. It results, in turn, in change of absorption properties of soil solid phases. There is a significant negative correlation between the total, inner and outer specific surface areas of the soil samples and the lipid contents in them. The electron microscopy study of various types of oil-containing samples (soil polluted by stock-tank oil, low-density fraction (<1.4 g/cm^3) of the oily sludge after all stages of the technological scheme of phytoremediation, and chernozem exposed to regular pollution by overland runoff from the sites of operational oil wells) has been performed. The transmission electron microscopy has shown the presence of electron-opaque spatially structured organic formations with different morphologies and linear sizes. Regular pollution of soils leads to formation of new kinetically stable organic and organic-mineral soil structures, having uncharacteristic of natural soil features. It's a fact, that there is a progressive formation of new types of functioning organic-mineral soil systems, which did not previously exist in nature.

EG-27

GEOCHEMICAL INDICATORS OF ANTHROPOGENIC APPORT IN THE TATUOCA RIVER FROM ACTIVITIES OF THE INDUSTRIAL PORTUARY COMPLEX OF SUAPE, BRAZIL

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The Industrial Port Complex of Suape (CIPS), shelters a variety of activities capable to interfere in the sanity of the receptor aquatic bodies and their stream sediments. The management of the harbor harbor activities, industrial and infrastructure can be elaborated through the study of the sediments quality of the surrounding aquatic bodies, like Rio Tatuoca, being able to indicate the distribution of the metals deposited and their eventual impacts. Four sedimentary cores were collected along Rio Tatuoca with the aid of sampling percussion equipment, soon afterwards they were split up in intervals of five centimeters composing a total of 33 samples that were analyzed in ICP/AES for determination of 16 chemical elements (Al, Ba, Ca, Cr, Fe, K, Li, Mg, Na, Ni, Pb, Sr, V, Y, Zn, Zr) besides the contents of organic matter and granulometric fractions. Through the statistical analysis, it was verified a separation among the chemical species Zr, V, Cr, Fe, Ni and Pb of the other species analyzed in this work, causing a different grouping among the cores 3 and 4 of the profiles 1 and 2, once the elimination of the matrix effect better evidences the affinity of the elements according with the geochemical background. It can be suggested that the chemical species Zr, V, Cr, Fe, Ni and Pb are indicative of terrigenous contribution. These results will be used as geochemical tool in the delineation of areas with larger degree of anthropic influence, subsidizing the management of environmental impacts in CIPS.

EG-28

TRACKING HEAVY METALS POLLUTION IN THE OGUDU WETLAND, LAGOS NIGERIA USING SEDIMENTS

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Wetlands are usually intensely impacted due to their strategic transitory locations and roles as depository for land derived waste materials. These make them active recipient, accumulators, and potential source of heavy metals for plant uptake, and in some cases ground water contamination. This study is aimed at assessing the concentration, intensity of impaction, and distribution of heavy metals in the study location vis-a-viz their potential health implications.

Six sediment cores were obtained from the study area using 30x10cm core barrels. The core samples were subdivided at 5cm intervals. These resulted in 30 sub-samples which were prepared and analysed using ICP-MS. An assessment of the intensity of contamination or pollution was undertaken using Enrichment Factor (EF), Geo-accumulation Index (Igeo), and Pollution Load Index (PLI). Furthermore, a geochemical profiling was employed to assess the concentration of heavy metals in sediments against depth.

The geochemical analysis revealed that the evaluated heavy metals surpassed their natural background. The Geo-environmental assessment indices revealed that Cu, Pb, and Zn have significant environmental implication. The geochemical profile plots for the sampled locations displayed a predominantly increasing upward trend which indicated an increase in the concentration of the soil's heavy metal content due to recent increase in anthropogenic activities within the area. Anthropogenic activities that are indicted for these metal concentrations include fossil fuel combustion, improper disposal of household and industrial wastes.

EG-29

ARSENIC CONCENTRATIONS EVOLUTION PRESERVED IN ESTUARINE SEDIMENTS CORE PROFILES IN THE ALAGOAS AND PERNAMBUCO STATES, BRAZIL

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Arsenic and metallic elements (Ni, Cu, Zn, Pb, Cd) concentrations were investigated on basis of samples from a three bottom core drills of 45 cm depth, analysed in estuarine sediments on the Alagoas and Pernambuco states, Northeast Brazil. A background value proposition was estimated for relatively well sediments preserved in these aquatics systems under tropical countries. The Botafogo and Jaboatão rivers stay in Pernambuco and Manguaba river in the Alagoas State. All these profiles (45 cm) is mainly composed by organo-pelitic sediments and its colors are shades of grey and black representing the last 100 years of the estuarine sedi-

mentation. Sedimentary records are strongly controlled by hydrodynamic constraints, very low currents inducing organo-pelitic sediments and the relatively high currents producing quartzose silts and sands. The analyzed chemical species generally had an increase in their concentration from the base to the top in all profiles, with the increase of organic-pelitic sediments. The chemical species shows a close correlation with Al_2O_3 ($r > 0.90$, generally), as consequence of adsorption by clay minerals and organic matter. In absolute terms, the arsenic levels reach values of approximately 22 mg/kg^{-1}, exceeding the threshold ERL (8.2 mg/kg^{-1}), with growing trend, setting up an environmental alert. Except for As, the concentrations of all elements are under the USEPA's ERL level. This result is influenced by small geogenic factors (rock weathering) and anthropic factors (industrial sources, urban sewage and fertilizers) but is representative of relatively well preserved in these hydrographic basins.

EG-30

EVIDENCE OF ANTHROPOGENIC CONTAMINATION BY CHROMIUM PRESERVED IN ESTUARINE SEDIMENTS, JABOATÃO RIVER, PERNAMBUCO, BRAZIL

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Two sub-recent sediments cores were collected from Jaboatão River estuary in order to determine the vertical distribution of metals (As, Cr, Pb, Hg, Ni and Zn) in estuarine sediments and to estimate the degree to which sediments are contaminated. The major elements and particle size were also analyzed. To assess the extent of anthropogenic pollution, the enrichment factor (EF) and toxicological reference values (SQG of USEPA) for river sediments were used. Al-normalized enrichment factors (EF) of metals were calculated based on average upper crust and two regional average values for pre-industrials estuarine sediments. The vertical distribution of fine fraction shows a gradual increase from the bottom to the top, while the Al/Si ratio presents an opposite behavior. Mn and K remain constant throughout the sediment profile. Fe, Mg, Ca and Na did not vary greatly with depth. Cu, Ni, Pb, Hg, Zn, Ca, Na, Mg, Fe, Al, and Ti are associated with the fine size fraction while the As is more related to the coarser fraction. Metal concentrations were highly variable especially for Cr (30-743 mg kg^{-1}). The EF values are typically under 1 for Ni, Zn, Pb, Hg indicating that these metals show no enrichment while other metals such as Cr present severe enrichment in most samples when compared to the upper crust reference values. Thus, the Jaboatão River sediments were contaminated with this metal by anthropogenic sources and the sediments are not of good quality in terms of content of arsenic.

EG-31

MERCURY IN BLACK SHALES OF BALTIC PALEOBASIN

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Toxic properties of black shales (BS) are known since the ancient times. The influence of mercury – even in small amount – can cause serious health problems and, in particular, this poisoning is a threat to fetal development and child development in the early stages of life. Mercury can have a toxic effect on nervous, digestive and immune systems, as well as lungs, kidneys, skin and eyes. Mercury is one of the most dangerous elements-pollutants of the biosphere with the highest toxicity among heavy metals, due to its chemical and geochemical features.

Baltic paleobasin of the dictionema black shales is located in the south-western and southern periphery of the Baltic crystalline shield and belongs to Vendian-Paleozoic platform cover. Sediments of the upper Cambrian-lower Ordovician extend from areas of southern Sweden and Estonia to Leningrad region (Russia). Dictyonema shale is a carbonaceous-argillaceous rocks containing up to 25% of the organic matter, clay and silty-sand particles. They contain illite, kaolinite, montmorillonite, chlorite, quartz, feldspar, pyrite, calcite, iron oxides and hydroxides, and carbonate, silicate, phosphate and sulphide concretions. According to M.P.Ketris and Ya.E.Yudovicha mercury clark in black shales (BS) is quite high and reaches 0,27 ± 0,03 ppm (2009).

Determination of mercury in black shales was performed using the Zeeman atomic absorption mercury analyzer RA-915M at the department of geochemistry, St. Petersburg State University. The study showed that mercury is presented in the samples in an amount of from 0.002 to 0.64 ppm.

In modern conditions as a result of weathering processes toxicants transform into migratory forms, enter the water and bottom sediments, accumulated by plants and may further be in the body of animals and humans. The migration is carried out in a mineral, ionic, colloidal and biogenic forms. Pathways and forms of migration depend on the association of chemical elements in rocks, landscape-climatic and geological conditions. The number of chemical elements in black shales may be represented in the form of particles of ultra-small size (less than 1000 nm) (Yushkin et all, 2005; Oleynikova, Panova, 2011).

Fin fraction was extracted from BS by hot water under certain conditions. Aqueous solution is analyzed by ICP-MS. In this case the detection limit for mercury was 0,0008 ppm.

Analysis were showed that the mercury content reaches 10,23 ppm.

Thus, black shales of the Baltic paleobasin accumulate up to 0,64 ppm of mercury that exceeds the clark value. In the aqueous extract (fin-fractions) of BS mercury contents up to 10,23 ppm were recorded. Mercury, which is in the rock in a mobile form can be leached from the rock and enter the water and soil of the area, creating water, soil and biogeochemical anomalies.

EG-32

ULTRASONIC STUDIES ON B-CYCLODEXTRIN/HYDROXYAPATITE COMPOSITES FOR POTENTIAL WATER DEPOLLUTION

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This paper presents structural, morphological and preliminary ultrasonic characterizations of the β-Cyclodextrin/hydroxyapatite (CD-HAp) composites synthesized by an adapted co-precipitation method. The structural and morphological properties were evaluated by Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Spectroscopy (EDAX). The novelty of our study consists of preliminary ultrasonic measurements conducted on CD-HAp composite uniformly dispersed in distilled water. The benefits of this non-destructive method could facilitate the modernization of the characterization techniques of different nanoparticles. Our experiments proved that the removal efficiency of CD-HAp composites with respect to lead ions depends on the initial concentration of lead. Considering the properties that both hydroxyapatite (HAp) and β-Cyclodextrin (β-CD) possess, with respect to potential environmental applications, this paper is focused on the study of a compound based on HAp and two different concentrations of β-CD (CD-HAp_1 and CD-HAp_2). At room temperature, the correlation coefficient of Langmuir isotherm (R^2) for Pb^{2+} removal by CD-HAp_2 had a higher value than in the case of Pb^{2+} removal by CD-HAp_1. On the other hand, the maximum adsorption capacity for the solid phase, qm (mg/g), for Pb^{2+} indicated a higher rate of removal of Pb^{2+} by CD-HAp_2. These adsorption results could bring valuable insight into the beneficial contribution of our compounds for the removal of heavy metal ions from aqueous solutions.

EG-33

HUMAN HEALTH RISK ASSESSMENT OF HEAVY METALS IN THE URBAN ENVIRONMENTS OF ARMENIA

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Soils of urbanized and industrialized areas are basis of environmental quality, and one of its main functions is to maintain human health (HH). In Armenia, in old mining regions and huge industrial cities, human activities lead to the formation of areas polluted by heavy metals (HM). In mining regions, high contents of HM are the result of geogenic and anthropogenic components superposition while in industrial cities HM are mainly from anthropogenic sources. In both cases, although primary pollutants and levels of anthropogenic input are different, increased contents of HM may pose a risk to HH. Therefore, HH risk assessment was done based on the contents of HM in soils of Kajaran, Yerevan, and Gyumri. The latter two are industrial and urbanized cities, while Kajaran is located near Mo-Cu combine. Risk assessment model of US EPA was used, and as a preferential exposure pathway, soil ingestion was chosen. The result showed that multi-elemental non-carcinogenic risk (HI>1) to adults observed in 4 sampling sites both for Yerevan and Kajaran while in Gyumri HI<1. For children, non-carcinogenic risk ranges 1.1-22.1 (mean is 2.3) for Yerevan, 0.8-7.4 (mean is 1.6) for Gyumri, and 2.9-21.3 (mean is 6.8) for Kajaran indicating possible adverse health effect for children in whole area of all cities. The riskiest elements were Pb and Cr in Yerevan, Pb in Gyumri, and Mo in Kajaran. The high Mo concentrations in Kajaran can be the result of geogenic input as well. The results obtained highlight the need for further detailed studies.

EG-34

CHARACTERISING ALUMINIUM DYNAMICS IN A RURAL STREAM USING CONCENTRATION-DISCHARGE RELATIONSHIPS

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Solute concentration-discharge hysteresis during storm events may be used to infer spatial and temporal dynamics of solute source availability and hydrological pathways. Concentration-discharge behaviour has been intensively studied at storm event scale for sediment and nutrients. However, little information is available regarding metal concentration-discharge hys-

teresis. In this study, Al dynamics were investigated in a small rural catchment under humid temperate climate in Galicia (NW Spain) using hysteresis analysis. The majority of the catchment (91%) is occupied by forest (65%) and pastures (26%) whereas 4% is used for cultivation (mostly maize and winter cereal) and the remaining 5% belong to impervious areas. The soils in the catchment are developed on metamorphic schists of the Órdenes Complex formed by easily alterable minerals, such as biotite (sometimes chlorite), plagioclase and amphiboles. The surface soil layer has silt or silt-loam texture, acidic pH and variable organic matter content (4.4-10.5%). Discharge and Al (dissolved and particulate) data were collected at the catchment outlet during 44 storm events between October 2005 and September 2008. Al (total and dissolved) concentrations were determined by ICP-MS. Particulate Al concentrations were calculated from the difference between Al total and Al dissolved concentrations. The results showed that particulate Al exhibit in most of the storm events clockwise hysteresis loops, reflecting the Al mobilisation from nearby sources to the stream via surface runoff. However, dissolved Al presented more frequently anticlockwise hysteresis loops, as the dissolved organic carbon (DOC). This implies a different transport pathway to the particulate Al, associated with DOC.

EG-35

ASSESSMENT OF THE POTENTIAL BIOAVAILABILITY OF CU AND ZN BY SEQUENTIAL EXTRACTION IN RIVER BED SEDIMENTS OF A SMALL RURAL SETTING (NW SPAIN)

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Heavy metals discharged into a river system by natural or anthropogenic sources during their transport are distributed between the aqueous phase and bed sediments. To assess sediment-associated metals, sequential extraction procedures are commonly applied and used as a measure of their potential mobility and bioavailability to living organisms. This study presents the results on the evaluation of the geochemical association of Cu and Zn in bed sediments of the upper Mero River (A Coruña, NW Spain). This catchment is located in a small rural setting with 42% of its area devoted to agricultural land (pastures and cultivation) and 53% to forest use. Sediment samples were collected from the top 5 cm of the river bed between the headwater and the catchment outlet. The < 2 mm fraction of sediments was separated and subjected to chemical analysis. To assess the bioavailability of Cu and Zn a six-step sequential extraction procedure was used, distinguishing the following fractions: soluble/exchangeable/specifically adsorbed, metals that are bound to Mn oxides, amorphous compounds, oxidizable organic matter, crystalline Fe oxides, and residual metals. The residual fraction was decomposed with hot mixed acid (HCl + HNO3 + HF). The elemental concentrations were obtained by atomic absorption spectrophotometry. The metals here studied mainly occur in the residual fraction suggesting a natural source (geogenic and/or pedogenic origin). The bioavailability of the three metals (considering the sum of the three least mobile fractions, namely, organic matter, crystalline Fe oxides, and residual) in the sediments decrease in the following order: Cu > Zn.

EG-36

SPATIOTEMPORAL VARIABILITY OF DISSOLVED METALS IN SURFACE WATERS OF A HUMID AGROFORESTRY CATCHMENT WITH LOW LEVELS OF ANTHROPOGENIC POLLUTION

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Evaluation of levels and spatial variations of metals in the surface waters within a catchment are critical to understanding the extent of land-use impact on the river systems. The aims of this study were to i) investigate the spatial and temporal variations of five dissolved metal concentrations (Al, Fe, Mn, Cu and Zn) in surface waters of a small agroforestry catchment (16 km^2) in NW Spain and ii) establish background levels for these metals in the riverine waters. The land uses include mainly forests (65%) and agriculture (pastures: 26%, cultivation: 4%). Stream water samples were collected at four sampling sites distributed along the main course of the Corbeira stream (Galicia, NW Spain) between the headwater of the stream and the catchment outlet. The headwater point can be considered as pristine environment with natural metal concentrations in waters because of the absence of any agricultural activity and limited accessibility. A total of 272 water samples were analysed during 5-year period. Metal concentrations were determined by ICP-MS. The results showed that, in general, metal contents increased from the headwater to the catchment outlet. Metal concentrations were relatively low (Fe > Al > Mn > Zn > Cu), suggesting little influence from agricultural activities in the area. Metals presented mean concentrations below reference values for world-unpolluted rivers except for Fe and Zn. This threshold was exceeds in the 3%, 5%, 29% and 84% of the samples for Al, Mn, Fe and Zn, respectively. Metal concentrations do not exceeded the quality standards of European legislation for water intended for human consumption.

EG-37

HYDROGEOCHEMISTRY OF THE DRINKING WATER SOURCES OF THE TOMBAK VILLAGE (KAHRAMANMARAŞ) AND THEIR EFFECTS ON HUMAN HEALTH

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The aim of this study is to investigate drinking water sources of the Değirmentaş village (Sarız-Kayseri-Turkey), in terms of hydrogeochemistry, isotope geochemistry, and medical geology. Water samples of the area were supplied from five different water sources. Isotopic analyses of ^{18}O and ^{2}H (deuterium) were conducted on the samples collected from the region for one year. Water quality assessment parameters such as temperature, pH, conductivity, alkalinity, trace element concentrations, anion-cation measurements and metal concentrations were determined using ion chromatography, ICP-MS, and ICP-OES techniques in order to determine the quality of water sources. During regional investigations, at the view of medical geology, the iodine contents of Değirmentaş drinking waters are range from 0.75 to 0.82 µg / L. The World Health Organization (WHO) reports that the amount of iodine in drinking water should be at least 10 µg / L. Değirmentaş people living in this area are thought to have been caused by the lack of drinking water in those who have gotten goitre disorder.

EG-38

HYDROGEOCHEMISTRY OF THE DRINKING WATER SOURCES OF THE YUKARIKARGABUKU (ANZOREY) VILLAGE (KAHRAMANMARAŞ) AND THEIR EFFECTS ON HUMAN HEALTH

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The aim of this study is to investigate drinking water sources of the Yukarıkargabükü (Anzorey) Village (Göksun – Kahramanmaraş-Turkey), Turkey, in terms of hydrogeochemistry, isotope geochemistry, and medical geology. Water samples of the area were supplied from seven different water sources. Isotopic analyses of ^{18}O and ^{2}H (deuterium) were conducted on the samples collected from the region for one year. Water quality assessment parameters such as temperature, pH, conductivity, alkalinity, trace element concentrations, anion-cation measurements and metal concentrations were determined using ion chromatography, ICP-MS, and ICP-OES techniques in order to determine the quality of water sources. During regional investigations, at the view of medical geology, it was thought that the hearing levels of Anzorey people exposure to low dose barium and the toxic effect on the inner ear would be high.

EG-39

HYDROGEOCHEMISTRY OF THE DRINKING WATER SOURCES OF THE DEĞIRMENTAŞ VILLAGE (SARIZ-KAYSERI) AND THEIR EFFECTS ON HUMAN HEALTH

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The aim of this study is to investigate drinking water sources of the Değirmentaş village (Sarız-Kayseri-Turkey), in terms of hydrogeochemistry, isotope geochemistry, and medical geology. Water samples of the area were supplied from five different water sources. Isotopic analyses of ^{18}O and ^{2}H (deuterium) were conducted on the samples collected from the region for one year. Water quality assessment parameters such as temperature, pH, conductivity, alkalinity, trace element concentrations, anion-cation measurements and metal concentrations were determined using ion chromatography, ICP-MS, and ICP-OES techniques in order to determine the quality of water sources. During regional investigations, at the view of medical geology, the iodine contents of Tombak drinking waters are range from 0.75 to 0.82 µg / L. The World Health Organization (WHO) reports that the amount of iodine in drinking water should be at least 10 µg / L. Değirmentaş people living in this area are thought to have been caused by the lack of drinking water in those who have gotten goitre disorder.

EG-40

DISTRIBUTION, SOURCES AND ENVIRONMENTAL RISK OF TRACE METALS IN SEDIMENTS OF LONGJIANG RIVER, SOUTH CHINA

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Trace metal enrichment in sediments impacted by sulfide mineral mining and smelting in the Longjiang River, South China has received high environmental concern. This paper aims to explore the spatial distribution, source and environmental risk of the selected metals of As, Cd, Pb, Sb, Zn, and Tl in the river system. The average concentrations of the six metals were all higher than the background values, especially for elevated Cd (2.0 mg/kg) and Sb (19.3 mg/kg). Enrichment factor values (EFs) of As, Cd, Pb, Sb, and Zn showed that they were highly enriched in the industrialized and urbanized areas, midstream of Longjiang river (3.2, 27.9, 8.6, 27.1 and 8.6 on average, respectively); and Cd also enriched in upstream and downstream (9.1, 14.5 on average, respectively). The metal concentrations in the river sediments showed significantly positive correlations with each other ($0.518 \leq r \leq 0.845$, $p<0.05$), indicating that the enrichment may be attributed to the midstream Sb-Pb-Zn metal smelting activities. Other anthropogenic sources such as sewage effluence may also contribute to metal enrichment in sediments. EFs of Tl (0.9-1.6) showed slightly variation in the river and significantly correlated with Ti ($r = 0.722$, $p<0.01$), indicated that Tl majorly originated from geogenic source. The average potential bioavailable fraction of As, Cd, Pb, Sb, Zn and Tl were 21.2%, 45.3%, 38.7%, 28.9%, 41.5%, 9.7%, respectively, and displayed positive correlation with EFs (except for Tl), indicating that the metal enrichment in surface sediments exhibited high environmental risk to aquatic system, especially in midstream.

EG-41

POPLAR LEAF ELEMENTAL COMPOSITION AS A REFLECTOR OF THE INTENSITY OF ANTHROPOGENIC IMPACT ON ECOSYSTEMS AND HUMAN HEALTH

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Tree leaves, due to their morphological features, can act as a kind of natural receptor that accumulate pollution from conjugated geosphere shells, mainly from the atmosphere, and reflect the intensity of anthropogenic impact.

In this research, we chose to study the leaves of *Populus nigra L.* (black poplar) on the urban territory with a high concentration of industrial companies of different profiles. It is a city called Ust-Kamenogorsk and situated in East Kazakhstan.

According to the complex of biogeochemical indicators and their comparison with those in other regions, the geochemical specificity of black poplar leaves in Ust-Kamenogorsk is established. The priority elements concentrated in the leaves (among the 33 studied) are Zn, Pb, As, Sb, Ag, Ta, U, Be, La.

Peculiarities of the spatial localization of chemical elements identified through their accumulation and distribution, allow us to state that the main source of Zn, Ag, Au, Sb is the lead-zinc plant "Kazzinc"; and Ta, U, Be – the Ulba metallurgical plant.

The next stage is the impact assessment of industrial enterprises on the environment by the method of life cycle impact assessment (LCIA) – USEtox™. We take into account the contribution of 8 chemical elements (Ag, As, Ba, Be, Co, Cr, Sb, Zn) for which information is available in the Ecoinvent database. The highest toxic effect on humans and ecosystems is observed in the impact zone of both industrial companies, while zinc emissions contribute most to the toxicity index (about 95%).

The results objectively reflect that by means of the elemental composition analysis of black poplar leaves; it is possible to determine not only the current state of the environment, especially in urban areas, but also to predict the future impact on the ecosystem and human health.

EG-42

AVAILABILITY OF HEAVY METALS IN THE KARST SOILS AND THEIR UPTAKE BY RICE

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The karst soils in southwestern China are formed by the weathering of carbonate rocks, which have high concentrations of heavy metals. This study collected 90 soil and rice samples in Hengxian county, southwestern China to research extracted concentrations of heavy metals (As, Cd, Cu, Ni, Pb and Zn). Three reagents acetic acid, EDTA and $CaCl_2$ were selected to extract these metals in the karst soils. The results showed lower concentrations of extracted heavy metals in these soils compared to anthropogenic polluted soils. EDTA extracted more metals than other reagents, but acetic acid extracted more Zn in most samples. These results indicates the bioavailability of heavy metals in karst soil is associated with rhizosphere environment, soil properties and metal intrinsic character. The alkaline environment of soil is not favorable to metal release, but organic acids from plant roots can enhance the metal solubility.

It is obvious rice in these soils absorbs selectively heavy metals according to available concentrations. Zinc, As and Cu showed higher absorption rates and Cd, Pb showed lower absorption rates for rice grains, which are different from anthropogenic polluted soils. Based on the correlation analysis of heavy metals, the best correlations were found between EDTA-extracted metals and metals in rice grains. This result indicates the rhizosphere environment takes a significant effect on the metal uptake of rice in karst soils.

EG-43

IMPACTS OF SOIL POLLUTION ON HUMAN HEALTH IN IRAQ

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The impacts of regional radioactive pollution, over all Iraq, and a domestic site pollution, 30 km west Mosul city at Northern Iraq, were highlighted in this study. The regional radioactive pollution are due to the Depleted Uranium weapons (DU) used against Iraq since 1991 till 2003. The effects of the regional pollution extended outside Iraq and noticed at the surrounding countries, Kuwait for example. The pollution rate were estimated using an international computer program designed for this purposes. The authorized communities announced that more than hundreds tons of DU missiles were used during 1991, and the rate increased to thousands of tons in 2003, at Southern, Middle and Northern Iraq. While the domestic radioactive pollution was caused by an accident case at (U) radioactive Waste grave. The accident cause releasing and distribution of radioactive waste material on the earth surface of an area 500m x 500m. The two events induce the environmental pollution in air, water and soil. The data show very high equivalent radioactive dose at the Battle Field at Basrah, Zubair and Safwan sites in comparison with the international accepted level of ICRP. Blood samples from persons (male and Female) living near the domestic polluted site were analyzed. The results show a significant abnormalities related to the normal characteristics. According to Mosul General Hospital documented data for that period, this may give an indication for a probability to induce an abnormal increasing in cancer types of some sensitive human body organs. The reported information for the affected 45 organs shows different ratios of response to cancer cases. They are distributed as follows: 10 organs 0%, 12 organs 50% , 10 organs 100%, 1organ 200%, 4 organs 300%, 1 organ 400%, 1 organ 500%, 1 organ, 800% and 1 organ 6400%. The latter ratio is related to the skin cancer, which is give a very good indication for the radioactive air pollution in this site specially for radioactive alpha particle emitters within Uranium compounds.

EG-44

IMPACT OF THE LESS IODINE IN WATER FOR PUBLIC HEALTH IN PONOROGO, EAST JAVA OF INDONESIA

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In Ponorogo, East Java province, there is Karang Patihan village suffer diseases is iodIne deficiency. Morphology the area found on the slopes of the hills more than 40%, so estimated minerals needed by the human body is a lot of erosion by streams of rain water, and its location is isolated from the urban areas so that the distribution of nutritious foods often have difficulty. Water samples were taken from the well; drilling; river and spring water, so the results of the Iodine analysis are as follows (Iodine in ug/Lt): wells, (SG-1; SG-2; SG-3; SG-4; SG-5) = 26. in the drilling (SB-1) = 44. river water (AS-1; AS-2) = 0 and spring water (MA-1) = 32, all elements of the Iodine less than 150 ug/Lt. Where as the needs of iodine per day for health is 150 – 200 ug/ Lt. Information from the local Health Department, the diseases shortage of Iodine is 89 people. To improve the quality of health care for the local population, improvement of nutrition and extra iodine salt to be given regularly by the local Health Department so that the next generation of the society will live more healthy and prosperous.

EG-45

WATER AS A SOURCE OF RADIATION EXPOSURE: LABORATORY EXPERIENCE AND METHODS OF RADIONUCLIDE ANALYSIS

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Water plays a crucial role in ecosystems and human health and well-being largely depends on its quality. Both drinking water and water used for industrial and commercial activities make a significant contribution to the total effective dose from natural background radiation. According to UNSCEAR (2008), humans receive up to 30% of the total worldwide average annual dose from natural sources like food and water. In some cases concentrations of naturally occurring toxic radionuclides (e.g. uranium) in water can be very high and exceed national guidelines.

To estimate radiation exposure levels (and other parameters) through ingestion of water the Laboratory of Isotopic Methods of Analysis (LIMA) has developed the complex of effective laboratory radioisotopic methods of measurement that includes more than 50 certified radiochemical and instrumental techniques recognized by the Russian Federal Agency on Technical Regulating and Metrology (Rosstandart) and featured in the Federal Register list. The complex can be applied in laboratories for various fields of science including geochemistry, radiology, environment studies and medicine. The methods comply with domestic and imported standard analytical equipment, are simple to use and allow obtaining reliable data.

LIMA has been improving and refining the complex of methods of radionuclide analysis for more than 20 years through our own comprehensive studies of a large variety of water bodies in Russia and abroad. We analyze natural (artesian and surface) drinking water supplies as well as waste water coming from nuclear facilities, produced water from oil and gas operations, groundwater in areas of uranium exploration and mining and natural water contaminated by the Chernobyl accident.

The collected data includes the results of more than 20 000 tests devised to determine natural and artificial radioisotopes (U, Th, Ra, Po, Pb, Pu, Am, Cm, Cs, Sr, etc.), to assess corresponding radiation effective doses and risks to human well-being as well as to provide information on radiological types of drinking water in different regions. This data may be relevant for groups of experts in medical physics and biological hazard protection who study various health-related environmental factors.

EG-46

WELL WATER MANGANESE IN FINLAND

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Manganese (Mn) is a natural occurring element found ubiquitously in bedrock, soil, water, air and plants. It is a neurotoxic element but it is also an essential micronutrient required in trace amount for human health. Mn concentrations greater than 50 µg/L may cause gray color or unpleasant odor or taste to drinking water (DW). Excessive exposure to Mn in DW has been associated with neurological disorders that resemble symptoms to Parkinson disease (PD) such as tremors, difficulties in walking and facial muscle spasms. Among children, exposure to Mn at levels common in DW has been associated with intellectual impairment. The ground water data was obtained from the database of the Geological Survey of Finland (GTK). The data of KAIMA-project consists of 5311 single samples including analysis from 2383 bedrock drilled wells and 2928 Quaternary deposit wells i.e. dug wells, springs, captured spring wells and Quaternary drilled tube wells. The number of monitoring samples was 4607 including 380 bedrock wells and 4227 Quaternary deposit wells. Manganese was mainly analysed as soluble form, but in few samples also total Mn was analysed. About 41 % of single water samples of drilled wells and 17 % of Quaternary deposit wells exceeded the Finnish national regulation of 50 µg/L for Mn. Preliminary results from monitoring data indicate that Mn concentrations have clear annual and seasonal variation. The findings showed that Mn was mainly in soluble form. Only in samples with high Fe concentration the manganese was bounded in particles and caused higher total Mn.

EG-47

AGRICULTURAL SOIL GEOCHEMISTRY OF TRACE ELEMENTS: ACCUMULATION PATTERNS IN CITRUS, OLIVE GROVES AND VINEYARDS FROM PELOPONNESE, GREECE

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Various agrochemicals, including fertilizers, pesticides and fungicides are commonly applied to agricultural land to promote crop growth and ensure successful harvests. However, their long term application is a contributor for trace metal accumulation in the receiving soil. We investigated the concentration levels of a large suite of trace metals (Cu, Pb, Zn, Cd, P, Ni, Cr, Co, Mn, As) in citrus (n=64), olive (n=61) and vineyard (n=40) calcareous soils collected from Peloponnese area, Greece, aiming to explore the influence of agricultural practices on the chemistry of soil from each crop category. Enrichment Factors (EF), calculated against uncultivated soils, showed that the vineyards and citrus soils are more susceptible to Cu, Cd and P accumulation compared to the soils cultivated for olive trees. Copper (range 42-275 mg kg^{-1} and 33-291 mg kg^{-1} for citrus and vineyard soils, respectively) was found to be the most significantly enriched trace metal as result of anthropogenic inputs related to the application of Cu-based fungicidal sprays. Application of a sequential extraction procedure on selected vineyard soils showed that the major geochemical hosts of Cu were the amorphous Fe oxides (34% of total Cu), followed by organic matter (25% of total Cu). Availability of Cu (defined as HNO_3, EDTA and HAc- extracted Cu), in the agricultural soils was comparable to that of highly urbanized soils from the city of Athens, indicating that similar sequestration mechanisms might influence the geochemical reactivity of Cu deriving from agricultural activities in the rural environment and traffic related sources in urban settings.

EG-48

ABOUT SCIENTIFIC HERITAGE OF THE EMINENT GEOCHEMIST AND MINERALOGIST STEPAN BADALOV

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BIOGEOCHEMICAL ROLE AND IMPORTANCE OF THE ELEMENTS WITH VARIABLE VALENCE AND UNSTABLE ISOTOPES IN HUMAN ORGANISM

Unstable isotopes were divided into 2 groups according to the effect they produce on human organism:

1. 12 isotopes with nucleus decay, more harmful rather than useful, from the most dangerous Radon to Platinum-190, and
2. 9 isotopes with isobaric transformations, more useful rather than harmful, from Potassium-40 to Lutetium-176.

The most active isotopes, having the shortest periods of semi-decay were discussed. Isotope decays and transformations occur in human organism at a rate of over 400,000 times per minute. These processes generate 23 new isotopes of other elements, some of which are useful, while others are detrimental for the organs and systems, where they originated. Out of more than 38 elements with variable valence, approximately 20, including Iron, Sulphur, Copper, Vanadium, Manganese, Cobalt, Molybdenum, Selenium, Gold, Phosphorus and others play the most critical role for various organs and systems of human organism.

The elements with variable valence (Iron, Manganese, Vanadium, Sulphur, etc) play important role both for the organism, and for separate organs. Their role is to either absorb or release Oxygen during the processes accompanying the changes of valences. Amounts of some of these elements are so negligible, e.g. Manganese in blood is only 0.0x mg / L that they can only work as catalysts facilitating activity of the most vital organs. Gold (both Au^{1+} and Au^{3+}), Vanadium, Manganese, Molybdenum (from 2 to 7), Selenium, Titanium, Rhenium, and other elements also play a vital role.

Illustrated by 2 Tables
Table 1. Distribution of the chemical elements and their isotopes in human organs and systems (in descending order of their importance)
Table 2. Unstable isotopes of the chemical elements (in descending order of their importance for organs and systems)

EG-49

BIOGEOCHEMICAL ASSESSMENT OF THE IMPACT OF CISCARPATHIAN LANDSCAPE ON POPULATION HEALTH

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The chemical composition of soils and natural waters affects the biochemical processes in phyto- and zoocenosis of certain area. Regularities of disease spread among the population of Ciscarpathia are consistent with three landscape groups – mountain, foothill and plain.

Carpathian flysch rocks are the main source of dispersed elements that enter the environment. According to research, the sediments of Cretaceous, Paleogene and Neogene period contain concentrations of Ti, Cr, Cu, Ni, Ga, Zr and Ba that are equal to bulk earth values, but Be, Mg, V and Sr compose less than bulk earth value. Abrupt changes of dispersed elements content are observed during the gradation from mudstones of Stryiska suite to siltstones and sandstones of Yamnenska suite, namely, the concentration of Mn decreases by a factor of 42, Cu – 21, Ba, Mg – 16, Ni – 3 and Ti – by a factor of 2. Along with the transition to the Quaternary sediments, concentration of trace elements in rocks significantly reduces and is not exposed to sudden changes in the entire their vertical section.

Liveliness of dispersed elements is increased in the weathering crust. In mountainous landscapes Sr is extensively washed from rocks, Mn and Cu are less washed; Ti, Cr and Va are poorly included into water migration. The intensity of elements removal decreases along with transition to plains. The intensity of trace elements involvement into migration is associated with rocks weathering. In mountainous landscapes the weathering crust coincides with the soil. Sr has the highest migration ability in Carpathians, then Mn, Cu, Ba, V and Pb follow in descending order.

According to the research, along with absolute landmarks increasing, water migration factors of micronutrients are increased. After passing to the soluble state trace elements reach the groundwater.

Groundwater mineralization significantly increases along with the changes in mountain landscapes on foothills and plains. In the direction from mountains to plains the content of Sr, V and Ba in groundwater decreases and the content of Ni, Pb and Mn increases. The highest concentrations of Cu, Cr and Mo are typical for groundwater of mountain landscapes.

Climatic conditions and mountainous relief of Ciscarpathia contribute to the rocks weathering and transition of trace elements into moving (mobile) form. In mountainous landscapes plant species composition is determined by mineralogical and chemical composition of soil formation rocks and intensity of their destruction. Soil depth in this area is shallow, granulometric composition is insignificant. This led to the formation of high mountain Phytocenoses, which are characterized by a high content of V, Sr, Mn and Cu.

In lowland landscapes of Ciscarpathia the conditions of phytocenoses are associated with increased concentrations of Mn, Ba, Cr and Pb in soils and groundwater. Groundwater miner-

alization in this area increases almost threefold in comparison with the mountainous area. The processes of dispersed elements migration are slowing down. Areas with high concentration and dispersion of trace elements are typical for lowland landscapes. Concentrations of V, Sr and Cu are smaller in plain area phytocenoses in comparison with highland phytocoenoses.

Plants are the food of humans and animals and are used to produce drugs. Qualitative and quantitative composition of compounds, synthesized by plants, depends not only on their type, but also on the composition of nutrient medium. Plants affect human and animal health by means of biologically active metabolites.

Mountain people are often affected by the thromboobliterating diseases; they rarely suffer from leukemia, lymphomatoid granulomatosis, malignant myopia, acute attacks of glaucoma, malignant neoplasms, brain and spinal cord tumors and nephritis.

Population of foothill area often suffers from leukemia and malignant myopia, population of plains suffers from acute attacks of glaucoma, gastric and lung cancer, tumors of brain and spinal cord and nephritis, rarer – from thromboobliterating diseases.

The results of medical and geographical studies give reason to believe that the prevention of blood system diseases, ophthalmology and dental diseases among the population via selection of diet with optimal micronutrient content could be quite promising.

EG-50

AN ARSENIC GEOLOGIC PROVINCE IN NORTHERN MEXICO, AND THE IMPLICATIONS OF LOW LEVEL EXPOSURE IN DRINKING WATER: INSIGHTS FROM A MURINE MODEL

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In this work, a Geographic Information System and a database of stream sediments were used to generate an arsenic map of the state. The highest As contents were constrained to the Yaqui Basin which is the main source of water for the state and for the most important agricultural area in México. The hydrologic Yaqui basin hosts some of the most important copperdominated deposits that can be considered part of a larger belt of intrusion-related ore deposits of northern Mexico and southwestern United States. Drinking water has been considered as the predominant pathway of human exposure to environmental metals in agricultural areas at arid regions. In this work, As-content of drinking water was analyzed from three indigenous towns located at the Yaqui agricultural valley. Water contains low levels of As when compared to areas such as Bangladesh, Argentina and Comarca Lagunera in Mexico. However, previous research show negative health effects for low dose and chronic exposure to As. To evaluate the health effects, mice were exposed to drinking water with low, medium and "high" As contents (0.075, 0.012 and 0.006 mg/L, respectively). The mice presented behavioral changes, such as pilo erection, Straub sign and aggressiveness. Those alterations coming from the interaction of animals and a neurotoxic agent. The results from this work shows that the Yaqui basin is a geological arsenic province that deserves further research, mainly because nearly 50% of Sonoran population live in cities and towns that are located within this province.

SECTION: SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL HEALTH (SD)

SD-01

STUDY TO DETERMINE FACTORS THAT AFFECT MALNUTRITION IN CHILDREN OF RÍO BLANCO, ZAPOPAN, JALISCO. MEXICO

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We studied the Río Blanco area located at the eastern part of the municipality of Zapopan, Jalisco, Mexico. Here there are two aquifers: the shallow one the water table (WT) is < 20 m depth; the deeper one the WT is at 50 m depth. Fractures and faults facilitate the interaction between these aquifers. The shallow aquifer supplies the population through waterwheels, and is used for drinking water, cooking, and irrigation (CEA, 2016).

Between 2006 and 2007, (before and post-rainy season) 30 waterways and a deep well were sampled to establish water quality. 23 chemical and physical parameters were determined. High concentrations of nitrates between 23.3 and 25.9 ml /l were found in the 100% of the samples with a pH between 7.26 and 5.82.

Height and weight of children under 5 were taken, they are the most vulnerable population. Medical examination was carried out as well. Our results show that the 54.2% of this population have chronic diarrhea and different degrees of malnutrition.

We suggest that the symptoms of this vulnerable population are associated with intoxication by the nitrate concentrations in drinking water. The lost of fluids and electrolytes cause children to lose body mass. It is possible that groundwater contamination is because of agricultural activities in the basin, agrochemical use, as well as septic tanks. In 1990 the 90.78% of households had no drainage.

SD-02

ADEQUATE TECHNICAL FOR WATER MANAGEMENT REDUCE PUBLIC HEALTH PROBLEMS IN NORTHEASTERN BRAZIL

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To evaluate the potential use of appropriate technology (water cistern) as one forms of water supply of the Brazilian semi-arid region diffuse population, was effected by the UFPE, a search in the village of Mutuca, municipality of Pesqueira-PE. Four investigative sections have been considered: technical vision, where they discuss the potentialities and difficulties of the employment; the anthropological vision, related to the acceptance of the population as an essential condition to the success of the development; the third vision addresses the aspects of public health, with indicators reduction of gastro-intestinal problems and worms in children. Finally, the fourth management vision encompassing the operation and maintenance of infrastructures where are addressed and discussed successes and failures. As a result it could be observed that the hydrological point of view, a 16 m^3 cistern can be implemented in all households which have a roof with at least 40 m^2 of area, with daily guaranteed withdrawal less than 50 l/day, whereas occurrence of failures of up to 40% in time were observed in simulations. In microclimate areas up to four tanks could be supplied. Highlight the difficulties inherent to the operation of tankers, with contamination by roofs. A real decrease in the numbers of cases of childhood diarrhea was verified in the units where the care recommended for the management of tanks were followed by families object of study.

SD-03

CHEMICAL QUALITY OF MINERAL WATERS IN THE METROPOLITAN REGION OF RECIFE – PE

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The Metropolitan Region of Recife (RMR), formed by 14 municipalities, was originated by several depositional environments that make up the coastal sedimentary basins of Paraíba (North) and Pernambuco (South), separated by the structural divisor Pernambuco Shear Zone, sheltering the Cabo, Beberibe, Barreiras, and Boa Viagem fissured aquifers with distinct hydrodynamic characteristics, and that mainly since the 90's have been contributing effectively to the supply of mineral water. Data from the International Association of Bottled Waters show that Brazilian demand for bottled waters grows more than 7% per year. Brazil is already the 4th largest market where five billion liters of mineral water are consumed each year, per data from the Brazilian Association of Mineral Water Industry. In the RMR, there are conflicts in the exploitation of the important Beberibe aquifer, where there are the largest reserves of mineral water and consequently, a greater exploratory demand. The indiscriminate use of these aquifers has caused serious damages, among them, the piezometric lowering and the variation of the hydrochemical parameters of the water. The chemical quality of the water, determined by the quantity and quality of the mineral salts such as calcium, sodium, potassium and magnesium, are within the standards established by the Brazilian drinking water legislation. Most of the mineral waters present a pH with values between 4 and 6, per the standard set by the Ministry of Health. In RMR most mineral waters have a good chemical quality, offering no risks to human health.

SD-04

STUDY OF RADON CONCENTRATION IN BAMA MINE

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Radon is a naturally radioactive noble gas, that can not see, smell or taste it. It can be revealed only by special devices. Radon gas produces by radioactive decay of Radium and Radium produce from Uranium decay. The amount of radioactivity in air by Radon gas measure in Bq/m3 of air. Evidence of high level of Radon and radiation associated with an increased risk of lung cancer has caused concern. In fact what about the health risk of Radon radiation is known is more than other carcinogenic. So, checking Radon gas in different region, especially in areas that are occupied by different people, both for employment and for life is essential. The study mine is located 20 KMs

southwest of Isfahan and into Irankuh mountain range. The purpose of this study is to measure of amount of Radon gas in indoor air of Bama lead and zinc mine and the environment surrounding it, and compare the amount of Radon in mine air with its critical level. This critical level produced by international organization for radiation protection for maintain the health of mine workers and surrounding residents will be provided. Samples were analysed by Radonmeter with this profile: (RAD 7 DURRIDGE 711 model, serial number 01872 made in USA, in 2 case, Radon and Thoron metery). The relationship between Radon concentration and height of each horizon from sea level was determined. With study of measurement that was done in 48 hours in different parts of mine, was determined that Radon is in permissible limit. In horizon of 1500 meters, average radon concentration during a day 28/3 Bq/m3 determined. But at the end one of sub-channels in this horizon where the ore is removed, radon gas concentration due to low ventilation, to be 196 Bq/m3 that is significant.

Keywords: Radon, Radioactivity, Bama mine, Permissible limit, Health effects

Introduction. Radon is a naturally radioactive noble gas, that cannot see, smell or taste it. It can be reveaked only by special devices. Radon gas produce by radioactive decay of radium, and radium produce from uranium decay. Uranium are found in soils and rocks in small quantities, although it varies from place to place. Radon gas is rising from the earth and be spread in the air and daughter nuclei of radon radiation which are solid at normal conditions, are jointed to the dust in the atmosphere.

Radioactivity from these atmospheric springs varies in different parts of the earth, and depends on local density of uranium and thorium in the earth. Radon concentrations in the atmosphere, is 0.000002 Bq/ml. But it is unusual densities ten times greater.

Because radon radiation daughter nuclei are found in aerosols in the atmosphere, since aerosols are also brought to the surface by rain. Increase in background radiation, when the rainfall is very reasonable. This phenomenon is also observed in practice, but when the ground is covered with snow, radioactivity that caused by suspended a particle is reduced. Radon decays in form of radioactive particles and can enter the body through inhalation. Inhalation of short –lived radon decay products linked to increased risk of developing cancer of the respiratory components particularly the lungs.

Lunge cancer only in America leads to 20000 and in Canada leads to 2000-3000 deaths annually from breathing radon in indoor air of homes. After smoking, radon has second ranks in mortality from lung cancer. Geology is the most important factor in controlling the source and distribution of radon.

Relatively high levels of radon exposure related to types of bedrocks and unconsolidated formations. For example could be named some granites, shales and phosphatic rocks. Radon gas released and controlled from the rocks and soil by a variety of minerals in which uranium and radium is present. Once radon gas is released from minerals, are transported by transport mechanism to surface soil and rocks. These mechanism are include natural carrier factors such as carbon dioxide gas and mineral waters, climate factor such as atmospheric pressure, wind, relative humidity, precipitation, permeability and drainage and amount of soil moisture.

Radon levels in outside air, indoor air, soil and mineral water can be very different. Radon is released from soil and rock and quickly diluted in the atmosphere. Outdoor concentration of radon gas is normally very low, and therefore does not cause danger. Radon in buildings, caves, mines and tunnels with poor ventilation can cause high concentrations in some cases. Building styles and ventilation rate can affect on the amount of radon gas in indoor air. The amount of radon gas exposure to an individual private depends to private homes and spaces used by the person.

Although the geological map of radon potential can be expressed relative risk of radon gas, but cannot predict radon risk for individual homes. This goal can be achieved only by examing the individual buildings. Radon is soluble in water and may thus is flow from upstream to a distance of about 5 km in the underground flowing rivers into limestone. Dissolved radon in ground waters will migrate in a long distance along the faults and caves from place to place depending on current speed.

Irankuh mines located in the mountain area of Irankuh and 20 km southwest of Isfahan between 51,31 to 51,45 longitude and 32,28 to 32,37 latitude, generally trend of this mountain is west and northwest to east and southeast, the average length of this range is 25 km and wide is 3 km. Minimum height is 1670 meters and maximum is 2750 meters above sea level.

This area has a temperate climate and average rainfall is 50 milimeteres in year. Mining activities are continuing in all seasons. Villages near the mine are: Abnil, Sahlavan, Baghkom, Afjad, Kelishad, Soderjan, Baghe abrisham and Yazdabad. In the Bama company , 4 mines working in the form of open pit and one mine in the form of underground. The company is active currently only in Gushfil and Tapesorkh. The only underground mine is being extracted is Gushfil too.

Place of measurement. As was previously stated, in the various layers of the earth, uranium radioactive element is expected, especially in the lead mine, because the lead is the last element of uranium group, there is density probability of this long life. Since radon is the radiation element of this chain, review of its concentration and does appear to be essential in lead mines. In this study, radon concentration in Irankuh underground lead and zinc mine in Isfahan province (indoor Gushfil mine) was selected. The oldest rocks in this region belong to the lower Jurassic that formed of black shale with siltstone and sandstone and is exposed only in the northern mountain range.

These shale are consistent with Shemshak shale. Middle and upper Jurassic formation has not been seen in the region. Cretaceous carbonate rocks that are essential rocks in this region with unconformity are located lied on the lower Jurassic rocks. This sediment belongs to the Barremian to Albian age. Their thickness is about 800 meters, and is formed from limestone and dolomite with a little shale and marl.

Measurement of radioactivity. There are several different methods for measuring radioactivity:

1- Radioactivity of a radioactive substance such as radon gas.

2- Received dose by tissues such as the dose received by lunges from solid decay products of radon.

3- Radiation is caused by radioactivity and radioactive thresholds for health, safety and environment, such as dose limit that used as law and information.

Radioactivity in the United States in typically measured in terms PCI. Curi unit has been named after French physicist, Marie Curie she was a pioneer in research on radioactive elements and their decay. In most countries Becqerel used as the metric unit (SI). One Becqerel show decay of an atom in a second. Becqerel refers to the amount of radioactivity that will decay an atom per second. Radioactivity levels in air caused by radon gas is measured per unit Becqerel per cubic meter of air. Average radon concentration in homes in great Britain is 20 Bq/m3, that indicate the decay of 20 atoms per second in a Bq/m3 radon, nearly 2 million radon atoms that decay per minute.

Fig.1. A view of Bama Lead and Zinc mine

Fig.2. The location of the measuring device at the end of tunnel

Radiation and radon gas effects on human health. Alpha particles deliver more types of radiation damage can be considerable. Although alpha particles cannot penetrate to great depth in tissue, but mass and high charge of them can be a large ionization.

Alpha radiation can not to penetrate from the surface layer of skin, but inside the lungs that does not protective lining, alpha particles decay by radon that are inhaled can be a serious threat for the molecules inside the cells of the lunge.

Gamma rays have great penetration power, their ionization and damage to tissue is comparable to the effects of X-rays.

Gamma rays usually have more energy than X-rays, radioactive sources are paced outside the body, gamma radiation from these sources is the biggest problem, due to the high penetration of gamma rays can be dangerous. While penetration capability of alpha particles is very limited in matter. Thickness of outer layer and dead of body skin, is sufficient to absorb all alpha particles from radioactive materials. Hence alpha radiation that located their source outside the body, they have no radiation hazard. But when the alpha particle emitting isotopes are in the inner region of the body, there is not outer layer of dead skin, that act as a shield. In this case, the radioactive energy loss of alpha is in the living tissues. For this reason and due to the high quality coefficient alpha particles, induction radiation that gives under exposure internal organs from radiation isotopes inside the body, extremely dangerous and can lead to cancer. Beta particles depending on the energy can penetrate body tissue to different depth and of course are a type of risk of external radiation.

Radiation by radon. Most radon is inhaled, given out and the relatively small number of alpha particles emitted by radon gets into the body. Four decay products of radon, have a short half-lives and all solid elements are radioisotopes.

The decay products may be as independent particles and suspended in the air or by binding to the surface of dust, smoke and moisture enter the respiratory system and trapped into lungs and cells of mucous members, and other lung tissues are irradiated.

The mortality rate of some miners from lunge cancer has been recorded in early middle age in Germany and Czech republic, has been as deaths due to radon gas.

Study on thousands of miner in Australia, Canada, China, Europe and the United state, in uranium, iron, tin and fluorite mines has been in a 30-year period.

These studies, despite several differences in study populations and methodology, prove increase in lung cancer with radiation by decay products of radon.

It is interesting to note that radon gas as a chemical product remains for decades and even in mineral water springs is significant as a therapeutic agent. First radon was considered as a relatively safe gas or from geological gases, and its important as one of the radioactive material with radiation dose has recently been identified.

The rapid effects of high doses of radiation of humans that can cause to be death or visible skin damage in a few days or weeks, but when a body part are affected by low radiation doses, radiation effects, will occur sometime after radiation. Radon gas present in the environment, has a late effect from the second type.

Although lung cancer related to radon gas occurs in the upper airways. But radon increases occurrences of other types of lung cancers from histologically.

Thus, the views expressed, the result is, survey and control of radon gas is necessary in different regions particularly in region were people for employment or for life be occupied.

Methods for measuring radon gas. The most important particle radiation from radon gas is the alpha particle with 5.486 Mev energy. Several detectors have been used in this area.

However, radon can also decay, gamma particles, that very week and their energy is about 0.51 Mev. Some detectors with measuring of gamma radiation can reveal radon concentration.

Rad 7. Device, including devices that can be measured radioactivity by its. This device is made in different models and designs, use for determine radon and thoron concentration in air and

soil air. This device has a air suction pump. The suction air passes through chamber that made from materials such as moisture retention (charcoal). The air enters into counting chamber. Chamber is a detector can be a needle cell or an ion. Alpha particles hit to the detector and created signals that process by the device electronic system and ready to be recorded. Information stored in the memory device. The device was equipped with printer and screen and show information by two methods.

Discussion. Data was measured in two cases, Thoron and radometery, in Gushfil underground mine from Bama company mines y radiometer device, this measurement took in several horizons at different heights above sea level. Conclusion are shown for each horizon. Thoron is one of the radon radioisotopes and is natural radiation gas, a member of the long chain of natural radiation thorium isotopes. Studies show that always on the side of radon, there is thoron, and its concentration shows is equal or even more than radon.

At altitude of 1500 meters above sea level, the amount of radon was measured during a day . thoronmetery of device in this mode is shutdown.

This measurement start from 15 pm at Sunday, 15th January, 2011, and finished at Sunday, 15 pm, 16th January, 2011. The device read automatically every 1.5 hour. In 24 hours, 16 reading were recorded. Results showed that the radon concentration began to increase from 1 am and reach to maximum at 7 to 9 am. Decreases again in the afternoon . radon concentration reaches from lowest, 16 Bq/m3, in the evening at 16 to 18 pm, to its maximum 43.3 Bq/m3 at 7 am. Rate change over the horizon of 1500 meters in 24 hours are 27 Bq/m3.

Conclusion. In this study, concentration of radon is determined based on allowed American environmental protection agency 9EPA). Values obtained within 2 days in different parts of mine are not exceeded from this limit. In some horizons for example 1480 and 1490 meters above sea level, the radon concentration is less than the allowable limit, but because radon concentration can be changed in different seasons and even a day, and this horizons is where the ore extracted and is the presence of workers, therefore must be controlled.

Radon concentration increases with decreasing altitude. This is due to increased pressure and reduced air movement and less ventilation, radon in the air move slowly to other locations. Poor ventilation is one of the important factors. Even at higher horizons, in the sub-channels, the ventilation rate is low and radon concentration in the horizon of 1500 meters is 28.3 Bq/m^3 in a day. But at the end of sub-channels, where the ore is collected, its concentration reaches to 146 Bq/m^3 that shoud be investigated. Its due to low ventilation in the end of channel.

SD-05

RISK ASSESSMENT FOR CHILDREN EXPOSED TO TRACE ELEMENTS IN AN URBAN, MULTI-PATHWAY EXPOSURE SCENARIO (MADRID, SPAIN)

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In order to assess the health risk for children (age 6 months to 2 years) in urban environments, samples of commercial baby food (jars from four categories i.e. fish, meat, fruit and vegetables, and powdered milk and cereal pap), soil from playground areas and household dust were collected. Lyophilized infant food and dust samples collected in wet wipes were digested with $HNO_3 + H_2O_2$, whereas heavy metals in playground soil were aqua regia extracted. Samples were analysed for Cr, Cu, Mn, Ni, Pb and Zn by GF-AAS. Two types of scenarios were modelled: (a) an averaged exposure (whole population and mean concentrations) and (b) a conservative scenario (consumer-only intake rates and 95th percentile exposure factors). Results of the risk assessment showed that the largest contribution to the overall risk was associated with the ingestion route for all three exposure media, and that food intake, in particular, resulted in levels of risk above the threshold of acceptability. In terms of non-carcinogenic risk, Mn was the largest contributor in playground soil, Cu in indoor dust and Zn in infant food. When bioaccessibility is taken into account, both non-carcinogenic and carcinogenic risks fall to safe levels for the average receptor.

Several sources of uncertainty still need to be satisfactorily addressed, i.e. inclusion of relevant toxic elements absent in our analytical suite (such as As), a more solid characterization of exposure factors, and a better understanding of relative bioavailability of trace elements compared to pseudo-total concentrations.

SD-06

ASSESSMENT OF MERCURY IN DIAGNOSTIC BIOMATERIALS OF DIFFERENT POPULATION GROUPS IN URBAN AREAS OF THE MOSCOW REGION

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Mercury is one of the most toxic and dangerous chemical element for the human health. In Russian hygienic standards only mercury as a chemical toxicant determined in all environmental components as a first hazard class compound. This stipulate the necessity for using detailed investigating ways to assess the mercury impact on the human body. It is possible to assess the level of mercury exposure on the human body by a direct determination of mercury concentrations in the human viscuses and textures only. For the purpose it is necessary to choose the available biomaterials that fully reflect the organism microelement status. Venous and umbilical cord blood, urine, hair and nails are the most informative and available biomaterials in assessing the mercury impact on the human body. The present work is devoted to the assessment of these biomaterials use possibilities of studying mercury exposure to various population groups living in the urban areas of the Moscow region. There were studied workers with not less than 3 years of work experience on a plant, pregnant women of age more than 18 years and of constant residence during not less than 3 years in this maternity hospital service region, children of 5-7 years and of constant residence in the region which is the nearest one to industrial areas. Mercury determination was done by Instrumental Neutron Activation Analysis (INAA) and by cold vapor atomic absorption spectrometry. The sampling was done in medical centers, plants, schools, pre-school centers in Moscow, the Moscow and Vladimir regions. About 900 samples were taken in whole. All procedures of sampling, samples transportation and biological material preparation for the analysis were done according to actual national requirements, international ISO standards and the methods described in "Standard operations procedures" (SOP) which are used in DEMOCOPHES program and recommended by World Health Organization (WHO). All participants of the research signed a special voluntary agreement. They also filled up personal questionnaires about their social and professional position. Children were involved only with a consent letter of their parents, private questionnaires were also completed.

No evidences of a high mercury exposure impact on the human body in Moscow and the towns of the Moscow Region were found. Presumably, the obtained mercury concentrations in the biomaterials mainly are due to consumption of fish and seafood. The complex of biomaterials studied in the article reflects levels of entering the human organism of all mercury forms. Nails and hair samples are interchangeable biomaterials in assessing the mercury impact on the human organism but it is difficult to remove dirty from the nails' surface. Therefore, if the amount of hair samples is sufficient it is possible not to analyze nails samples.

SD-07

PIGMENTS AS SOURCES OF LEAD AND HEXAVALENT CHROMIUM IN URBAN DUST

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High concentration of hexavalent chromium as crocoite micropigments in traffic yellow painting is reported in urban dust and air filters from a developing city located in the Sonoran desert. Erosion of asphaltic cover is enhanced by climate, and the presence of mineral crocoite ($PbCrO_4$) in road dust at an aerodynamic diameter smaller than <1 μm suggests its integration into the atmosphere by wind resuspension processes. Cr content in street dust reported on this work is higher than most of the concentrations previously published worldwide. Crocoite as micro and nanoparticles in dust was identified by combined techniques of Raman microspectroscopy, XRD, and SEM. A positive Pb-Cr correlation was found for all studied samples, and Pb-isotopes data show a crocoite signature in urban dust and air filters, thus representing an ingestion and inhalation route of lead and hexavalent chromium for human exposure. The presence of hexavalent chromium and lead in traffic yellow paint used in Latin America has not been previously addressed, and it represents an unknown health risk to exposed population.

SD-08

PEDESTRIAN EXPOSURE TO METALS AND CATALYST-DERIVED MINERALS BY DUST SUSPENSION AT ARID ZONES: IMPLICATIONS FOR HUMAN HEALTH

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Understanding the potential impacts of polluted dust on human health is critical for semiarid zones because climate change promotes dust suspension. Such areas are characterized by the occurrence of rainfall of short duration and high intensity followed by high evaporation rates during monsoon season. The climate promotes a cycle of erosion, surface runoff, dust deposition in urban basins and further evaporation leading to dust suspension by traffic. Hermosillo is located within the Sonoran Desert, and it is characterized by a high incidence of diabetes, cardiovascular and neoplasms when compared with other sites in Mexico. These three diseases can show complications by traffic exposure. In this study, airborne dust was collected at two different heights (pedestrian and

rooftop level), as well as dry deposited dust at playgrounds from elementary schools. Stronger dust episodes were found related to post-monsoon season with major peaks associated with decrease of humidity. Airborne dust was significantly higher at pedestrian level (~44% of analyzed days) when compared to roof level (~18% of analyzed days). At pedestrian levels, fine particulate fractions occur as metal-enriched agglomerates resembling coarse particles with high concentration of As, Pb, Cu, Sb, Be, Mg, Ni and Co. Such agglomerates act as main carriers for micro and nanoparticles of emergent contaminants related to traffic. Particularly, minerals such as cordierite, crocoite, zircon, and compounds as cerium oxide and PGEs were found at dust deposited in playgrounds from elementary schools and at pedestrian levels. According to worldwide guidelines, particulate matter sampling should be conducted by monitoring particle sizes equal and inferior to PM_{10}. This work suggests that such procedures may compromise risk assessment in semiarid environments, where coarse particles act as main carriers for emergent contaminants related to traffic. This effect is especially concerning at pedestrian level, leading to an underestimation of potential impacts of human exposure. This study brings forward novel aspects that are of relevance for those concerned with dust suspension processes across semiarid regions and related impact to human health.

SD-09

ASSESSMENT OF PTES LEVELS OF URBAN STREET DUSTS FROM TWO CITIES OF PORTUGAL: POTENTIAL HUMAN HEALTH RISKS DETERMINED BY ORAL BIOACCESSIBILITY

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Urban street dust is a complex mixture consisting of suspended particles (aerosols), and displaced soil and biogenic materials of low grain size fraction, which can be easily mobilised and easily inhaled /ingested by people.

In this work the potentially toxic elements (PTEs) levels and its oral bioaccessibility in urban street dust samples collected in two nearby Portuguese cities were determined. Under similar geological features the two cities (Estarreja and Aveiro) located in the central coast of Portugal differ in the type of antropogenic pressures. Estarreja, with a greater influence of industry and agricultural activities, has an area of 20.2 km^2, and about 7500 inhabitants. In this city is located one of the biggest chemical industrial pole of the country, which left an environmental contamination legacy, resulting from more than 85 years of industrial production. This represents a constraint for the agricultural practices (a very important activity in the region) and a risk to human health. About 20 km away from Estarreja is located Aveiro, with an area of 45.32 km^2, and a population of 18,756. Although the ceramic industry, the production and processing of metals and pulp and paper industry are the main industrial activities of the municipality of Aveiro, in the city the main anthropogenic pressures are associated with traffic and building construction.

In both cities, the sampling was conducted in the urban areas: in Estarreja about 4 km^2 and in Aveiro 3 km^2. The results showed that levels of Cr, Ni, Fe, and Pb are quite similar between cities, whereas high levels of Zn and Mn were found in Estarreja, while Co and Al is higher in Aveiro. Anyway, a high intra-site variability of PTEs contents is verified in both cases. The oral bioaccessibility data is also very variable between PTEs and intra-city.

SD-10

IMPACT OF CLIMATE AND TECHNOGENIC ACTIVITY ON POPULATION HEALTH

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Active climate changes take place on our planet. And there are many theories around this process, including global warming.

The reasons for climate change are mainly thermodynamic processes on Earth and external impacts, such as fluctuations of the solar radiation intensity and possibly human activity.

The sun is the main energy source for absolute majority of processes that occur on Earth, it depends on the development and existence of all living things. The temperature increase takes place both on our planet and on other planets of our solar system. The dynamics and solar radiation regimes are crucial in assessment of future climate processes. The next cycle of solar activity is the reason of average temperature increase on the planet and the associated melting of glaciers.

Investigation of eternal frost showed that we live in an era of global temperature increase since the end of the Ice Age. Parts of the western Atlantic ice cover become thinner at one meter per year, and mountain caps begin to reduce three times faster than twenty years ago. Since the ice starts melting, there emerges a threat of increased biological activity. Last years a sharp displacement of climate zones is recorded.

Due to the change of number and behavior of bacteria and viruses, solar activity affects the spread of epidemics and pandemics (diseases spread in entire countries and continents), as well as the spread of epizootic (massive animal diseases). During the years of high solar activity there emerge the pandemics of cholera, influenza, dysentery, diphtheria, etc.

Increased solar radiation causes air extra ionization. As a result, density and reflectivity of ionosphere layers change, ozone layer is partially destroyed and Earth's surface gets an increased amount of ultraviolet radiation.

Numerous studies have determined that magnetic and solar storms change geomagnetic field intensity and negatively affect the activity of the central nervous and cardiovascular system.

The main factors of anthropogenic impact on climate are: increasing concentration of greenhouse gases and increased emission of aerosols into the atmosphere. Increased concentrations of these gases lead to increased absorption of radiation from Earth. This causes heating of the atmosphere and hence the Earth's surface.

Currently it is generally acknowledged that the growth of greenhouse gas emissions in the twentieth century is the result of human activity, but there is no clear correlation between the Earth temperature change and the increasing concentration of greenhouse gas emissions.

Certainly, the local impact of anthropogenic and technogenic human activity on climate (creation of artificial reservoirs and dams on rivers, deforestation, etc.) can be essential, but there is no point in overestimating human potential in comparison with the natural factors. But the anthropogenic effect could provoke climatic changes and cause a new cycle of warming.

Rise of temperature creates favorable conditions for disease development, which contribute not only to high temperature and humidity, but also to the expansion of habitat of animals hosting the disease (e.g. malaria).

Increased development of the microflora and lack of clean drinking water will foster the growth of infectious intestinal diseases. Rapid proliferation of microorganisms in the air may increase the incidence of asthma, allergies and various respiratory diseases.

In the future it is planned to pay much attention to greenhouse gas capture that emerge during electric power production and directly from the atmosphere in via plant disposal, use of ingenious artificial trees and carbon dioxide injection to deep ocean depths, where it will dissolve in water column.

SD-11

HEALTH CONDITIONS OF TOUR MANAGERS LEADING INTERNATIONAL TOURS TO DIFFERENT GEOGRAPHIC AREAS

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Tour managers are frequently exposed to various health hazards associated with travel, but data on their health conditions are limited. We conducted a survey on tour agency employees in Taiwan to understand specific health problems in the tour managers with specific tour-leading areas. A total of 152 tour managers participated in this study. The main tour-leading area of a tour manager was defined as the area with the greatest tour-leading percentage reported by the tour manager. When a tour manager had two or more main tour-leading areas, the tour manager would contribute to two or more samples in the analyses. Finally, we got 110 tour managers mainly leading tours to China, 18 to North-East Asia, 33 to South-East Asia, 1 to North America, 6 to Europe, and 3 to New Zealand/Australia. Considering the power of statistical analysis, we only made comparisons among the tour managers leading tours to China, North-East Asia, and South-East Asia. The result showed a significantly higher prevalence of recent cough (in the past three months) reported by the tour managers leading tours to North-East Asia compared to those leading tours to other areas. The adjusted odds ratio was 14.9, with 95% confidence interval of 3.1-70.7 ($p < 0.01$).

SD-12

HEALTH RISKS EXPOSURE TO BUILDING MATERIALS USED IN CIVIL ENGINEERING WORKS. AN EXAMPLE IN URUGUAY

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Portland Cement is widely used in buildings and construction works as an important ingredient of concrete products and very little information on health effects of the particulate air pollution from cement factories, is available. However, most cement dusts chemical elements are potentially harmful to the environment and population health in general. Cement dust causes lung function impairment, chronic obstructive lung disease, restrictive lung disease, pneumoconiosis and carcinoma of the lungs, stomach and colon. Other studies have shown that cement dust may enter into the systemic circulation and thereby reach the essentially all the organs of body and affects the different tissues including heart, liver, spleen, bone, muscles and hairs and ultimately affecting their micro-structure and physiological performance. Some of the dangerous elements of cement dust include: Particulate Matter (PM2.5 & PM10), lead, arsenic, chromium VI and chromium III, mercury, manganese, cadmium, crystalline silica among others. Uruguay has several Portland Cement kilns in different parts of the country. This work describes the main health risks of populations living near a cement kiln and of occupationally exposed workers. This study assessed the exposure of workers in three cement plants using the NIOSH methods: 0500 (total dust), 0600 (respirable dust). 41 samples were taken with autonomous systems equipped with 37 mm PVC filter and cyclones to separate the respirable fraction. Dust concentration determination was performed by gravimetric method, with controlled temperature and humidity conditions. Results were compared with international reference values obtaining the following results: PLANT 1: 56% above the TLV value, PLANT 2: 25% above the TLV value, and PLANT 3: 46% above the TLV value. With the obtained results, it is possible to prioritize those places and work areas where immediate actions should be taken to reduce workers' exposure to cement dust and determine which sites require further evaluation. We highlight the importance of establishing a program to improve working conditions accompanied by training on the health risks associated with exposure to cement dust.

SD-13

COAL PROCESSING CAUSES HEALTH PROBLEMS

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Coal, which formed after fossilized organic matter has been trapped in rock formations for many years, is Brown-black flammable substance. It consists mainly of carbon, hydrogen, oxygen and nitrogen. Coal is the most common fossil fuel in the World. Although coal is mainly composed of carbon, coal dust which formed more than 50 substances and their oxide components, is a complex and heterogeneous mixture. The amount of minerals in the coal dust depends on the particle size of the powder and the coal seam. Coal dust consist mainly of kaolinite, illite, calcite, pyrite and quartz. Variety of environmental and health problems in burning or processing of fossil fuels — coal, oil, and gas. The problem is exceeded by human activities. Part of the dust is formed by the transformation of the ore and the side rocks into small particles because of the mechanical processes, and another part by the transfer of the dust into the furnace during the ventilation of the furnaces. Polluting particles in the air can cause problems in human. Additionally pollutants in the air can increase asthma symptoms. These dusts that form in the mines cause also pneumoconiosis disease which is important for the health of the workers. Pneumoconiosis is the lung disease caused by long-term respiration of dust suspended in the air. The size of the dust, the density in the environment and the quality of storage affect the disease. Besides the genetic structure of the body and the use of cigarettes are effective in the formation of the disease.

SD-14

HARMFUL EFFECTS OF ASBESTOS

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Asbestos is a fibrous material that comes from the silicates and naturally occurring in rock and soil. There are two types of asbestos which are chrysotiles and amphiboles. The former is structure of serpentine minerals and the latter is having a five different type which are amosite, crocidolite, tremolite, anthophyllite and actinolite.

Heat resistance, heat insulation and durability to strong chemical and physical effects are the most important characteristic of asbestos. Asbestos uses on textile, ceramic and cement thanks to their bonding properties. Moreover, it is inexpensive, easy-processing and easy obtainable. All these properties of the asbestos have allowed to be used as raw material for many years. There are asbestos reserves in many places in the world, and they led to fiber contamination on environment. Turkey, Russia, China, Cyprus, Finland, USA and Canada have environmental exposure to asbestos. Asbestos dust in residential area and workplace cause serious diseases in workers and inhabitants. Prolonged inhalation of asbestos fibers can cause serious illnesses such as lung cancer, mesothelioma, and asbestosis via cell death and oxidative damage.

SD-15

THE INDUSTRIAL FACTORS IMPACT ON THE FUNCTIONAL STATE OF MINING WORKERS IN THE MURMANSK REGION

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Healthy lifestyle ensuring is a priority of sustainable development of human society. The working conditions are an important factor in shaping the health of working age. This is especially true for workers associated with harmful and dangerous working conditions.

The aim is the evaluation of the industrial factors impact on the organism functional state and the genome stability of the loparite mining workers.

The study was being conducted on the ore-dressing and processing enterprise in the course of three years (2013-2015). Total 471 mining workers had been examined, the comparison group was 255 people. Physiological indicators of organism condition assessed by cardiohemodynamic parameters: heart rate variability (HRV) and tensio arterialis. Genome destability was evaluated on buccal cells and human lymphocytes of peripheral blood using micronucleus test.

The analysis of the organism functional state has been showed a working conditions complex impact on the workers health. This is reflected in autonomic dysfunction of the HRV regulation. Dysfunction is expressed in the stress indexes (SI) increasing the in earlier exhaustion of adaptive reserves, in the reducing of the vegetative level contribution in heart rate regulation by the autonomic nervous system. A significant contribution of the very low-frequency component (VLF) in the frequency range of HRV indicates a decline in the functional state of worker organisms. It is a precursor of adaptation failure and a high degree of vulnerability to the environmental factors effects. Mining workers are exposed to the most severely affected by industrial factors. Analysis of the health workers structure showed the prevalence of before disease status and pathological conditions regardless of gender. The distinct and significant growth of pathological conditions observed with age and service length.

The genome destabilization of the mining workers was shown apoptosis rate reducing and refresh rate increasing in buccal epithelium. The increase of the cytogenetic abnormalities frequency was noted in the buccal cells, including the frequency of cells with micronuclei, cell with proliferation disorders. The cell cycle time reduction and multi-core cell frequency increasing were detected on the lymphocytes cells culture. This constitutes a violation of the process of cytokinesis and proliferation rate of cells and therefore an increased cancer risk.

SD-16

MOLECULAR, ISOTOPIC AND GENETIC COMPOSITION OF HUMAN GALLSTONES: A GEOMEDICAL STUDY

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Bacteria in the greater environment are seen to be responsible for a variety of concretions i.e. Stromatolites, oolites and calcium carbonate concretions. The structure and shape of their concretionary product is closely linked to the nutrients available in their immediate environment. Their environments can be ascertained by studying the molecular and isotopic structure of their fabricated products. It is believed that doing a similar study on human gallstones – as a possible by-product of bacterial metabolism, may yield similar information as to why gallstones form and the reason for their various morphologies/shapes. Long standing debates about the likelihood of biogenic or abiogenic processes developing various concretions in the natural environment are a regular point of contention when dealing with biomineralisation. The most notable of these debates centres on oolites, calcium carbonate nodules and, more recently, calcifications and lipid concretions in the human body. Although the current research has edged towards a more biogenic view with the former two topics, those involving the human body are only at the beginning of such debates. The objective of this study is to identify possible analogues between the human microbiome and the environment that lead to biomineralisation/concretionary structures within these systems. We will aim to investigate whether particular bacterial species are implicated in the crystallisation/accretion of gallstones in the gallbladder. We will compare these results with Oolites; calcium concretions found abundantly in various environmental contexts where bacterial precipitation of the calcium oxalate matrix is well understood. We hope this novel approach will reveal clues to the mechanisms behind lithogenesis of gallstones in the human body.

SD-17

BLOOD MERCURY LEVEL OF PEOPLE LIVING IN COASTAL AREAS

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This study was performed to evaluate the effects of residence in districts which included seashore, and those of recent seafood intake on human blood mercury level. Korean adults older than 19 years of age recruited by probability sampling methods stratified by sex and age from 102 sampling areas that cover all metropolitan, urban, rural districts in Republic of Korea. The study subjects were 2114 Koreans (920 men, and 1194 women). Personal interview was performed with a structured questionnaire including questions about demographic characteristics, current address, and dietary habits. Concentration of total mercury in blood was determined using a thermal decomposition gold amalgamation atomic absorption spectrophotometer designed for direct mercury analysis. Blood mercury level was compared by the residence area (coastal area versus inland area) and by recent seafood intake. Geographic mean (geographic standard deviation) of total mercury concentration in whole blood was 3.90 (1.88) μg/L. Blood mercury level was different according to the geographical area of study subjects. The geometric mean of blood Hg level was higher in subjects who were residing in coastal areas (5.05 μg/L) than those who were in inland areas (3.82 μg/L). Subjects who ate seafood within 3 days prior to blood sampling (4.19 μg/L) showed a significantly higher blood Hg level than those who did not (3.46 μg/L). The geometric mean of blood Hg level was highest in coastal dweller with recent seafood intake (5.42 μg/L), and followed by coastal dweller without recent seafood intake (4.18 μg/L), inland dweller with recent seafood intake (3.97 μg/L), and inland dweller without recent seafood intake (3.56 μg/L). These results suggest that residing in coastal area and recent seafood intake might be independent determinants of blood Hg level.

SD-18

TOXICITY STUDIES ON DEXTRAN STABILIZED IRON OXIDE NANOPARTICLES

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The surface functionalization of maghemite nanoparticles can introduce additional functionality, which can be successfully used widely in various fields of medicine and environmental applications.The spherical shape of the nanoparticles and uniform size with an average diameter around 9.5±0.5 for γ-Fe_2O_3 and DMNp was 17 nm and 21 nm respectively. Moreover, a non-invasive method based on ultrasounds was used to characterize the aqueous solutions. The ultrasonic

experiments at 5MHz are capable to identify important characteristics of the tested suspensions, such as the velocity and attenuation and the FEM model allows to simulate the effective wave propagation in the fluid with dispersed nanoparticles. The inverse problem tested in this case, has provided a series of pairs of elastic constants, from which the pair offering the best fit was extracted. Our in vitro and in vivo assays presented in this study have shown that the γ-Fe_2O_3 and DMNp nanoparticles are non-toxic and biocompatible proving a huge potential to be used in the next generation of diagnostic and therapeutic agents, improving the survival rate and the quality of life for many cancer patients.

SD-19

PSYCHO-IMMUNE ASPECTS OF ADAPTATION TO THE INJECTION OF MICROORGANISMS FROM PERMAFROST IN EXPERIMENT

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One of the fundamental questions in biomedicine is how the health of not only human but also animal is affected by various factors, including climatic. This is especially related to climate change in the direction of warming. As a result of this phenomenon comes the melting of microorganisms that have a unique enzymatic activity and unusual metabolism from permafrost (Gonzalez, Robb, 2000; Prokofeva et al, 2000.). It is therefore important to know how the immune system and psyche to react. Because the main function of these systems is organism protection (Sukhovey 2014; 2016). The purpose of the study is to determine the relationship of behavioral and immune responses in the experiment on introduction of microorganisms from the permafrost. Bacteria of the genus Bacillus from the permafrost were introduced to laboratory mice intraperitoneally. The requirements of the Helsinki Declaration of the World Medical Association, the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (number 123, 1986), as well as the order of the Ministry of Health of the Russian Federation № 267 from 19.06.03 "Rules of good laboratory practice in the Russian Federation" of humane treatment of laboratory animals were observed in all experiments. Status of the immune system was evaluated as of cellular (DTH) and humoral immunity (AFC), behavioral reactions on the part of the psyche – in the test "Open field". The introduction of microorganisms from permafrost in the behavioral plan is proved itself a typical picture of stress. Motor and orientative activity increases on 10 day, and search activity is sharply reduced ($p < 0,01$). There are observed, that defecation boluses ($p < 0,01$) and grooming reactions ($p < 0,05$) are also decrease, which indicative of depressed emotional state. Any changes on the part of the psyche are restored to the level of control to 30 days. The functional activity of the immune system (AFC and DTH) increases during this period ($p < 0,01$). Thus AFC 3.8 times higher than that of DTH. Therefore, the physiological stress is transformed into mental anxiety. The mechanism of this transformation corresponds to the general regularities of perception: visceral stimulation in the form of painful tension is interpreted by mental as a trouble. Automatically run a program of general undirected activity – the search subject of the needs, capable to remove the tension. However, since source of tension acts the stressor, which can not be identified by psyche the starting coping circuits, affordable this animal.

The experimental studies on animals, in the methodical plan, can be control with respect to a person where it is necessary to differentiate the interpretation on the part of the psyche. Research in this area is needed in the first place, for the indigenous peoples of the North, who get infectious load in addition to the one that already exists. Also, due to the fact that they have traditionally eat raw fish through which organisms get to them. Secondly, it came to the North migrants who expose themselves to more infectious load: drink unboiled water, attached to the raw food (slices of frozen fish or meat served coldsterlet) and the rest. This would allow a better understanding of how to relate to a) pure physiological responses to the stressor, b) subliminal psychic reactions, based on simple phylogenetic schemes of processing of visceral stimulation, c) interpretation based on cultural explanations (myths, legends).

SD-20

DETERMINATION OF HEAVY METAL LEVELS IN GROUNDWATER AS POSSIBLE CAUSE OF BALKAN ENDEMIC NEPHROPATHY (BEN) IN THE VILLAGE MILOŠEVAC

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Balkan endemic nephropathy (BEN) is a chronic tubulointerstitial disease of the kidneys, geographically limited to countries of the Balkan Peninsula. Progressively eroding kidney tissue, this disease leads to patients being completely dependent of dialysis and is often accompanied by carcinoma of the upper urinary tract (S.V.M. Maharaj et all, 2013).

This paper deals with analyzing drinking water from household wells of Balkan endemic nephropathy sufferers in the village of Miloševac.

The method of atomic absorption spectroscopy (AAS) was used in determining the concentration of heavy metals (Pb, Cd, Zn, Cu, Mn, Fe, Co and Ni) in the water samples. The maximum allowed concentration of Zink for drinking water is 3 mg/dm3 (Сл. лист СРЈ, бр. 42/98 и 44/99). Analysis of the samples showed Zink concentrations between 0,0016 and 0.4302 mg/dm3. Concentrations this low are in accordance with the findings of a group of Romanian researchers who have analyzed the drinking water in their own endemic area (Orem W.H. et all. 2002), leading them to the conclusion that the lack of Zink could have possibly played a significant role in the occurrence of BEN.

Heavy metal concentrations in the water samples are for the most part within the maximum allowed values. Well Nr. 7 shows an increased concentration of nitrates (0,269 mg/dm^3), while well Nr. 2 shows high concentrations of Manganese (0,9746 mg/dm^3) and Nikle (0,0218 mg/dm^3). Research has confirmed that high concentrations of heavy metals are not uniformly present in ground waters, so heavy metal poisoning can not be considered the cause of BEN.

Water sampling was accompanied by inquiries into the habits, living conditions and exposure to toxic materials of the BEN patients over the last thirty years. These show that living habits of BEN patients do not differ from those of village inhabitants in the non-endemic area.

Research by Slade and alt. (2009) has shown that aristolochic acid can cause BEN. Being absorbed through the seeds of the *Aristolochia clematitis* plant of which it is an alkaloid, it gets into the flower used by the population for nutrition purposes. This research has confirmed that chronic aristolochic acid poisoning by means of flower can not be considered a viable mechanism leading to the occurrence of BEN in the village of Miloševac, as the local population mostly uses industrial flower. If indeed aristolochic acid is the cause of BEN, and the cause is not food ingested, the cause has to be drinking water. The concentration of aristolochic acid is not particularly relevant, as only prolonged exposure (10 to 20 years) can lead to BEN.

There are lignite findings in the vicinity of the endemic areas. Research into the presence of plant traces containing nephrotoxic substances (the likes of aristolochic acid) in these sediments, potentially leaking into the drinking water, is therefore required.

Research so far suggests that the causes of Balkan endemic nephropathy are to be found in organic compounds in the drinking water. Continuing this research, the lignite will be analyzed for the purposes of determining the concentration of aristolochic acid. As a poorly soluble substance it would be leaking into the ground water.

SD-21

HEALTH PROBLEMS RELATED TO INADEQUATE PUBLIC SUPPLY IN RURAL AREAS OF NORTHEASTERN BRAZIL

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Much has been known about the relationship between water and public health. Although not always easy to measure the positive impact produced by the water supply on the occurrence of gastro-intestinal problems and worms. Epidemiological studies have shown consistent results regarding the existence of that relationship. In Brazil, the diarrhea is the leading disease related to inadequate sanitation. For the studies case was conducted the impact Diagnosis of the conventional systems implantation in rural villages in the municipalities of Arcoverde and Sertânia, benefited by the Arcoverde Adductor System, and in the rural localities of the municipalities Afrânio and Dormentes, benefited by the system Adductor Afrânio / Dormentes. The rural localities selected were the villages of Malhada, Umburanas, Cruzeiro do Nordeste, Moderna, Caveira, Roça Nova and Realém. One fact to consider is that in rural areas considered, until the deployment of systems, there was no distribution networks of water or wastewater treatment, where public health sanitation related showed the fragility. For the period previous to regular supplies, it was verified high incidence of dysentery and worms in children. For the later period, there has been a real reduction in numbers of cases of infantile diarrhea in locations benefited by systems. It is observed that the largest decrease occurred in the locality where the water distribution is made directly into the homes, due to the possibility of greater hygiene and no water contamination in collection and transportation.

SD-22

«WATER – STONE – MAN» CONCEPTUAL MODEL OF A BALANCED SYSTEM BY V.I. VERNADSKY

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V.I. Vernadsky attached great importance to water in the processes of mass transfer of substance and energy transfer in the form of various physical fields which is concentrated in his world known 'water-stone-gas-living' balance system. The present article focuses on the influences of nonsaline underground drinking water used in everyday life on human health, i.e. hydrogeological aspects of medical geology. Pharmacological influence of ion-saline and microcomponent composition of underground water has been known since the early times (Plinius jr., Aristotle, M.V. Lomonosov). However nowadays holding the 1st Kiev International Scientific Conference on Scientific and Methodological Basis of Medical Geology on 17-18 April 2013 in which the authors of this article took part can be considered a significant breakthrough and a step towards higher awareness in the field [2].

The major source of water on the territory of West-Siberian Megabasin is Atlim-Novomikhailovsk hydrogeological complex. Its technogenic affect is global and permanent. The complex is located in the area where hydrocarbons are extracted with related processes such as water pumping into the terrastatic pressure support system, bottom water waste management etc. Besides this territory is urbanized and residential. Comparative characteristics of chemical composition of drinking water on the territory of Yamal-Nenets, Khanty-Mansiysk autonomous regions and Tyumen were published earlier in the paper [2]. They show the difference in deviations from the standard. If we draw parallels with the data of diseases in the areas in question, the highest number of patients with anemia per 100 000 of the population has been registered in Yamal-Nenets autonomous region (636,1), as well as patients with kidney diseases (107,1) [5], the highest number of subcutaneous tissue problems by a slight margin were registered in Khanty-Mansiysk autonomous region – 5656,8 [5]. Tyumen takes the second place in anemia patients (429,4) [5]. At the moment direct relation has been shown between a higher level of manganese and the growth of bone and muscle diseases as well as urogenital problems (the highest number of patients with urogenital

diseases has been registered on the territory of Yamal-Nenets autonomous region (9361,7)) [5]. The leading place for gastrointestinal diseases is still held by Yamal-Nenets autonomous region – 10541,3 [5]. Despite the fact that all water pumps are equipped with water cleaning facilities this does not ensure the required hygenic level of water from the point of view of the completeness of its mineral and microelemental composition. Of 68 underground water sources in Yamal-Nenets autonomous region 16 (23,5%) do not meet sanitary requirements, out of which 9 (13,2 %) [4] don't have sanitary protection areas around water sources.

The present article makes the balanced system of V.I. Vernadsky more specific by introducing noospere (man) in it. 'Water-stone-man' conceptual model makes it possible to analyse the demographic health situation taking natural (geological) and technogenic factors into account.

SD-23

THE EDUCATION ROLE FOR THE POPULAR PARTICIPATION FACE TO PUBLIC POLICIES DIRECTED TO HYDRIC RESOURCES

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Humanity has pursued 'pure' water for thousands of years, very probably since prehistoric times. The first municipal water treatment plant was installed in 1804 at Paisley, Scotland. The Metropolis Water Act 1852 was an Act of the United Kingdom Parliament which introduced regulation of water supply companies in London, including minimum standards of water quality for the first time. The 19th century brought the Industrial Revolution and many countries established standards focusing the drinking water quality. The WHO published after the Second World War end (1958) the *International Standards for drinking-water*. In 1982, WHO shifted its focus from 'International Standards' to 'Guidelines' for the establishment of national standards and regulations. However, such national and international public policies do not completely assure the population health. The public policies are governmental actions materializing as laws and programs (Dye, 1984), but the population would need to participate, contributing with individual and collective actions for their evaluation, complaint and pressure face to the institutions. This requires an education able to provide tools aimed for a more responsible and political action. Nery-Silva and Santana (2016) indicate the need of a more participatory public administration allowing that diverse social groups participate on the construction and implementation of such policies. This participation would strengthen them, helping on the construction of a healthier society and environment. Education for participating should be a great purpose/contribution of the environmental education.

SD-24

FLUORIDE IN BULGARIAN GROUNDWATER – DISTRIBUTION, STATUS AND PROBLEMS

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The problem of high fluoride concentration in groundwater is common for many countries as well for Bulgaria and Russia. The territory of Bulgaria is a relatively small, but it is characterized by a varied geological and hydrogeological conditions. The formation of the chemical composition of groundwater relates to these conditions as well on the distribution and concentration of fluoride. The content of fluoride in fresh groundwater is usually below 1 mg/l regardless of whether they are formed in rocks with different age, origin, chemical and mineralogical composition (Figure 1). Only 2% of the total area of Bulgaria has fresh groundwater with a fluoride content higher than 1 mg/l. There are less than 20 inhabited places where fluoride concentration in groundwater is above permissible in Southern Bulgaria. In the past there were more but after the construction of reservoirs increasing use of surface water with low fluoride content.

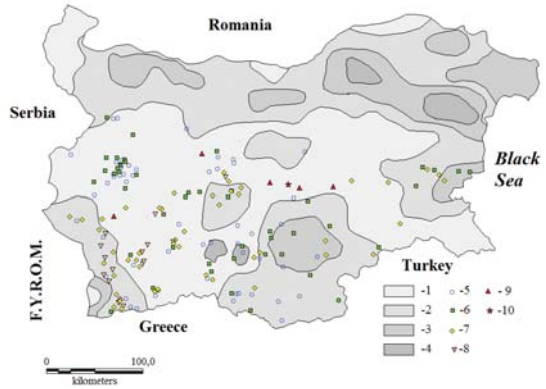

Fig. 1. Distribution of fluoride in fresh and mineral waters: 1. Area with fresh water containing F < 0,3 mg/l; 2. Area with fresh water containing F 0,3 – 0,5 mg/l; 3. Area with fresh water containing F 0,5 -1,0 mg/l; 4. Area with fresh water containing F > 1,0 mg/l; 5. Thermal water field containing F < 1,5 mg/l; 6. Thermal water field containing F 1,5 – 5 mg/l; 7. Thermal water field containing F 5 – 10 mg/l; 8. Thermal water field containing F 10 -15 mg/l; 9. Thermal water field containing F 15 – 20 mg/l; 10. Thermal water field containing F >20 mg/l.

Relatively high content of fluoride are found in many thermal and mineral water fields connected with fault disturbances. The maximum concentrations in the country are registered in vicinity of the town of Kazanlak (the thermal water field "Ovoshtnik" – 23–24 mg/l). Origin of fluoride of this area is due to the high possibility of F-leaching at high temperatures and pH from various fluoride minerals. Mineral water was used as drinking one by the local people in this area until there was no any central water supply that caused distribution of fluorosis among many people there. Now, this issue has been solved. Another problem is the bottling of mineral water with fluoride content more than 1,5 mg/l and its distribution on state markets.

High concentration of fluoride in groundwaters is observed in some aquifers in Northern Bulgaria but due to their high TDS they are not used at all for drinking purposes.

SD-25

A GLOBAL PROBLEM: ARSENIC

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Arsenic is a metalloid with an average concentration of 2 ppm and a density of approximately 5.8 g/cm^3 in the ground crust. More than 200 mineral compounds contain arsenic as a component. It constitutes about 0,0005% of the earth. It is the 20th most common element on earth, the 14th in sea water and the 12th in human body. Arsenic naturally occurring with geothermal, volcanic activities and weathering of rocks. Besides, it occurs because of anthropogenic and biological sources in nature. In this way, consumption of drinking water which is contaminated and the use of arsenic-contaminated aquifers for irrigation poses a risk to the agricultural environment and food chain. The World Health Organization (WHO) has determined that the maximum arsenic content in drinking water is 10 µg / L and that the water containing arsenic above this value is toxic. It has also been classified by the International Agency for Research on Cancer (IARC) as group-1 carcinogen. Arsenic exposure causes significant skin lesions like melanosis, keratosis and pigmentation, causing cancer and genetic material damage, cardiovascular disorders, respiratory, excretion, circulatory, endocrine and immune system diseases.

SD-26

SYNTHESIS AND CHARACTERIZATION OF MAGNETIC IRON NANOPARTICLES WITH POTENTIAL APPLICATIONS IN GEOCHEMICAL PROCESSES

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The goal of this research was to determine and optimize the reactivity of geo-engineered particles of magnetite (Fe_3O_4) with potential applications in environmental remediation of trace elements (TE). The Fe_3O_4 nanoparticles were synthetized by co-precipitation of Fe^{3+} and Fe^{2+} ions at room temperature in controlled atmosphere. The obtained materials were investigated by transmission electron microscopy (TEM), X-ray diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy, Raman spectroscopy, Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray analysis (EDAX). The calculations of the average particle size of Fe_3O_4 samples before the adsorption of As^{3+} and Cu^{2+} ions indicated that the dimensions of the particles Fe_3O_4 decreased after the adsorption of As^{3+} and Cu^{2+} ions. The BET surface area and average pore size of the Fe_3O_4 nanoparticles were 100.5179 m^2/g and 24.39779 nm. The adsorption of As and Cu has been described by a Langmuir type isotherm. A good Langmuir fit for the adsorption isotherms of As was obtained. The coefficient of Langmuir isotherm (R^2) at room temperature was 0.999 for Fe_3O_4 and the maximum adsorption capacity for the solid phase (q_m) was 66.53 mg/g while the Langmuir constant K_L was 0.297. Collectively, the results suggested that iron oxide nanoparticles had a potential for removal and/or immobilization of TE from contaminated waters and/or soils.

SD-27

VARIATION OF CHEMICAL GROUNDWATER COMPOSITION: INCIDENCE OF ENTEROVIRUSES OCCURRENCE AND THEIR TRANSPORT MECHANISM IN THE SALTO AQUIFER, URUGUAY

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In some areas of Uruguay groundwater is the only source of water for human consumption as well as for industrial-agricultural activities. Usually, it is considered as a safe source, due to the "naturalfilter" which takes place in porous media, groundwater is commonly used without any treatment. The passage through porous media is considered an important barrier against viruses, as a result groundwater would be acting as a virus transmission vector. Gastroenteric viruses like

Rotavirus (RVA) and Norovirus (NoA) affect in a high degree the Uruguayan population each year; setting an elevated risk of gastro-enteric diseases as diarrhea and others symptoms of acute gastro-enteritis like vomits and abdominal pain [1]. This study focuses on the incidence of viral (Rotavirus, Norovirus and Adenovirus) and bacterial (Total and Fecal Coli-forms and Pseudomonas aeruginosa) contamination in groundwater found in Salto, Uruguay. The study also pays close attention to the possible correlation among these groups of microorganisms and its effects. Moreover, the mechanism of virus transport has been studied by circulating contaminated water throughout columns formed with material from the aquifer. A subgroup of the screening wells has been selected for an annual survey. On this subgroup, besides bacteria and viruses analysis, a standard physical and chemical characterization has also been done. Results show a significant seasonal variation on microbiological contamination. In addition to this, the results of the current study are expected to provide an insight into the impacts of groundwater in Salto's viral gastroenterocolitis outbreak.

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SD-28

QUALITY OF IRRIGATION WATER IN A HIGHLY INDUSTRIALIZED AREA IN NW OF PORTUGAL

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This study was carried out in Estarreja urban area where an important chemical complex is operating since Second World War. The most important input of contaminants into the environment is related to the past with production of sulphuric acid and with a chloralkali plant. The main purpose of the present study was to evaluate the quality of groundwater used for crops irrigation in order to identify environmental risks.

In 2013, the concentration of 70 chemical elements and 33 organic compounds (selected taking into account the raw materials, intermediates and final products handled by the various industrial units) were analyzed in 22 groundwater currently used for irrigation purposes. In 2014 a new survey was performed for confirming previous results and expands the study area.

It was found that near half of the groundwater samples present levels of Mn above the recommended maximum concentrations for irrigation water establish by FAO or Dutch guidelines. In 10% of the samples the levels of As, Hg and Sb are above the previously mentioned guidelines. For the 33 organic compounds analyzed only 14 were detected. The PAHs are only detected in one groundwater sample but in concentration below the Dutch guidelines. The carcinogenic benzene was detected in 16% of the samples with concentration maximum of 1100 µg/l and far above the Dutch guidelines (30 µg/l). Other organic contaminants like vinyl chloride, aniline, chlorobenzene and nitrobenzene were also present.

In this industrial area with intensive agriculture and pasture it is urgent to evaluate possible human/animal health damages.

SD-29

NATURAL MINERALS – NATURAL PROTECTION OF WATER SOURCES

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The problem of drinking water quality remains acute in Russia. The typical toxic organic impurities in water sources that supply settlements are oil products dissolved in water and phenol. Their content in water often exceeds the maximum permissible concentrations. The negative role in this process belongs, first of all, to the activity of industrial enterprises carrying out unauthorized discharges of sewage flowing in drinking sources.

The solution of this problem is possible through the application of cheap, ecologically safe natural mineral sorbents, which can be easily recovered and are presented by the vast subsurface resources. Natural sorbents are usually characterized by the multicomponent composition. Beside the main active components (carbon, silicon, aluminum etc.) a range of useful additional elements are present: silver, gold, platinum, a variety of organic compounds. Thus, it is not uncommon for natural sorbents to have bacillicidal and catalytic properties, which increase their economic attractiveness. Also, the problem of the utilization of the spent natural sorbents is easily solved. For some of them the regeneration is applicable, others are reused in the construction industry or for the obtainment of useful additional elements, contained in them.

Type III shungite ore of Zhagozhenskoe deposit in Karelia can be used as a sorbent material for the purification of the water from the oil-products and phenol, for the land remediation as well as for the purification of industrial wastes from the toxic reactive compound UDMH (1.1- dimethylhydrazine).

Even in the 17-18 centuries schungite ores were famous for their healthy properties. The local population has used the water sources of "Three Ivans", which is located on the territory of Zaonezhie peninsula and "Caricino key" near the village Tolvuya on the shore of Lake Onega for medical purposes. Water sources arising from schungite thickness have a beneficial effect in the treatment and prevention of skin diseases. Based on the medical properties of schungite water Tsar Peter I ordered to organize the first Russian resort for rehabilitation of wounded and ailing soldiers on the largest source in Karelia "Marcial Waters", located 70 km from Petrozavodsk.

All-round studies of the shungite ore sorption properties revealed such important data as the characteristics of porous structure, specific surface, sorption capacity and sorption power for the various sorbates.

The benefits of shungite ores usage are: high organic contaminants sorption capacity, such as oil-products, phenols, fatty high molecular weight acids, spirits and others. The oil-products collection effectiveness reaches 99%, phenols and low concentration solutions collection effectiveness reaches 90%. Type III shungite sorbent was tested for neutralization of liquid technological wastes, containing highly toxic rocket fuel – 1,1-dimethylhydrazine. Positive results were obtained. Spent shungite can be regenerated by a steam-gas activation at the temperatures of 300-800^0 C or by the annealing in air at 400-800^0 C. Chemical and electrochemical regeneration are possible.

Thus, on the basis of complex study of physical and chemical parameters, structure and mineral composition, it is shown, that shungite ores are a sorption material, applicable to the purification of waste water and contaminated soil from the oil-products and other organic polluters.

SD-30

GEOGRAPHIC VARIATION BETWEEN ARSENIC IN DRINKING WATER AND CHRONIC KIDNEY DISEASE: A NATIONWIDE POPULATION-BASED STUDY IN TAIWAN

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Arsenic may affect the function of proximal convoluted tubules and glomerulus, but epidemiological data are limited. We conducted a nationwide cohort study in Taiwan, where the prevalence of end-stage renal disease (ESRD) is among the highest in the world, to evaluate the associations between exposure to arsenic in drinking water and the occurrence of chronic kidney disease (CKD) and its progression to ESRD. Using data extracted from the Longitudinal Health Insurance Database of the National Health Insurance in Taiwan, we constructed a cohort aged 40 years or older and identified patients of CKD newly diagnosed between January 1, 1998 and December 31, 2010. Arsenic levels were assessed on the basis of a nationwide census survey conducted by the Taiwan Provincial Institute of Environmental Sanitation. The data were available on 311 townships, covering about 85% of the townships in Taiwan. After adjusting for sex, age, income, comorbidities, we found residents of areas with arsenic levels ≥50 µg/L in the drinking water had a hazard ratio (HR) of 1.10 (95% confidence interval [CI]: 1.08-1.12) for CKD and an HR of 1.07 (95%CI: 1.01-1.14) for ESRD. We have also identified the endemic areas of arsenic exposure and constructed maps of arsenic levels using the geographic information system. We concluded that a high arsenic level in the drinking water was a risk factor for developing CKD and ESRD, independent of most documented risk factors. Intervention programs should be implemented in endemic areas of exposure to reduce the risks.

SD-31

FLUORINE CONCENTRATION IN EARTH MATERIALS IN PARTS OF NORTHERN NIGERIA

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Concentrations of fluorine in earth materials (rocks, soils and water) are varied. These variations in concentration are due to certain factors such as presence of fluorine minerals in rocks, soil pH and in water (pH, residence time, water type, climatic conditions and depth). Concentration of fluorine in rocks in parts of northern Nigeria (parts of northeast) in migmatite ranges from 500 to 1100 ppm, 606 to 2500 ppm for coarse porphyritic hornblende biotite granite, granodiorite, 500 ppm and the Cretaceous Bima Formation 62 and 79ppm. Fluorine in soil samples ranges from 146 to 555ppm. In the northcentral areas; migmatite, 25 to 380ppm, coarse porphyritic hornblende biotite granite, 79ppm, trachyte, 949ppm, riebeckite granite (Langtang Area), 800 and 1000ppm, rhyolite, 1749ppm. Content of fluorine in rocks of the Jos Younger Granite province are; applo-pegmatitic granite gneiss (basement), 4864ppm, Ngeil biotite granite, 47 and 162ppm, Jos – Bukuru Biotite Granite 914 and 6231ppm, Dilimi Biotite Granite, 2587ppm and quartz – pyroxene – fayalite porphyry, 1280ppm. Fluorine in soils of the Younger Granite Province ranges from 155 to 598ppm from 0 to 6m depth in two locations. High fluoride (>1.5mg/l) WHO Upper Limit were recorded in drinking water in all areas with high fluorine content in rocks, except the Jos Bukuru Younger Granite areas which have over 80% of water points with fluoride lower than 0.5mg/l WHO Lower Limit. Fluorite in rhyolite and riebeckite in granites have been identified as minerals leaching fluorine into water in Langtang Area. In the Northeast areas, biotite and hornblende in granites and migmatite are the minerals hosting fluorine. Inhabitants of areas with high fluoride in groundwater show clear manifestation of dental fluorosis.

SD-32

A STATISTICAL APPROACH OF HEAVY METAL POLLUTION INDEX IN CREEK SURFACE WATER SAMPLES (NIGDE, TURKEY)

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In this study, ten surface watersamples from Yagdan Creek (Nigde, Turkey) were collected and analyzed for metals (Cr, Ni, Cu, Cd, Pb, Zn) to assess the level of contamination [1, 2]. In order to get this, heavy metal pollution index (HPI), correlation among elements, factor and cluster analyses and were calculated.

Stations on the creek, in order, have the HPI values (S1=67,12; S2=68,90; S3=88,83; S4=90,39; S5=85,02; S6=179,10; S7=387,13; S8=363,31; S9=288,25; S10=214,74). The stations located close to the source of the creek (1-5) having low risk, whereas those located far fromthe source of the creek (having high risk (6-10). These HPI results were meaningful since the latter values were obtained from Pb-Zn miningstock areas, industrial areas, city center, slaughterhouse, and also purification of wastewaterareas.

Cr-Cd and Cr-Ni are highly positively correlated; Pb-Cu and Pb-Cd are highly positively correlated. Zn does not show any correlation between other elements. The results also display meaningful correlations among the other elements and the above mentioned places. These results are also supported by the [1, 2] data.As can be seen the reasons for pollution in the creek were because of different sources (e.g. mining and municipality areas) rather than one source. The heavy metal pollution in these areas should be rectified.

SD-33

AQUEOUS BIPHASIC SEPARATION OF THALLIUM FROM AQUEOUS SOLUTION USING PROPANOL AND SALTS

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The aqueous biphasic system has a great potential to separate metal ions (such as gold and zinc) [1-2] from aqueous solutions due to its non-toxicity and cost-effectiveness. However, few studies on the separation of thallium (Tl) using aqueous two-phase systems have been reported. In this study, extraction and separation of Tl from aqueous solution using a new aqueous biphasic system consisting of propanol and salts were investigated. The extraction of Tl was driven by the complexation between Tl-chlorocomplex ($TlCl_4^-$) and the protonated oxygen atom from propanol. The addition of appropriate amount of salt helps form the aqueous two-phase stratification, in which Tl and propanol were enriched in the upper phase while the most water and salt were separated in the bottom phase. Over 99% of Tl(III) can be extraction under the extracting system of 6mL of Tl(III) and 1mL of 1.5M HCl and 3mL of propanol and 1.6 g of salt. This extraction method works perfectly on Tl(III) but poorly on Tl(I), which implies that this methodology not only could be an effective means to recovering Tl from wastewater but also be a good alternative to the analysis of Tl speciation in aqueous solution.

SD-34

ISOTOPIC AND RACE ELEMENT CONSTRAINTS ON THE ORIGIN AND EVOLUTION OF SALINE GROUND WATERS IN CONFINED AQUIFER SYSTEMS OF YUNCHENG BASIN, NORTHERN CHINA

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A combination of major, trace elements and $\delta^{18}O$, $\delta^{2}H$ values is used to examine the origin and evolution of saline ground waters in confined aquifer systems in the Yuncheng Basin, northern China. The ground waters are characterized by distinctly lower $\delta^{18}O$ and $\delta^{2}H$ values. This depletion indicates palaeo-climatic effect and calculation shows that these deep ground waters are recharged under a climatic condition which is about 3 °C cooler than the modern temperature. Four groups containing elevated Cl^- concents are delineated in the study area. The ground waters from these groups are characterized by distinctive stable isotopic and chemical signatures. This difference is interpreted in terms of different origin and hydrochemical processes. Group I and IV waters show strong evidence of mixing with thermal waters, while Group II is shown to be influenced by downward vertical leakage of overlying shallow ground waters. Variations for waters in Group III are explained by a mixing model involving a deep saline water. Apart from mixing, evapotranspiration, cation exchange, and dissolution of evaporate salts contribute to the ground water salinity. A second-stage carbonate dissolution also occurs in Group I and IV waters. For the two thermal waters in this basin, their high TDS concentrations are related with the fault structures.

SD-35

EFFECT OF CALCIUM AND MAGNESIUM CONTENTS IN DRINKING WATER TO THE ARTERIAL STIFFNESS, SLOVAK REPUBLIC

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The article is dealing with the impact of Ca and Mg contents in drinking water on the arterial stiffness of resident population living in the Krupina district, Slovak Republic. The Ca and Mg contents in groundwater/drinking water ("water hardness") used for public supply of residents vary significantly according to geological structure of the territory. The lower Ca and Mg contents are found in drinking water in the geological environment made of Neogene volcanites while increased Ca and Mg contents are typical for geological environment of sedimentary Neogene (aquifers located in greater depth).

The study was based on the two-phase measurement of the arterial stiffness in a sample of 144 randomly selected respondents, being divided into two groups according to Ca and Mg contents in the drinking water. One group of respondents was supplied by soft water (Ca <25 $mg.l^{-1}$, Mg <10 $mg.l^{-1}$) and the second group was supplied by harder water (Ca >80 $mg.l^{-1}$, Mg >20 $mg.l^{-1}$). Arterial stiffness was determined by measuring the aortic pulse wave velocity (PWVao). Based on the measured levels of PWVao the arterial age of respondents was calculated. Achieved results have documented higher arterial stiffness (i.e. lower elasticity of arteries) of the respondents drinking soft water deficient in Ca and Mg contents. This was reflected in higher PWVao levels, higher number of pathological cases (PWVao >10 $m.s^{-1}$) and in higher arterial age of respondents supplied by the soft drinking water in comparison with their real age. "The absolute difference" between the real and arterial age in the case of two evaluated groups of respondents (soft vs. harder water) was in average nearly 5 years (5.5 in the 1st phase and 4.3 year in 2nd phase of measurements).

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SD-36

CONTENTS OF ESSENTIAL MACRO-ELEMENTS IN HAIR AND NAILS OF RESIDENTS IN THE KRUPINA DISTRICT, SLOVAK REPUBLIC

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This paper deals with the analysis of Ca, Mg, Na, K and Si contents in hair and nails of residents living in the Krupina district, Slovak Republic. Study area is located in geological environment of volcanic rocks (mainly andesites and their pyroclastics) releasing into the other compounds of the environment, mainly groundwater/drinking water and soils, low contents of Ca and Mg on the one hand and increased contents of Na and K as well as very high Si contents on the other hand. Neogene volcanic rocks were across the Slovak territory identified as the most unfavourable geological environment with documented negative health effects on resident population. In study area (Krupina district) with resident population supplied within public supply system with soft drinking water (Ca <25 $mg.l^{-1}$, Mg <10 $mg.l^{-1}$) mainly increased mortality from cardiovascular diseases but also e.g. oncological diseases was documented compared to Slovak average health status. This study aimed to analyse reflection of such unfavourable geological environment in contents of selected essential elements including Ca and Mg in biological materials of residents. Biological monitoring was performed in a sample of 111 respondents (48 adults, 63 children). Total number of 91 hair samples and 61 nail samples was collected and analysed. Median values of evaluated essential elements were determined in hair in levels: Ca 664 $mg.kg^{-1}$, Mg 81 $mg.kg^{-1}$, Na 281 $mg.kg^{-1}$, K 127 $mg.kg^{-1}$, Si 50 $mg.kg^{-1}$ and in nails in levels: Ca 1 449 $mg.kg^{-1}$, Mg 198 $mg.kg^{-1}$, Na 1 115 $mg.kg^{-1}$, K 1 027 $mg.kg^{-1}$ and Si 176 $mg.kg^{-1}$. Generally all of evaluated elements showed high variability and high variance of concentration levels. Their contents in nails were markedly higher (about 2–5 times) than in hair. We did not document any significant differences in nail concentration levels between genders while in case of hair significantly higher contents mainly of Ca and Mg were observed for women.

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SD-37

CURATIVE WATER IN KARELIA

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Karelia is the part of the Baltic region of the ferruginous and radon waters formed in the crystalline rocks of the Fennoscandia Shield. Reserves of the mineral waters are estimated and used for therapeutic purposes in only two fields – "Martial Waters" (iron) and "Kondokskoe" (radon). The first Russian resort "Martial Waters" with the direct participation of Peter the Great in 1719 marked the beginning of resort business in Russia. Name of the resort was given in honor of the god of war Mars. In the Peter the Great's time only springs existed there. Currently there are 4 artesian wells. Known reserves of mineral water is 15 cubic meters per day. In its modern form, the resort operates since 1964 and is used for medical purposes and drinking fresh ferruginous water. This is bicarbonate-sulfate-calcium-magnesium groundwater with a high content of an iron up to 140 milligrams per liter.

Another type of mineral water of Karelia is radon water. The field of the mineral water "Kondokskoe" is located in the northern Karelia. A spring with highly radioactive water was discovered in 1977 during exploration work on the iron ore deposit Kostomuksha. Groundwater is confined to the upper part of the Archean metamorphic rocks and drained by springs in the area that has the tectonic contact with granites, migmatites and sedimentary-volcanic rocks. The spring water is cold, very fresh, with the average radon concentration of 4200 Bk/l. The estimated reserves of the mineral water is 6 cubic meters per day. Water is used only for external treatments (baths) in the Kostomuksha hospital.

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SD-38

PULMONARY TOXICITY OF PARTICULATE MATTER DERIVED FROM DUST SAMPLES FROM DZHIDA MINE (TRANSBAIKALIA): PRELIMINARY RESULTS

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Inhalation of mineral contaminants can have highly detrimental effects on human health. A large body of scientific literature describes associations between short-term and long-term exposures to ambient particulate matter (PM) and increased mortality and hospitalization from cardiovascular and respiratory diseases, based on epidemiologic studies of human exposure to PM with aerodynamic diameters ≤ 10 microns (PM_{10}) [1].

In the present report, a preliminary hazard identification study of the toxicity of PM derived from dust at the area of the Dzhida tungsten-molybdenum mining-concentrating complex, located near Zakamensk town in Buryatia Republic (Russia), is considered. Molybdenite and sulfide-hubnerite ore wastes up to 40M tons in total have been accumulated in this place. Five pooled samples were examined. Three of them were the solid fraction of snow samples taken near the waste dam. Two samples contained home dust from attics. To study the fraction used to 0.074 mm, weight of sample about 2 g.

Dust samples were resuspended in air and passed through a Next Generation Impactor (NGI) in the laboratory. The study has identified respirable fraction (PM_{10}), amounting to about 1% of the initial sample, by mass. Pulmonary toxicity of each sample were studied in mice. 100 μg of respirable dust in 50 μl of vehicle were delivered by pharyngeal aspiration. Vehicle (Saline) was a dispersion media (DM), containing mouse albumin and a phosphotidylcholine to reduce particle agglomeration. Also included was a "background dust" control from the Arizona, USA region, which contained predominantly crustal elements. Mice were euthanized 24 hours after aspiration and lung inflammation and injury were assessed, along with systemic vascular endothelial dysfunction. Bulk elemental and trace metals analysis of the initial samples and bulk elemental analysis of PM_{10} fraction made by ICP-OES, while trace metals analysis of PM_{10} made by ICP-MS.

Administration of the PM_{10} fraction samples taken near the tailings had a significantly greater impact on inflammatory processes in the lungs and vascular constriction of experimental mice than inhalation of house and attic dust. All five samples exhibited greater pulmonary toxicity than the background dust PM10. The concentration of metals in respirable fraction of dust is two to three orders of magnitude higher than in the original sample; ICP-MS analysis suggests that lead (Pb) and cadmium (Cd) may be a specific concern.

All data presented here are preliminary until a complete quality control check has been done on the data.

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SD-39

APPRAISAL OF MICROBIOLOGICAL SAFETY OF NATURAL PELOIDS

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Microbiological control for sanitary safety, particularly of pathogenic microorganisms, is essential along the processes of preparation, storage, topical application and reuse of both *natural peloid* and *peloid s.s* (*stricto sensu*) or just *peloid* (Gomes et al., 2013). Obviously, *natural peloids* with origin in sedimentary or in volcanic deposits, due to their exposure and to the possibility of bearing significant contents of organic matter, are more susceptible to microbiological contamination comparatively to *peloid s.s*. (those called *designed and engineered peloids*, a particular type of *extemporaneous peloids*), that could be produced in controlled chemical and microbiological conditions (Gomes et al., 2015). Dermal absorption is the natural pathway for microbial infection, hence the skin areas under treatment should be healthy, i.e., without "*entrance doors*". Various authors have reported a particular concern about the presence of potentially hazardous microorganisms (bacteria and fungi) in natural peloids. Within the European countries, with exception of certain regions of Germany and France, there are not quality standards or guidelines for *muds* and *peloids* applied for therapeutic purposes. In the European Union, there are no uniform rules for the microbiological specifications of *muds* and *peloids*, despite the concern shown by the European Spas Association (ESA, 2006). If *medical peloids* are equivalent to remedies or medicines, they should not contain pathogenic microorganisms such as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Candida albicans*, *Escherichia coli* and *faecal coliforms*, within others.

One *natural peloids*, a mud of a saltpan (from the Aveiro lagoon), and one *peloid s.s* (prepared by mixing commercial kaolin and spring natural mineral water) were selected. Both samples were microbiological analysed, before and after being submitted to sterilization using an autoclave (Panasonic, model MLS-3751L at 0,3 MPa and 121 ºC during 20 minutes and an hyperbaric chamber (Hiperbaric model 55) at 600 MPa and 18 ºC for 15 minutes. The efficiency of both processes is compared and discussed.

SD-40

GEOSOCIAL PROCESS: CONCEPT AND LAWS

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The paper presents data on the natural and social catastrophes, and their analysis, which confirms the idea of Aristotle–Leibniz–Mach of the unity of the surrounding world – animate and inanimate nature and society. For the purpose of quantitative analysis of the problem "proving of the unity of the surrounding world" the list of the most powerful natural disasters and significant social phenomena, including the N=2824 events that occurred during the last few thousand years of our history, was compiled for the first time. Each event in the list is characterized with year, place, a brief description and a source of information about it.

The totality of the data was classified by three parameters: intensity of event, its type and scale (territorial) level. All events are divided into natural disasters (earthquakes, volcanic eruptions, hurricanes and floods, droughts and climatic anomalies), social phenomena (wars and battles, revolutions and rebellions, genocides, epidemics, fires) and others. Catastrophic events were classified by logarithmic scale (J) that is based on socially important parameters: human casualties P and material losses Q ($). The maximum intensity of the events (of our time) corresponds to J=I ($1.5\cdot10^{13}<Q\leq1.5\cdot10^{15}$, $1.5\cdot10^{8}<P\leq1.5\cdot10^{10}$), and minimum intensity is J=III ($1.5\cdot10^{9}<Q\leq1.5\cdot10^{11}$, $1.5\cdot10^{4}<P\leq1.5\cdot10^{6}$).

The analysis of the different data sets, including selections of only natural disasters, only social phenomena and all the events together, was carried out. It is shown that all three data sets have identical properties: they are described by distribution laws with similar slopes of events repeatability plots $\Delta\lg N/\Delta J\approx-0.6$, similar periods (260±50 years) and the ability to cluster in small time slots. Clusterability of events within the whole system appears as "attraction" and / or the interaction between natural disasters and social phenomena.

Clusterability of natural disasters and social events and their relationship (interaction) made it possible to introduce the concept of geosocial process. The medical geology data, demonstrating the complex effect of geological processes and the products of their activities on people's living social conditions are shown. Thus, if the medicine determines the level of society health, medical geology determines state of knowledge of the geosocial process. The data obtained allow to start modeling the geosocial process which takes into account the value of the real geosocial risk that can be used in the preparation of programs of the integrated regional development, primarily, such as Siberia and the Russian Far East.

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SD-41

ADVANCING MEDGEO IN UNIVERSITY ENVIRONMENTAL EDUCATION:PROGRESS IN URUGUAY

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Medical Geology as an emerging discipline has grown in practice and in theory since its beginnings in Uruguay in 2003. In this presentation, we focus on the educational aspects at University level.

The Toxicology Department of the Chemistry Faculty of the Universidad de la República began to introduce MedGeo in short courses for continuing education in 2003. In 2004 it was first included as one of the subjects in an elective course called "Environmental Toxicology and Medical Geology" taken by advanced students who had previously approved the "Fundamental Toxicology" course.

In 2017 a new additional course called "Advanced Topics in Environmental Toxicology and Medical Geology" will be held for the first time in our Faculty.

This presentation explores the evolution of Medical Geology in our University from 2003 to 2017 with an Educational Research approach, highlighting its contribution to the Environmental Sciences.

SD-42

MAIN CHARACTERISTICS OF THE GEOMAGNETIC VARIATIONS IN THE MOSCOW REGION

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Increased interest in the variations of geophysical fields and, in particular, in geomagnetic variations is associated primarily with the establishment of environmental conditions, which is not static, and its variability directly determines the adaptation to the environment and the evolutionary direction of changes of biological organisms, especially human. Electric and magnetic fields are of particular importance, since the violation of transmission conditions and perception of human organs of electromagnetic control signals with bioelectromagnetic resonances is one of the main causes of body imbalance. It is important to note that along with the short-period biorhythms (0.1-20 Hz), responsible for the functioning of the heart, the neuromuscular system and the brain, there are several long-biorhythms in humans with periods ranging from 1 day to 1 year, responsible for physical, emotional and intellectual health. Bioelectromagnetic response with these periods is very significant.

In this research we used the results of instrumental observations of geomagnetic field, carried out in the period of 2009 – 2015 at Geophysical Observatory "Mikhnevo" of Institute of Geosphere Dynamics of Russian Academy of Sciences. The observatory (54,960 N; 37,774 E) is located in the Moscow region.

The analysis shows that in general the geophysical situation in the Moscow region is disturbed. The tendency to increasing in geomagnetic activity over time is established. Repeatability of geomagnetic disturbances is characterized by clearly pronounced periodicity with characteristic periods of about 14, 27, 60, 182 and 365 days.

SD-43

THE EFFECTS OF AIR POLLUTANT CHANGE ON RESPIRATORY DISEASE DURING DUST STORM DAYS IN TAIPEI CITY, TAIWAN

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Background/Aim. Long-range transport of dust particles in the atmosphere has been recognized as having direct and indirect effects on health. We conducted an epidemiology study to evaluate the associations between acute exposures to air pollutants and respiratory diseases during the dust storm periods, taking into account the possible lags in their effects.

Methods. We retrieved daily records of outpatient department (OPD) visits from a random sample of one million people in the National Health Insurance Research Database of Taiwan and included records on OPD visits for respiratory infection (ICD-9 codes 460 to 519) from 2005 to 2010. Data on air pollutants were obtained from the air quality monitoring stations established in Taipei City by the Environmental Protection Administration. Air pollutant data included PM_{10}, $PM_{2.5}$, carbon monoxide (CO), ozone (O_3), nitrogen oxide (NO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). We adopted a case crossover design to evaluate and describe the effects of air pollutants on respiratory infection. The lag days of the effects were taken into account in the data analyses.

Results. The PM_{10} concentrations during dust storms days were significantly higher than those in the 2-day period immediately ahead of the dust storms. We found that the risk of OPD visits for respiratory infection had significant associations with, O_3 ,SO_2,PM_{10}, and $PM_{2.5}$, during the dust storms days in Taipei. Levels of CO,NO,NO_2, were negative associated with OPD visits for respiratory infection. When the lagged effects are considered, O_3 was negatively associated with OPD visits for respiratory infection.

Conclusions. This case-crossover study provides evidence supporting the effects of CO, NO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ on OPD visits for respiratory infection with different lags in Taipei, Taiwan.

SD-44

INDOOR RADON EXPOSURE IN HIGH RADIOACTIVITY REGIONS AND PUBLIC HEALTH

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Prolonged exposure to radon gas, the radioactive daughter of naturally occurring radium-226 of uranium decay series, has been demonstrated to be harmful to human health and the World Health Organization (WHO) has classified radon as a carcinogenic element. Many regions around the world do have geological settings with elevated levels of uranium and thorium and especially there, the radon concentrations inside buildings may build up attaining harmful concentrations from the radiation point of view. Analyses of radon were carried out in public buildings and private dwellings in granite uranium bearing regions and compared with radon levels in other geological settings of Portugal. Average radon concentrations were low in sedimentary regions in the south of the country, around 10 Bq/m3, but attained average values of 600 Bq/m3 and even up to 12 000 Bq/m3 in a few cases in the granite regions of the North of Portugal, especially in uranium bearing regions. The exposure to these high radon concentrations is assessed in the light of WHO recommendations and of European Union Basic Safety Standards (EU Directive 2013/59). The need for corrective measures and for an action plan to lessen the exposure of the population to indoor radon in high radioactivity areas is discussed.

SD-45

SITUATION ANALYSIS OF CUTANEOUS LEISHMANIASIS IN AN ENDEMIC AREA, SOUTH OF IRAN

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Objective. To update current situation of the cutaneous leishmaniasis (CL) in Kazerun County, southwest of Iran and to analyse the epidemiological aspects of the disease during 2005–2015.

Methods. Data on CL were obtained from the Health Center of Kazerun County, and then were analysed and mapped using SPSS and Arc GIS 10.3.

Results. A total of 700 cases of CL were recorded during the study period with an overall decreasing trend from 2005 to 2015. More than 60% of the patients were inhabitants of rural areas and males were infected more than females. Although there was not a significant difference between gender, job categories, residence and CL infection ($P > 0.05$), and age groups were significantly different ($P < 0.05$). But there was no significant correlation between monthly cases of the disease with average temperature ($P > 0.05$). Most of the acute lesions were found to be present on the hand, leg and face, respectively. The average CL incidence in the study area was calculated as 24.9/100000 population. A hot spot for the disease was found in southern part of the area ($P < 0.05$).

Conclusions. This study revealed that CL is present in Kazerun country. Thus, effective monitoring and sustained surveillance system is crucial in counteracting the disease, and if possible, to eliminate it.

SD-46

CLIMATE CHANGE AND THE DISTRIBUTION OF MALARIA VECTORS DURING THE PAST 5 DECADES IN IRAN: A SPATIAL ANALYSIS

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Background Global warming and climate change affect various aspects of mankind, including public health. Anopheles mosquitoes are of Public Health importance and can be affected by global warming and other environmental variables. Here, we studied the distribution of Anopheles vectors of malaria in relation to environmental variables in Iran. Methods Long-term meteorological and entomological data of about 50 years in retrospect were collected and arranged in a geo-database and analyzed using ArcGIS ver. 9.3 and exported to SPSS ver. 20 for statistical analysis. Results Distribution maps have been updated for seven species of Anopheles vectors of malaria which involved Anopheles culicifacies s.l., An. fluviatilis s.l., An. stephensi, An. dthali, An. sacharovi, An. maculipennis.l. and An. superpictus in Iran. Distribution maps of vectors were made based on district areas using Kriging model. Historical and recent records were demonstrated for each Anopheles based on climatic factors in the distribution areas of each Anopheles vectors. Discussion Iran, like other parts of the world is faced with warming and this probably affected the distribution of Anopheles vectors. Despite the warming phenomenon, the country's climate had changed during the cold season as temperatures became colder or cooler. This study shows that some vectors had migrated from the central part of Iran with dry and sunny landscape, moved towards the mountainous areas of the north or the warm and humid areas of the south. Historical records show that these anophelines have previously been distributed in lowland areas. If this process continues in the future, Anopheles mosquitoes may be seen in low lands with cold areas in central and northern parts of the country or will occupy humid and warm climates in the southern parts of the country where water is more available.

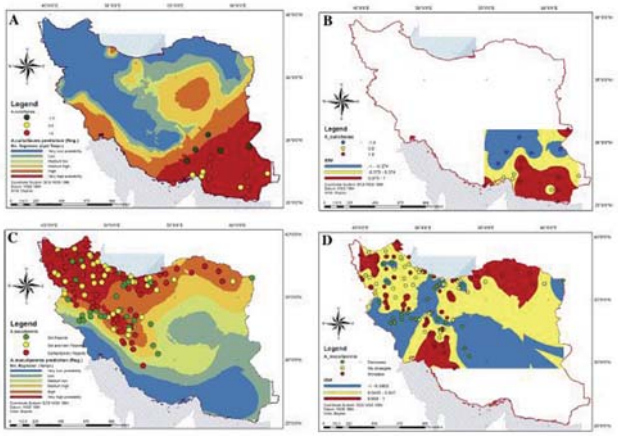

Figure caption - Current distribution compared with historical distribution and predicted distribution of An. culicifacies s.l and An. maculipennis s.l.; A. distribution and predicteddistribution of An. culicifacies s.l in Iran, B. population fluctuations of An. culicifacies s.l in South-East part of Iran, C. distribution and predicted niche of An. maculipennis s.l. inIran, D. changes in the distribution of An. maculipennis s.l. during the past 50 years.

SD-47

CHARACTERIZATION AND BENEFIT OF PORTUGUESE GYPSUMS AS RAW MATERIALS FOR DERMOCOSMETICS

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Gypsum deposits exploited for cement company CIMPOR in Loulé, Óbidos and Soure, were submitted to chemical, mineralogical, and technological characterizations, with particular emphasis in the recommended ones for the evaluation of the quality degrees needed for application in dermocosmetics. The studied deposits correspond to outcrops of small dimensions, in diapiric anticline areas. In rule, they present gypsites of white colors, generally of higher quality for the traditional applications (as white cement) or grayish, generally not adequate for cements and mortars. Several analyses were carried out, namelly, grain size distribution (wet sewing and sedigraph), mineralogical composition (X-ray diffraction), geochemical (major and minor elements) analyses (X-ray fluorescence), abrasiveness, plasticity, texturometric (adesivity and firmness), oil absorption and cooling rate. The results obtained so far point to Óbidos gypsum as the one showing greater mineralogical and chemical quality (almost pure gypsite/calcium sulphate), being also the finer (<63 μm) one, whereas Loulé and Soure present some mineralogic impurities (mainly quartz). Studied gypsums show, in general, good characteristics for application in dermocosmetics, namely in what concerns properties such as absorption, plasticity, adesivity, firmness and abrasiveness. This last one presents, however, some limitations, in the cases of Loulé and Soure, with higher values (due to quartz presence). Thus, they need to be submitted to beneficiation to allow its application in products supporting, or even taking advantage, of relatively higher abrasiveness. For this, grain size separation (to obtain finer fractions) and density separation (to reduce quartz content) were performed.

SD-48

WHAT DOES GEOCHEMICAL COMPOSITION OF CHILDREN'S HAIR REFLECT MORE: GENDER PECULIARITIES OR ENVIRONMENTAL EXPOSURE?

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The research is based on analysis of the total contents of Al, As, Br, Ca, Cl, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, Pb, Rb, S, Se, Si, Sr, Ti, Tl, V, Zn (EDXRF) in the hair of 47 girls and 63 boys from Vilnius kindergartens and 7 of them (Cr, Cu, Mn, Ni, Pb, V and Zn) determined by AAS in snow-cover dust. Detailed study of correlation of 7 mentioned elements both in snow-cover dust and in hair is given by Taraškevičius et al. (2017: DOI:10.1007/s10653-017-9977-7). The correlation of the contents of Cr, Ni and V in dust with respective contents in hair was more significant for boys ($p<0.001$) than for girls. Only for Pb, the correlation had similar strength for both genders ($p<0.01$). The hair of girls is inclined to accumulate higher contents of Ca, Cu, Fe, Mg, Mn, Ni, Si, Sr and Zn (3.0, 1.1, 1.7, 1.9, 1.9, 1.3, 1.2, 2.6, 1.2 times, respectively) than boys, the differences are significant at $p<0.01$. The hair of boys has higher content of other elements: 2 times higher of Br and Cl, 1.6 times of K, 1.1 times of P ($p<0.01$) and 1.2 times of Na ($p<0.05$). Review of gender influence on the differences in hair elemental composition is also done. Our observations suggest that when using the results of kindergarten children's hair analysis for various aims (e.g. for recommending the nutritional supplements) both the gender and the environmental conditions of the residences must be taken into account.

SD-49

HEMOGLOBIN BLOOD – INDICATOR OF A HUMAN'S LONG-TERM ADAPTATION TO THE ENVIRONMENT GEOPHYSICAL PARAMETERS

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We draw our attention to the general geological history of some regions of our planet and the surprising similarity of the health indicators of the long-lived population of these regions.

A human being and other living beings are generators of physical fields that interact with geophysical fields – magnetic, gravitational, seismic, etc.

The hemoglobin level (Hb) in blood is a universal nonspecific indicator of adaptation processes, processes of the body's tension on various external influences.

Human hemoglobins are metalloprotein molecules, which have a large magnetic moment, because the Hb molecular contains from 62 to 70 percent of the total body iron.

It is known that the modern Mediterranean, Black and Caspian Seas are relics of the Tethys Ocean and have a common geological history.

It is also known that among the peoples settling the coasts of the Mediterranean and Black Seas – Southern Europe and North Africa, various forms of hemoglobinopathies, in particular thalassemia, are common. A similar pattern of blood can be found among the population living in lowland regions of Azerbaijan and Dagestan

The identical blood picture was found in Kazakhstan – among the population of the Caspian Lowland.

The characteristic feature of the blood picture here is the low level of Hb (from 73.6% to 95% in different years) sometimes reaching critical numbers of 53 g / l (normal 110-140 g / l) with a normal ferritin index (the main iron reserve in the body), the presence of a significant number of target red blood cells (up to 14% in the field of view in 47% of the examined people), which normally do not exceed 1% and never increase with iron deficiency anemia, which, apparently by mistake, is considered to be one of the most common diseases in this region.

SD-50

INFLUENCE OF REGIONAL GEOPHYSICAL FACTORS ON ORGANISM OF LOCAL SPORTSMEN. SPECIAL ASPECTS OF THEIR PREPARATION FOR COMPETITIONS

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Almost all events in our country and the world – all sports and other competitions are conducted without taking into account ethnic and other physiological characteristics of a person. Regional geophysical features, that is, features of the place of permanent residence of an athlete play a major role among many factors that directly relate to homeostasis (constancy of the internal environment of the body).

Regional features of the geosphere cannot but affect the biosphere – the anatomical and physiological characteristics of organisms that permanently reside in a given territory, in particular the human body.

In the process of trainings and competitions, athletes nearly always experience "oxygen hunger" – hypoxia, as they consume oxygen on the sharply activated metabolic processes associated with muscle contraction, which ultimately leads to a decrease in the ability of muscles to contract. Hypoxia is one of the leading factors limiting sports performance capacity.

The effectiveness of the training process and sports competitions is closely related to the concentration of oxygen in blood, the oxygen transport system of the blood, the transport of electrons in the respiratory system of the mitochondria, the synthesis of macroergic phosphates and bioenergetics of the organism.

It is known that our planet has places with large geomagnetic anomalies, where the majority of the population is diagnosed with abnormal hemoglobins, which probably react to these phenomena.

We know that unlike colleagues from other regions, the bodies of athletes permanently residing in such areas are working with an acute exercise.

Currently, there are many ways to increase the physical activity of an athlete. For example, supply of additional oxygen to the athlete's body.

However, athletes from unfavorable regions should periodically and more often attend training camps in more favorable regions. In our opinion, it is also necessary to take into account the lifetime of red blood cells, which perform the function of transporting oxygen in the body and maintain favorable conditions for the formation of new cells when possible.

SD-51

THE IMPACT OF MEDICAL AND GEOLOGICAL FACTORS ON THE WELLBEING OF THE POPULATION IN THE TYUMEN AND KALININGRAD REGIONS

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Medical and social research on economic growth are important to the identification and assessment of natural and anthropogenic factors and geological risks that could threaten human health and the existing or projected objects of industrial sphere. Although geological factors, especially anthropogenic ones, are recognized for their influence on the quality of life and environmental health, there is nevertheless a dearth research and discourse on their impact on human health within the general public.

The goals of this study were to examine the influence of the geological environment and anthropogenic factors on human health, and to assess how medical and geological factors impact the quality of life as experienced by the population. Subject of our research can be defined as an effect on health from the environment. As a part of our research, we studied environmental factors such as air and water contamination and their effects on human health. We compared the data for Tyumen and Kaliningrad regions of the Russian Federation. These regions were selected on the basis of oil and gas production. However, there are differences between them. The Tyumen region has significant hydrocarbon resources, and oil extraction is greatly prominent. Therefore, this results in many environmental problems. Meanwhile, the Kaliningrad region is more focused on it as "background" factor/resource, where there is only one main enterprise of producing sector ("LUKOIL-Kaliningradmorneft") and oil fields are small and shallow. Oil production in the Tyumen region is tens millions tons per year, but in the Kaliningrad region oil production is typically less than 1 million tons.

The assessment of health and social safety is derived from the applied sociological methodology of primary quantitative research. It can help those responsible for environmental policy development and decision making in the Tyumen and Kaliningrad regions in minimizing the impact of negative environmental factors on the population health. This was why this social problem was selected for this particular research.

We used the main methodology of standardized sociological research, which allowed us to reach large groups of people with a pre-formulated set of questions. The data obtained in the survey and secondary statistical data were used as primary empirical data. The main questionnaire consisted of 77 questions, which looked at demographic parameters, work conditions and health status etc. The research took place in 2014-2015 with 165 respondents in the Tyumen region and 150 respondents in the Kaliningrad region. Data processing was conducted with the help of a software package used for logical batched and non-batched statistical analysis, the SPSS, which is the program often used for statistical analysis in social science. Data processing was also done using MS Excel and Statistica. Descriptive statistics, in particular frequencies and cross tabulation, were the main focus of this research, since they quantitatively described and summarized relevant information about the regions.

Basing on the proposed hypothesis of the impact of natural and anthropogenic factors on population health and the quality of life, we chose the impact of oil production as an independent variable, and the health of the Tyumen and Kaliningrad regions as the dependent variable. As a part of this case study, we examined the most common pollutants (organic substances, oil and oil products) and their impact on air and water, which are reflected in the corresponding issues of the

region's health. On the basis of the sociological survey it was concluded that the oil factor significantly affects population health, especially diseases related to the lungs and stomach. These issues were evident in the Kaliningrad region, even if it was a so called "background" region and not the main one as Tyumen region, where these features were revealed most clearly.

We concluded that the increasing anthropogenic and technogenic impact on the environment are particularly noticeable in these two regions of the Russian Federation. This research on environmental safety aims to assist officials with developing a better policy at the federal and regional level.

SD-52

DUST POLLUTION IN THE VICINITY OF PETROCHEMICAL PLANT: CASE STUDY OF PAVLODAR (REPUBLIC KAZAKHSTAN)

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Air pollution is an important medical and ecological issue for many cities in the world. One of the most significant indicators of air quality is the content of fine dust aerosols in it. For this reason it is necessary not only to have the information on the content of chemical elements in the atmosphere, but also to know modes of their occurrence and the particles sizes. Solid particles with the size of less than 10 и 2,5 μm are the most hazardous for the human health, causing the respiratory diseases, and by the weakened immune system – early death [1].

It should focus attention on the dust condition of atmospheric air in the industrial areas and settlements with industrial enterprises impact.

With the purpose to estimate the air pollution level and diseases increase risk, we have collected snow samples in the vicinity of Pavlodar petrochemical plant and in the village Pavlodarskoye (population 6230 persons), located 3 km far from the plant. 22 samples were collected. We study snow solid phase. The character of technogenic impact was assessed through the daily dust load on investigated areas. The samples were analyzed using scanning electron microscopy.

The value of dust load varies from 40 to 306 mg/m^2 a day, and in the village Pavlodarskoye in the limits of 30-443 mg/m^2 a day. With distance from the plant, north-eastwards, dust load amount increases at a distance of 2,5 km and equaled 306 mg/m^2 a day. The average pollution level was determined through estimated maximal dust load value, which corresponds to moderately hazardous level of disease rate of population according to [2]. Also, mineral and non-mineral phases of the samples were determined. It was identified, that some particles in the insoluble fraction of aerosol in snow with the size of 0,5-25 μm can get into human organism by inhaling.

SD-53

NATURAL OCCURRENCE OF POTENTIALLY HARMFUL FLUORIDE CONTENT IN GROUNDWATER: AN EXAMPLE FROM NAKURU COUNTY, THE KENYAN RIFT VALLEY

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High fluoride concentrations have been known to have several health implications on humans and animals health. The present study deals with the occurrence and distribution of fluoride in different aquifers in Nakuru County, Kenyan Rift Valley. Water-quality data from 32 boreholes and hydro-geological data were acquired from the Catholic Diocese of Nakuru-Water program and from literature respectively. Results show a dominant Na-HCO_3 and a slight Na-HCO_3-Cl water type dominated by sodium, fluoride, chloride, sulphate and bicarbonate. More than 87% of the boreholes show fluoride levels higher then the limit recommended by World Health Organization for safe drinking water. Fluoride levels ranged from 0.5–72 mg/l with a mean of 11.08 mg/l and showed a strong positive correlation with the dominant parameters and a negative correlation with calcium, borehole depth, and water hardness. The correlations suggest that, minerals dissolution and evaporative enrichment might be the main processes of fluoride release and concentration in groundwater. Spatial analysis showed that, fluoride concentrations were not confined to the type of aquifers, but rather to their locations. Low fluoride aquifers were located close to the rift's Bahati and Mau escarpments, while high fluoride aquifers were in the rift floor, where the fluoride hotspot was located. Dilution of groundwater by high rainfall and little water-rock reaction time in the escarpment recharge zones leads to low fluoride concentrations. Accumulation of dissolved solutes in the rift floor aquifers as groundwater flows from the escarpments, and evaporative enrichments from high temperature leads to high fluoride concentrations.

SD-54

GEOPHAGIC TERMITE MOUND SOILS AND THEIR POTENTIAL HEALTH IMPACT ON PREGNANT WOMEN IN ONANGAMA VILLAGE, NORTHERN NAMIBIA

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Geophagy, a common practice of eating earth materials such as clay is more common in pregnant women and children under the age of three. Historically, geophagy has been observed among people (and animals) in all parts of the world since ancient times. In Africa, the practice is common mainly in South Africa, Malawi, Zambia, Zimbabwe and Swaziland where clay ingestion is wide spread among women. Reasons for Geophagy in Pregnancy (GiP) are linked to physiological and psychological while factors such as cultural and socioeconomic motivations also play a major role. Geophagy has both beneficial and detrimental health implications. It has a risk of concomitant detrimental maternal and foetal health effects. Despite the negative connotations that have been ascribed to it, the practice still remains very widespread and have no boundaries with regards to race, socio-economic status, age, religious orientation or ethnic origin. Soil may be directly ingested from the ground, but in many situations there is a cultural preference for "special sources" soil, such as the walls of termite nests or traditional herbal–soil mixtures. Though geophagy is known and reported to be a common practice among Namibian population, there is no documented evidence on its prevalence or its health effects. The present study aims, therefore to establish the prevalence of this practice and its possible health effects on pregnant women in a small rural village of Onangama in the Northern part of Namibia. This will be achieved through the geochemical and mineralogical study of soil material that is consumed and correlation (if any) will be assessed through a health survey on pregnant women from the study area.

SD-55

IODINE AND THE PREVALENCE OF ENDEMIC GOITER IN NIGERIA – A CASE STUDY FROM AJARA – BADAGRY IN LAGOS, SOUTH-WESTERN NIGERIA

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Iodine is an important element required by human body for proper thyroid functioning and there has long been an established link between this element and goiter occurrences. Generally, goiter cases have been commonly associated to iodine deficiency in a remote mountainous regions. In Nigeria, studies on prevalence of goiter have been restricted to the basement metamorphic/ igneous granitic terrains of central Nigeria (e.g. Okonkwo &Tiwari 1987). This is notably in Enugu, Cross- River and Benue where endemic goiter due to iodine deficiency has been identified with TGR almost greater than 60% (Egbuta et al., 2003). Lar (2013) reported that no goiter cases have been identified from communities within the sedimentary basins and coastal areas of Nigeria. Also, goiter belt map for Nigeria by Isiche et al., (1987) put some sedimentary/coastal regions in Nigeria i.e. Lagos, Ogun and Bayelsa on a goiter prevalence scale of 0-5.

Although, it is generally believed that people living on the sea coast have sufficient supply of iodine however, Sharbari et al., (2007) stated that this does not guarantee iodine sufficiency. This statement amongst others might justify the possibility of the occurrences of goiter in some of the sedimentary/coastal environment in Nigeria i.e. Ogun and Lagos (Gbadebo Oyesanya, 2005; www.thenationonlineng.net). However, a thorough review has shown that very little to no study has been carried out in Nigeria to examine goiter's prevalence in its sedimentary/coastal environments. Hence, the important need for appraisal of the prevalence of endemic goiter in such environment.

REFERENCES

1. Egbuta, J., Onyezili, F., & Vanormelingen, K. (2003). Impact evaluation of efforts to eliminate iodine deficiency disorders in Nigeria. *PNublic health nutrition*, *6*(2), 169 –173
2. Gbadebo, A. M., & Oyesanya, T. M. (2005). Assessment of iodine deficiency and goitre incidence in parts of Yewa Area of Ogun State, Southwestern Nigeria. *Environmental geochemistry and health*, *27*(5), 491 –499.
3. Isichei UP, Das S, Egbuta JO, Banwo AI, Norinto I and Nagataki S. (1987). Endemic goiter in Plateau State, Nigeria: the possible aetiological factors and the establishment of endemic goiter map for the region: *Proceedings of the Nigerian /Japan Conference. University of Jos Press;74 –79*
4. Lar, U. A. (2013). Trace elements and health: an environmental risk in Nigeria. *Earth Science*, *2*(3), 66 –72.
5. Okoronkwo, M. O., & Tiwari, I. C. (1987). The prevalence of Endemic goitre among preadolescent and adolescent children in Bassa Local Government area of Plateau state, Northern Nigeria. In *Proceedings of Nigeria–Japan joint conference on trace metal, goitre, diarrhea, medical entomology*
6. *Sharbari Basu, Biswajit Mohanty, Somali Sarkar, G. Satheesh Kumar(2007).Estimation of iodine levels in drinking water in Puducherry District. Biomedical research; 18(3):171 –173.*
7. www.thenationonlineng.net (0ct 2014) Lagos begin battle to rid Badagry of goiter, site assessed on April 14, 2017

PUBLICATIONS

PUB-01

LOCAL HEALTH ISSUES FROM ENVIRONMENTAL SOIL PHYSICS EXPERIMENTS

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Background On assignment from the Swedish defense research agency lysimeter installations and plot experiments were performed to study soil transport of fission products: caesium-137, strontium-90 and plutonium-239. 50-years later neighbors were concerned about an increased number of cancer cases in adjacent areas. The environmental health clinic at Uppsala university hospital was consulted together with municipality authorities. Method Population data from the two parishes with the experiments was retrieved together with the number of cases of malignancies from the Regional oncologic center. Using GIS-technique and geocoordinates the distances from the experiment site to the places of domicile for the population were calculated. Both descriptive statistics on cancer incidence with chi-square analysis and logistic Poisson regression analysis were applied to data. Results Descriptive statistics showed an increased incidence of cancer closer to the field experiment sites (M-H-Chi2 $p < 0{,}0001$). On the other hand, when possible confounding from age, years living in the habitat and gender was introduced in the logistic model, only age and years living in the habitat were significantly related to cancer incidence ($p < 0{,}0001$). Conclusion The observation from the local population, that there was an increased occurrence of cancer cases closer to the experimental areas, was confirmed, but could probably be explained by a spurious relation to age, where more elderly people lived close to the sites. In the aftermath ethical questions were raised why the local population was not informed about these experiments in their neighborhood.

PUB-02

RISK ASSESSMENT OF POTENTIALLY TOXIC TRACE ELEMENTS IN SOILS AND LETTUCE FROM THE RAŠA COAL MINING AND METAL INDUSTRY AREA (LABIN CITY, CROATIA)

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The Labin city area (North Adriatic) is known for more than three hundred years old exploration of the Raša coal, which had high calorific, radioactivity, and sulphur values. Several small coal-fired power plants, metal factories, and foundries were operating successfully until late 1990s. Due to lack of proper environmental legislative in the past, and today's derelict mill legacy, there are several pollution hotspots. Following the air-drying, grinding, and digestion of soil and lettuce samples in acids, elemental analysis was carried out by HR ICP-MS and AAS. By using Sr values from the regional geochemical map, calculated soil enrichment factor and geo-accumulation index maximum values are as follows: Hg 28.2 and 3.7, Cd 9.3 and 2.4, V 6.0 and 1.5, Se 11.9 and 2.6, Pb 12.3 and 3.6, Cr 49.0 and 4.4, Zn 25.0 and 5.3, Cu 83.4 and 5.1, and U 5.7 and 2.9, respectively. These values are indicative of severe soil pollution in the studied locality, thus calling for further detailed investigations. As regards the lettuce samples, element ranges (mg/kg d.w.) are following: Hg 0-0.03, Cd 0.06-0.38, V 0.39-8.33, Se 0.13-2.53, Pb 0.13-2.84, Sr 2.80-118.40, Cr 0.86-5.48, Zn 6.09-30.20, Cu 2.34-12.79, and U 0.03. Estimated daily intakes (μg day^{-1}) of Cd (31.2), Pb (216.4), Cu (1338.2), and Zn (3371.5) are lower than those prescribed by WHO/FAO. However, the estimated daily intake (μg day^{-1}) of Se is 353.8, which is tenfold the normal intake in Croatia. This could be attributed to soil pollution with Se due to the Raša coal combustion.

PUB-03

HEALTH RISK ASSESSMENT OF POTENTIALLY TOXIC TRACE ELEMENTS IN SOIL POLLUTED BY THE RAŠA COAL COMBUSTION IN A CROATIAN COAL-FIRED POWER PLANT

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The only coal-fired power plant in Croatia is situated near the city of Labin, on the east coast of the Istrian Peninsula (the Northern Adriatic Region). The Raša coal (with super-high content of sulphur, up to 14%) was mined at six localities around the city of Labin for more than a century. Our latest research showed that the soil surrounding the plant is highly polluted with PAHs, and moderately polluted with potentially toxic trace elements Cd and Se. Herewith, the aim of this study was to assess for the first time a health risk for the local inhabitants from Cd and Se caused by ingestion or dermal exposure to soil particles. The hazard index (*HI*) was used to assess non-carcinogenic human health risk of Cd and Se. Since slope factors for Cd and Se based on oral or dermal exposure of general population are not assigned due to the lack of evidence of carcinogenicity, we were not able to calculate carcinogenic risk from Cd and Se present in soil. The results showed that the calculated non-carcinogenic risk due to Cd (HI_{max}=0.06) and Se (HI_{max}=0.02) in soil were well below the threshold value (*HI*=1) for both adults and children, indicating that exposed individuals are unlikely to experience adverse health effects. However, further detailed investigation including larger number of potentially toxic and carcinogenic trace elements will be conducted in the future. These results will provide basic information of metal pollution control and environment management in the Labin area.

PUB-04

AN ECOLOGICAL ASSESSMENT OF THE PRISTINE PRAŠNIK SPECIAL RAINFOREST RESERVE

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Croatian forest reserves are among the richest in EU. One of them is the Prašnik rainforest, declared as a special forest reserve since 1928, which is located near the major highway linking Western and Eastern Europe. It has the second tallest oak in Europe (39.6 m), the age and girth of which are 350 years, and 7.82 m, respectively. More than 20 years ago, numerous mines were placed in the area because of Croatian War of Independence, having threatened visitors and scholars to this day. During the late August 2015, soil, moss, and mushroom samples (n = 26) were collected from the protected locality. Following their air-drying, grinding, and digestion in acids, elemental analysis was carried out by HR ICP-MS. Soil element values (mg/kg) were following (mean ± SD, range): Pb 37.3 ± 6.5, 29.2-47.1; Al 53,080 ± 3,420, 44,090-56,070; Cr 79.2 ± 6.5, 64.5-85.1; Ni 24.4 ± 2.8, 19.4-28.6; Cu 17.2 ± 4.1, 13.1-25.3; Zn 127.8 ± 33.2, 101.1-216.4; Sr 116.2 ± 5.0, 103.2-121.4; Ba 388.1 ± 24.1, 327.2-409.7; and As 11.2 ± 3.4, 7.3-16.6. By using Sr values, calculated enrichment factor ranges (based on the regional geochemical map) were following: Pb 1.2-1.7, Al 0.7-0.8, Cr 0.9-1.0, Ni 0.5-0.7, Cu 0.6-1.2, Zn 1.2-2.7, Ba 0.8-0.9, and As 0.8-1.7. Except Zn which is moderately enriched in soil (EF 2-5), all other variables showed deficiency to minimal enrichment (EF < 2). Element ranges (mg/kg d.w.) in mosses and mushrooms were following: Pb 2.3-6.9, and 1.1-6.4, As 0.4-1.0, and 0.2-3.7, Cd 0.1-0.3, and 0.02-0.2, and Ni 2.0-4.5, and 1.0-8.1, respectively.

PUB-05

ORE MINERALIZATION OF THE ZAVOJŠNICA RIVER

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Ore prospection was conducted in the Zavojšnica river water basin in order to find secondary oreo propagation of copper minerals and other related metals. Results are given in tables and ore propagation maps, in which the indicated concentration of minerals in individual slicks is shown. Analysis of the results shows that ore prospection can be applied in this area in order to determine mechanical oreo propagation. During the research two potential areas of mineralization were determined, the area of polymetalic hydrothermal sulfidic mineralization and the primary Fe-Cu sulfide mineralization area.

PUB-06

ON DISTRIBUTION OF 137CS IN SOILS OF AGRICULTURAL LANDSCAPES OF ORYOL REGION AND ITS CONTRIBUTION TO THE RADIATION DOSE

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Despite the fact that since the Chernobyl disaster took place 30 years in the Russian Federation are still have areas with high levels of radiation. There are 487 zones that has radioactive polluthion. The density of soil contamination with cesium-137 (as of 2014) falls within the range of 37-185 kBq / m^2.

Given that 81% of the territory of the Oryol region is occupied by agricultural land, it is necessary to have strong control over the content of artificial radionuclides in the soil, to provide security for longer stays and permanent use in food products produced in local farms, as well as to prevent the accumulation of radioactive substances in farmed crops.

To assess changes in the radiation situation in the Orel region in August 2016 in some localities dosimetric measurements and soil selection were performed for subsequent measurement of radionuclides, particularly Cs-137. Sampling and dosimetric measurements were performed at the previously selected farmland the 4 settlements: Droskovo (Pokrovsky district) Domnino (Sverdlovsk region), Red Slobidka (Glazunovsky District) and Lubyanki (Dmitrov district). In these settlements previously (2010) have conducted a dose-measuring and content of Cs-137 in the soil, which will allow us to further clarify the dose reduction as a consequence of the half-life, and migration processes.

Samples were collected by the method of "envelope" The selection of soil samples carried a ring with a diameter of 20 cm and a height of 5 cm. At each point were selected consecutively ten soil samples to a depth of 1 m.. For the subsequent evaluation of the vertical distribution of Cs-137 in the arable and the underlying horizon. The content of Cs-137 and other radionuclides was determined in Moscow, gamma spectrometer Canberra.

As a result, studies have found that the exposure dose of gamma radiation on the ground in all investigated areas of the Oryol region does not exceed the established norms. Although Cs-137 content in soil decreased in comparison with 2010, it makes the main share of the modern radiation dose. The impact of migration on the redistribution of the test radionuclide seem insignificant. Most of it (roughly 90% of the total) is concentrated in the upper soil layer (10 – 12 cm).

The findings confirmed that the radiation situation in the Orel region returned to normal. However, the issue of payments to the population remains controversial: we can talk about the health of the population of the Oryol region, which directly affected 30 years ago during the Chernobyl accident.

PUB-07

BIOTROPISM OF MINERAL FORMATIONS IN HUMANS

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Biogeneous mineral concrements of various localization as stones in human body are alien pathogenic formations that cause a set of dangerous diseases. Among these biogeneous formations are calcifications, bilious and salivary stones. Still there is no consensus on the issue of their origin, but many medical workers connect them with an infectious etiology. It allows to assume a complex of reasons to generate this pathological process resulting in serious clinical consequences.

In medical practice patient diagnosis is based on clinical data, laboratory and tool research data, the latter ones result from pathophysiological basis and allow to give more definite interpretation of this or that disease, including radiological symptoms as manifestations of a pathological process course. Therefore it was interesting to investigate concrements morphology and mineral structure from the mineralogical point of view, in terms of minerals ontogeny, their priming source the crystallization nutritious, and spatial geometry for future modeling of their growth.

Biogeneous mineral concrements of different origin have been studied on mineralogical approach for their composition, structure and morphology. Among them are calcifications of various localization; bilious and salivary stones calcifications, other mineral formations. We believe mineralogical base of crystal growth theory as biogeneous stones arise and grow in human body.

We implemented a complex of physical testing methods, among them are optical microscopy, X-ray powder diffraction, XPD, X-ray Computed microTomography, μXCT. General data on morphology and composition we studied using optical microscopy. X-ray powder diffraction detected crystalline phase composition, but concrements also contained amorphous phases. So we used X-ray Computed microTomography, its advantages for studding biogeneous minerals analysis are obvious: the method is non-destructive and permits fast quantitative estimation of internal structure characteristics, i.e. without crushing; testing under room temperature. Thereby X-ray Computed microTomography allows to visualize internal volume of any object without destruction, thus determine its morphology and phase segmentation.

Actually mineral concrements display heterogeneous phase composition and morphology, irregular forms twisting edges, and usually have organic tissues in central part. Calcifications consist of 5-6 phases, two belong to an organic fabric (possibly proteins and lipids), other 3-4 mineral phases are wivewnit, hydroxlapatite, hydroxlcarbonateapatite and calcite of different density. The formed and young arising calcifications 30 microns size have been compared. Both organogeneous calcifications have considerable similarity of phase composition, but the young one also contained less than 0,15 wt.% slightly crystallized hydroxlapatite. Thus the young calcification has already initiated the development of atherosclerotic process. XCT tomograms of the salivary stone display morphology similarity to the one of mineral substance, for example ferromanganese nodules or pearls, but differ in phase composition. XPD of various salivary stones detected composition similar to calcifications, but gallastones were of different phase composition.

Biogeneous concrements calcifications, salivary stones and gallstones differ in phase composition and morphology, mechanisms of their nucleation and grows. The used mineralogical approach is alike histology in medical and biological studies, but may better promote disease courses explanation, revealing mechanisms of the calcification process development, being aimed at the human health protection.

PUB-08

FOREST FIRES, METAL MOBILITY AND HEALTH: DOES INCREASING FIRE FREQUENCY POSE A RISK TO HUMAN HEALTH

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Forest fire is a global phenomenon that occurs in most terrestrial ecosystems, especially in arid and semi-arid environments. More than 30% of the Earth's land surface is subjected to a significant frequency of fires and the United Nations estimate that globally fires burn around 650 million ha of forest annually. In the forest soils, naturally occurring and anthropogenic added metals are sequestered in sediments, soil organic matter and vegetation, where they are relatively immobile. Moderate to high intensity forest fire (including controlled burning) may alter number of physical and biogeochemical properties of the forest soil including metal bonding and exposure, which potentially increase their mobility into water and air. Fire increases the soil erosion rate up to 100 fold, which facilitates rapid transport of these metals downslope and downstream by runoff and wind and their subsequent deposition in distal soil and water bodies influence on surface and groundwater qualities with increased contaminant levels. This may impacts on human health as many of the mobilised metals are environmental persistent, toxic to the biota and are easy to accumulate and magnify in the organism through food chain. This is particularly significant given that more than 4 billion ha of forest catchments provide high quality water to communities including 31 major cities in the world. In times of climate fluctuation and with the increased fire frequency, the impact of increased mobility of toxic metals must be assessed in terms of risk to human health.

PUB-09

MERCURY IN BLACK SHALES OF SWEDEN

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Toxic properties of black shales (BS) are known since the ancient times. The influence of mercury – even in small amount – can cause serious health problems and, in particular, this poisoning is a threat to fetal development and child development in the early stages of life. Mercury can have a toxic effect on nervous, digestive and immune systems, as well as lungs, kidneys, skin and eyes. World Health Organization considers mercury as one of ten of chemicals or groups of chemicals, which are the most dangerous to the social health service. Mercury – is the typical representative of cumulative poisons and the dangerous pollutant of the environment, especially when its ejection in water occurs, because as a result of the bottom microorganism activity the formation of the toxic and water-soluble methyl mercury occurs, absorbed by water and other sea organisms.

Mercury is one of the most dangerous elements-pollutants of the biosphere with the highest toxicity among heavy metals, due to its chemical and geochemical features. Mercury is able to block protein molecules, to break their biosynthesis, to cause mutagenic changes in DNA, to suppress growth and accelerate aging of plants. Mercury organic compounds are the most dangerous, because they are much more toxic and are being actively absorbed by living organisms [1-3]. The mercury distribution in sediment rocks is fairly evenly, however, in some cases there is an increase of its content in rocks, enriched with carbonaceous matter.

Baltic paleobasin of the dictionema black shales is located in the south-western and southern periphery of the Baltic crystalline shield and belongs to Vendian-Paleozoic platform cover. Sediments of the upper Cambrian-lower Ordovician extend from areas of southern Sweden and Estonia to Leningrad region (Russia).

Dictyonema shale is a carbonaceous-argillaceous rocks containing up to 25% of the organic matter, clay and silty-sand particles. They contain illite, kaolinite, montmorillonite, chlorite, quartz, feldspar, pyrite, calcite, iron oxides and hydroxides, and carbonate, silicate, phosphate and sulphide concretions.

Dictyonema shale are specialized in U-V-Mo, moreover they are enriched with a significant amount of copper, nickel, cobalt, zinc, lead and other chalcophilic elements. For some elements the content can reach the following values (ppm): U – 300, V – 1000, Mo – 360, Cu – 365, Ni – 190.

According to M.P.Ketris and Ya.E.Yudovicha mercury clark in black shales (BS) is quite high and reaches 0,27 ± 0,03 ppm [4].

Determination of mercury in black shales of the Baltic paleobasin was performed using the Zeeman atomic absorption mercury analyzer RA-915M at the department of geochemistry, St. Petersburg State University. The study showed that mercury is presented in the samples in an amount of from 0.002 to 0.644 ppm (Table).

Due to the fact that the substance flows from the parent soil-forming rocks create a regional geochemical background and may affect the state of the vital activity environment, adversely affecting the biocenosis, for the development of living organisms, including humans, it is exceptionally important to study the behavior of mobile forms of toxicants.

In modern conditions as a result of weathering processes toxicants transform into migratory forms, enter the water and bottom sediments, accumulated by plants and may further be in the body of animals and humans. The migration is carried out in a mineral, ionic, colloidal and biogenic forms.

Pathways and forms of migration depend on the association of chemical elements in rocks, landscape-climatic and geological conditions.

In recent years, many researchers have shown that the number of chemical elements in black shales may be represented not only in the form of minerals and micro-minerals, but also in the form of particles of ultra-small size (less than 1000 nm) [5].

Not so long ago, due to the unprecedented growth of analytical techniques and new technologies it became possible to solve the problem of separation of nanoparticles from rocks and soils [6].

Nano-fraction represents a part of the sample where the chemical elements are in the mobile form (ionic, molecular or colloidal) and have a particle size less than 1000 nm. Rare and trace elements that in nature reluctantly form their own mineral forms, are being accumulated in nano-fraction. Herewith, the larger the pore space of the sample, the higher the proportion of nano-fraction (up to 6 wt.%) and the more rare and trace elements are there.

In the development of the technique of the separation of the fraction having a particle size less than 1000 nm was put the fact that under certain conditions, the nanoparticles in water form colloidal solutions that are stable in many cases for long periods. The mass of material in the sample solution is determined by the weight method, removing water by evaporation from the aliquot of the solution. This fraction was called nano-disperse or nano-fraction (NF), and the way of its selection is protected by Russian Federation patent.

The method is based on treating of rock samples with water under certain conditions, to provide the completeness of the selection in the solution of all forms of chemical elements, having a particle size up to 1 micron. Colloid-salt aqueous solution is analyzed by ICP-MS for the maximum possible range of chemical elements. It should be noted that the analysis of aqueous solutions allows to maximally realize opportunities of the ICP-MS method, because there is no adverse effect of the additionally administered with the decomposition of samples chemical reagents and it decreases the influence of alumino-silicate matrix, which leads to decline of detection limits on the order of 2-3 and for mercury – 0,0008 ppm.

Using the developed methodology, the analysis of the Baltic paleobasin black shales nano-fractions was performed (Table). The analysis of the data shows that the nano-fractions content in the samples of black shale ranges from 0,3 to 7,1 wt.% , and the mercury content reaches 10,23 ppm.

Thus, black shales of the Baltic paleobasin accumulate up to 0,6 ppm of mercury that exceeds the clark value. In the aqueous extract (nano-fractions) of black shales mercury contents up to 10,23 ppm were recorded. Mercury, which is in the rock in a mobile form can be leached from the rock and enter the water and soil of the area, creating water, soil and biogeochemical anomalies.

Table. The content of mercury in black shales and its nano-fractions, ppm

Sweden (n=42)	BS	mean	0,309
		min	0,002
		max	0,644
	NF	mean	0,146
		min	0,003
		max	1,79
Estonia (n=10)	BS	mean	0,011
		min	0,002
		max	0,031
	NF	mean	0,019
		min	0,007
		max	0,035
Russia (n=10)	BS	mean	0,018
		min	0,003
		max	0,045
	NF	mean	3,824
		min	0,031
		max	10,23

PUB-10

FLUORINE IN DRINKING WATER AND MORBIDITY TEETH CARIES IN CHILDREN LIVING IN DIFFERENT MEGACITIES OF RUSSIA

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The main natural source of fluorine in the human organism is drinking water. The maximum absorption of fluorine occur during growth and development, when the hard tissues of the teeth still forming. According to the World Health Organization (WHO), tooth caries is related to global health problems. In Russia, the disease ranks first among other topical problems of modern dentistry (Kuzmina E.M., 2011; Alyamovskiy V.V. et al, 2014.). Various level of tooth caries population of different regions led to the conclusion about the existence of depending on the origin and development of tooth caries by environmental factors.

The aim of the study was to examine the prevalence and intensity of tooth caries flow, the level of individual oral hygiene in children of different megapolus and determine the features microcrystallisation saliva on the degree of activity and intensity of caries process, depending on the fluorine content in drinking water.

A clinical dental examination of the 971child (435 boys and 536 girls) aged 6-7 years constantly living in the cities of Moscow, Saint-Petersburg and Kursk. It was found that children living in these megacities there is a high prevalence of tooth caries, which is 95,1-97,5%. The intensity of the flow of tooth caries by the index "CFE+ kf" (its the component to "C" – carious, "F" – filling, "E" – extracted constant tooth, and "c" – carious, "f" – filling temporary tooth) was for residents Moscow – 5,51 ± 0,25, Saint-Petersburg – 6,29 ± 0,13 and Kursk – 5,32 ± 0,15. Sex differences in the intensity of the caries process flow were observed in children these megacities. Established correlation intensity flow caries in children by type of saliva microcrystallisation. With intensive flow tooth caries of the third degree of activity of caries process (decompensated form) in children are more common pattern of saliva microcrystallisation at II Б and II В type for Puzikova O.J. (1999). Reduced level of individual oral hygiene, identified among children with decompensated flow carious process, due mainly to low awareness of parents on individual oral hygiene and prevention of tooth caries in children of this age.

The fluorine content in the drinking water residents of cities investigated regions is different, but in terms of the prevention of tooth caries is low enough values: Moscow – 0,16-0,22, Saint-Petersburg – 0.02-0.04, Kursk – 0,32- 0.41 mg / l.

Thus, the deficiency of fluorine in the drinking water is one of the main factors determining the high prevalence and intensity of tooth caries in children aged 6-7 years living in different megacities of Russia. Therefore the problem of the shortfall intake in the organism of this element for the Russian population living in areas with low fluorine content in the environment for the prevention of dental caries, remains actual.

PUB-11

MUMIJO (SHILAJIT) AT BAIKAL

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Mumijo-bearing Baikal confirmed the discovery of the akvabitummumijo on the west coast in the valley Srednie Khomuty (N52 ° 10'11.55 "E105 ° 35'47.11 '').

The bedrock deposit represented socket 30x50 cm mice lithos-phageo a lump of dry grass covering the yellow bean-shaped (up to 1cm) feces on black and brown streaked, films, crusts and clusters of black plate with a metallic sheen zernopodobnyh oolitoidov (1-2 mm) oxidized primary-secondary aquabitum mumijo. Out Extract mumijo Dry – EMC ($Vv_{водн.}$) amounted to 23%, wherein the ash content of 13.68% were found close to the average content obtained from elemental analyzer «Euro EA CHN» laboratory microanalysis Institute of Organoelement Compounds, Russian Academy of Sciences (Moscow): C: 40, 75%; H: 5.44%; N: 9.28%; O content in ash-free sample from the difference between 100% – (C% + H% + N%) = 35,74%. The integration over intervals of the spectrum 13C NMR obtained by the spectrometer «Avance-400" in the Chemistry Department of Moscow State University, gave a structural-group composition: carbon alkyl links of the order of 25%; aliphatic carbon bound to nitrogen or oxygen atoms in the methoxy-groups, sugars, peptides and amino acids, about 30%; carbon aromatic structures of the order of 30%; carboxyl carbon (in carboxylic acids) and amide (peptide bonds in) of the order of 15%.

Geologically, the area is composed of limestones and dolomites lie on potassium ($K_2O \geq$ 5%) granites rapakivi. On satellite mumijo-bearing degassing pipe diameter of at least 15 km away stands concentric rings in the exo- and endo-contact zone of granite massif. Almost half of the pipe has continued into the waters of the lake.

Pulsating deep production mumijo-bearing laminar flow of gases in the rift lake has a modern age and, of course, is related to seismicity: here there are traces of ancient and modern earthquake intensity up to 10 points. In this area, at the bottom of Lake Hills has a height of 6 m and a diameter of 25 m may owe untypical for Baikal gas hydrates production processes, leading to swelling of the relief.

Mumijo (shilajit) is found in the lineaments transform the Baikal-Kamensky hidden deep shift with thermal waters with a high content of the mantle helium in the north-eastern border of the Altai-Sayan-Khangai continental arch over a vast area of anomalous mantle with low density and high temperature.

PUB-12

THALLIUM POLLUTION RECORDED IN A SEDIMENT PROFILE NEAR A STEEL PLANT, SOUTH CHINA

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Thallium (Tl) is a rare element and heavy metal with high toxicity. It bears unique elemental properties of both lithophile and chalcophile, thereby rending its dispersion in igneous rocks as well as in numerous sulfide mines. In the North Guangdong Province, there are abundant Tl-rich mineral resources (e.g. pyrite ores, lead-zinc ores) located along the 3rd largest river, China. Large quantities of heavy metals have been discharged into the river system. The research on Tl pollution here is hitherto quite limited. This paper presented a pioneering investigation of Tl distribution in a sediment profile affected by waste-discharge from a steel plant – a newly found significant source of Tl pollution in South China. The results showed that (1) Tl contents ranged 1.03 to 3.13 mg/kg with a mean of 1.89 mg/kg, which is about triple Tl content in local background soil (0.68 mg/kg); (2) Tl has a significantly positively relationship with Ni, Cu, Zn and Cd; and (3) About 30 % to 54% of Tl exists in mobile fractions in the selected sediments.

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PUB-13

OCCURRENCE OF THALLIUM IN TYPICAL INDUSTRIAL WASTEWATERS AND ITS ENVIRONMENTAL IMPACTS

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Thallium (Tl) is a non-essential heavy metal. Serious Tl pollution incidents successively occurred in the Pearl River, China. In this study, we presented a very first comprehensive report of Tl concentrations in typical industrial wastewaters and natural water courses in the Pearl River Basin. The results unveiled that the wastewater from a Pb-Zn smelter had the highest Tl concentration, followed by wastewaters from a Zn refining plant, and wastewaters from a steel plant wastewaters. Tl elevation in these wastewaters is mainly due to low melting and boiling temperature of Tl compounds. Very high enrichment of Tl (several tens of mg/kg) was found in the raw Pb-Zn ores used for production in the Pb-Zn smelter. The Zn refining plant utilized Tl-rich fly ash waste. Though Tl content in the raw Fe-oxide ores of the steel plant is relatively low, with contents usually lower than mg/kg, high production temperature over 1000 °C just vaporized Tl compounds almost completely into vapor, which goes directly into the wastewater during the process of wet dust removal. River waters near the point sources mentioned-above mostly had higher Tl level than the drinking water limit in China.

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PUB-14

A MODERN INTEGRATED APPROACH TO ESTABLISHING NATURAL AND TECHNICAL SYSTEMS

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Development and implementation of any natural and technical system (NTS) must be accompanied by a suite of mandatory programmes and subsystems that ensure sensible and safe management of subsurface resources. A complex of productive (technological) NTS assets must incorporate a starting suite that is broken down into:

1) A programme on compulsory scientific research on studying local geochemical cycles in order to evaluate how a proposed NTS will affect local residents' health.
2) a system of environmental baseline monitoring that includes compulsory monitoring of the atmosphere and hydrosphere within the adjacent areas and rests for the results produced by the scientific research (paragraph 1);
3) A programme on estimating accumulated environmental damage and mitigating consequences that arise from exploitation of natural systems and landscapes.
4) a health insurance programme that provides insurance coverage for people suffering from endemic diseases common for geochemical landscapes where an NTS is located;
5) an environmental insurance programme that elaborates in detail any potential risks (of medium to high probability) when environmental media are affected by human impact inflicted by an NTS;
6) a programme on informing local residents online about the status of environment's components and explanation how an NTS is affecting health of organisms involved in local geochemical cycles.

A new NTS must be commissioned only if the programmes above have been taken into account. The already existing systems must be expanded with these subsystems.

When we consider the current level of information and computer technologies worldwide and drawing upon experience gained by top-performing countries in environmental protection and responsible management of subsurface resources, we can conclude that major transformations await Russia's environmental industry in the nearest future.

PUB-15

THE NECESSITY TO INTRODUCE COMPULSORY MONITORING PROGRAMMES WHEN EXPLOITING NATURAL AND TECHNICAL SYSTEMS. PERSONAL RESPONSIBILITY

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A country's potential is largely determined by the existing resource base and human resources, primarily the population's state of health and education level. These two parameters influence economic development of a country and, consequently, the quality of life.

The health of people living and working close to mining facilities within a natural-technical systems (NTS, i.e. mining enterprises, mineral processing and refining facilities, production waste storage sites etc.) is directly dependent on the quality of environment's components, primarily on air and drinking water quality.

Any NTS represents a facility capable of inflicting environmental damage and has to be consistently and continuously monitored. Its monitoring must be introduced at the earliest stages of developing and creating an NTS.

Moreover, monitoring and rapid response programmes need to be governed at the national level and have a binding effect at every level of subsurface resources management.

If we consider how important it is to monitor hazardous factors that directly affect the health of local residents, even the most basic monitoring system must incorporate compulsory monitoring of water and air quality and must also evaluate geochemical cycles of a local circulation of elements.

Of no less importance is a programme on developing and implementing immediate actions aimed at reducing environmental impact following an accident or an unforeseen situation at NTS facilities (both nature- and man-induced factors).

Since anthropogenic impact is increasingly growing under current conditions, it is necessary to draw public attention to an issue of building networks for environmental monitoring as well as to raise public awareness of the concept of personal responsibility for the existing components of the environment.

Personal responsibility can be increased and the public can gain a better understanding about the importance of environmental protection measures when exploiting an NTS by using information that shows a direct relationship between geochemical cycles occurring in the environment and health of people involved in these cycles.

PUB-16

MINING PROCESSING ENTERPRISES AS SOURCES OF ENVIRONMENTAL CADMIUM POLLUTION

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Cadmium, as the pollutant of the environment, belonging to the II class of hazardous substances, is not currently being given sufficient attention due to its small amounts in the total mass of contaminants. Then, as cadmium is one of the most toxic heavy metals, it is a cumulative poison, causing significant harm to living organisms and the ecosystem as a whole. The degree of negative impact on biota in cadmium is comparable to such known toxicants as arsenic and lead. The toxicity of cadmium appears already at low concentrations.

Excess content of cadmium in plants is characterized by growth retardation, damage to the root system, chlorosis of the leaves, red-brown coloration of the edges of leaves and veins, oppression of photosynthesis. In hydrobionts, the excess cadmium content is characterized by pathological changes in the internal organs, vascular disorders, toxic edema of the epithelium of the gills, kidneys, and the brain. In food and feed, it is a cumulative poison, with a very long half-life. In mammals, it accumulates in the liver, kidneys, bones, and wool.

According to various studies, cadmium causes such serious disorders as diseases of the musculoskeletal system and connective tissue, leading to anemia and bone destruction; Affects the central nervous system, leads to neurological diseases; Violate the phosphorus-calcium metabolism, changes the activity of many hormones and enzymes; Leads to diseases of the liver and urogenital system; Cadmium accumulates in rapidly multiplying cells and is the cause of many cancers.

Cadmium is a rare, scattered element. The distribution of cadmium in the earth's crust follows the pattern of distribution of zinc. Cadmium is mainly found in copper-pyrite, polymetallic, lead-zinc ores. Deposits developed by mining enterprises in Russia contain cadmium in the range from 0.006 to 0.018% in copper-pyrite ores and from 0.2 to 0.5% in polymetallic ores.

On the example of "Dalpolimetall" can be traced to the behavior of cadmium in the separation of lead and zinc ores. Part of the cadmium passes into the lead concentrate, some into the tailings, accumulating in the tailings pond.

The main method of ore dressing is flotation – separation technology, which involves the use of a large amount of water in basic, auxiliary separation operations and in other shops. In addition to the waters formed during the current development of the fields and sent through treatment plants to discharge into natural water bodies, a significant amount of man-made water is accumulated in the spent quarries and tailing dumps.

Chemical elements in the tailing dumps are present in the geochemically mobile form, therefore, the waste of the concentrating factories, along with the industrial effluents of the enterprises, represent the greatest environmental hazard. Seeping through the dams and the bed of structures, the tailings water filtration facilitates the introduction of cadmium into surface and groundwater.

Cadmium causes significant harm to plants and ecosystems in general, in particular human health, spreading through food chains, and therefore the extraction and neutralization of cadmium is a priority environmental task in the areas of mining operations. Measures for the purification of waste water from mining enterprises from cadmium will limit the entry of this toxic substance and its compounds into surface waters, which will significantly affect the ecosystems of regions in immediate proximity to enterprises, reducing the anthropogenic load on soil, plants and the final recipient of humans.

PUB-17

STUDYING THE BEHAVIOR OF CADMIUM IN TECHNOLOGICAL PROCESSES OF PROCESSING RAW MATERIALS OF NON-FERROUS METALS AND REVEALING ITS NEGATIVE IMPACT ON THE ENVIRONMENT AND HUMAN HEALTH

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Cadmium, as the pollutant of the environment, belonging to the T category of hazardous substances, is not currently being given sufficient attention due to its small amounts in the total mass of contaminants. According to various studies, cadmium causes such serious disorders as diseases of the musculoskeletal system and connective tissue, liver and genitourinary diseases, neurological diseases, and also is the cause of many oncological diseases.

Cadmium is mainly found in copper-pyrite, polymetallic, lead-zinc ores. In the ores of deposits being developed by GOKs of Russia, the cadmium content ranges from 0.006 to 0.018% in copper-pyrite ores, from 0.2 to 0.5% in polymetallic ores. The maximum values of cadmium content among copper-pyrite deposits are characterized by Alexandrinsky and Talgan (Chelyabinsk region) – about 0.019%. Among the polymetallic and lead-zinc deposits, Yuzhnoye (Primorsky Krai) – 0.0848%, Rubtsovskoye and Korbalikhinskoye (Altai Krai) – around 0.05%.

The mining enterprises of Russia, which extract copper-pyrite ores, include OAO Uchalinsky GOK, LLC Bashkir Copper, OJSC Buribaevsky GOK, OAO Bashkirsky MSK, ZAO Ormet, OAO Alexandrinsky GRK. Lead-zinc and polymetallic ores are mined in Russia by Gorevsky GOK OJSC, MMC Dalpolimetall OJSC, Sibir-Polymetal OJSC, Novo-Shirokinsky Rudnik OJSC, as well as new enterprises – Baikalrud and Kyzyl-Tashtygsky GOK . According to our calculations, the ore mined contains about 170 thousand tons of cadmium annually, while only 1 thousand tons of cadmium is released into commercial products (metal cadmium). The main losses are associated with the waste of enrichment, which accumulate in the tailing dumps.

The example of MMC Dalpolimetall (Primorsky Krai) for the period 2009-2014 analyzed cadmium in the process of enrichment of lead-zinc ores. The bulk of cadmium is concentrated in zinc concentrate (from 50 to 80%), with a tendency to reduce the recovery of cadmium, which is associated with both a deterioration in the quality of the initial ore and a decrease in the quality of the process. Some cadmium in the process of enrichment of lead-zinc ores at JSC Dal'polymetal turns into lead concentrate, the remaining part – goes to the tailings, accumulating in the tailings pond.

For a long time, the lead concentrates of JSC Dal'polymetal were processed on-site in the village of Rudnaya Pristan with the production of lead by the obsolete technology of rock melting, with no cadmium being recovered. According to the results of observations by the Federal Service for Hydrometeorology and Environmental Monitoring, the soil of the kilometer zone from the village of Rudnaya Pristan is a territory with a dangerous category of soil contamination with lead, cadmium and zinc.

Part of cadmium concentrates in copper concentrates during the enrichment of copper-pyrite ores. According to our data, more than 100 tons of cadmium with copper concentrates and other products are annually processed into the copper smelting facility of Sredneuralsky Copper Smelter (SUMZ, Revda, Sverdlovsk Region). In the technological process, cadmium passes into all solid products of roasting and melting – in blister copper, slag and lead products (over 82%). The lead product is exported by the enterprise, slags are used as building material.

On the example of one of the zinc plants in Russia – OJSC Electrozinc (Vladikavkaz) – the behavior of cadmium in the technological process of processing zinc concentrates containing cadmium is analyzed. The bulk of cadmium in the plant's loading is concentrated in zinc concentrates, the smaller part in secondary zinc raw materials. At the same time, cadmium is extracted into the main commercial output (pig iron cadmium), part – into semi-products (cakes and clinker), about 5% – refers to losses (fumes, gases, etc.). In recent years, the extraction of cadmium in commodity products has grown to 86-87%, which is associated with the improvement of the technological process.

Based on data from the Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), regions with an elevated cadmium content in soils have been identified. In particular, such cities include Kirovgrad, Revda, Rezh (Sverlovsky region), where enterprises that carry out metallurgical processing of cadmium-containing products are located. For the Sverdlovsk region, a high incidence of 3 indicator categories (diseases of the musculoskeletal system, neoplasms, diseases of the blood and blood-forming organs) is characteristic, which indicates an increased level of negative influence of harmful components (in particular, cadmium) on the environment and human health. It is necessary to conduct in-depth monitoring of the situation at metallurgical enterprises related to cadmium.

PUB-18

INDIVIDUAL EXPERIENCE ON TELECOMMUNICATION

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The movement of informations such as massive hazards and extreme natural changes,have been studied carefully.The scientific researchs submitted through international events on e-Health in UAE and GRF Davos:One Health Summit,have been approved.And the international Socity for Emergencies :tiems,have highly appreciated the activity that acquaints about the possibility on hands to move informations from us to whom on the screen of the t.v. device and despite the time.

That occures since many years and continuously,uptill now.

The most serious achievements dual this function have been of great help dual preperdness and creating the suitable methods to find the main factors of risks of any challenges such as climate warming.

Keywards:Accepted submissions:Basel Asad Prize:research entitled: Ward off Disasters: 2001: Ministry for Health of Syria, Third International Conference on Disasters Early Warning:ewc3, AGSE 2009, IDRiM 2010, COBRA 2010, RACR-china-sra,iucn Congress 2008, Gi4DM Antalia, GRF Davos, Rio and Amsterdam 2016 conference on climate,iaia 2016, isdrrr 2015, more, All Hazards Recovery,Massive catastrophs, DRR.

PUB-19

HYDROCARBON SPHERE OF MAGMATIC ROCKS

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Actuality of the problem in the relationship between humans and geological processes. One of the powerful geological processes is the degassing of the Earth presented in a wide variety of phenomena, from the calm, cool, invisible, permanent, constructive to explosive, hot, spectacular, rapid, destructive. The main force is the degassing of magmatic rocks is greater 65% of the total volume of the Earth's Crust. In interpretation and generalization were attracted a huge amount of data taken during the field work, experimental data on the degassing of rocks and theoretical – of the gas mode calculations of degassing of the mantle diapir. Generalization and interpretation revealed that the igneous rocks containing hydrocarbon from the of trace and up to large fields Hydrocarbon

gases are present equable, regardless of the type of igneous rocks. In ultra-deep wells, hydrocarbon content, observed throughout boreholes. In the area of the deepest borehole of the World Kola, hydrocarbon gas composition presented to C_6 inclusive, and CH_4 content reaches 54.02 liter / ton, and heavy hydrocarbons to 2.13 liter / ton. Noting the entire spectrum of hydrocarbon gases and their homologues. The composition of the dispersed hydrocarbon gases resembles the composition of hydrocarbon deposits. Hydrocarbons are manifested in various forms of gas: free, dissolved, adsorbed, occluded, etc. forming hydrocarbon background of crust. In space – time continuum of igneous rocks Earth's crust there is Hydrocarbon Sphere. Material will highlight the normal and anomalous hydrocarbon zones of the Crust, affecting human health!

PUB-20

IS 'URBAN MEDICAL GEOLOGY' A CONTRADICTION IN TERMS?

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Medical geology is defined as the impacts of geologic materials and geologic processes on animal and human health. Most urban dwellers, especially in North America, are largely shielded from the natural environment. Most people living in cities work, study, travel, and live in air conditioned spaces, drink municipal or bottled water, eat processed foods purchased at supermarkets, and breathe air tainted by industrial or automotive exhausts. The geologic environment, despite a low profile in many cities, can have important impacts on the health of city dwellers. Climate change has resulted in an increase in dust storms impacting cities in the U.S. southwest, eastern Australia, and eastern China. These storms expose the city dwellers to high burdens of a range of minerals and pathogens that the minerals host. Cities are not immune to natural disasters such as volcanic eruptions, earthquakes, landslides, etc. that expose the population to potentially toxic elements, harmful gases and dangerous minerals. Many workers in cities are exposed to dangerous minerals and trace elements that often adversely impact their health. Analytical tools used by geoscientists and databases that they create can be useful in identifying trace element anomalies in soil, air, and water created by anthropogenic activities, determining their source(s), and modes of occurrence. In short, medical geology is an active, but under-recognized, field of study in urban communities around the world. As urban areas are commonly the centers of population, education, medical facilities, and financial and political power, it is essential that the decision makers are aware of the importance of urban medical geology.

PUB-21

JACOB DE CASTRO SARMENTO: MEDICINAL USE OF GEMS AND BALTIC AMBER IN THE EIGHTEENTH CENTURY

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Jacob de Castro Sarmento (1691-1762), one of the most outstanding Portuguese doctors, was a New Christian, prosecuted by the Inquisition, who went into exile in London. He succeeded in creating an effective form of administration for quinine in the treatment of fevers. In 1730, he became a member of the Royal College of Physicians, and was elected as a fellow of the Royal Society of London. In his remarkable book, *Materia Medica Physico-Historico-Mechanica. Reyno Mineral,* written in Portuguese, published in London, in 1758, Sarmento expressed growing disbelief in some long established myths on the therapeutic effect of most gems; their magic and apotropaic effect was completely set aside, not in line with growing rationalistic and scientific state of science. Sarmento threw down myths such as the alleged effectiveness of magnetite in labour, and he advised against the danger of gastric perforation after ingesting comminuted gems in electuaries. Baltic amber figures in the chapter dedicated to earths. Its origin: vegetable, mineral, fossil or animal, was still discussed. It was very praised, especially in the repair of surgical wounds, in the treatment of skin conditions such as scabies and leper, as a physical agent in the treatment of muscle contractures and palsies. Sarmento also described methods of preparation of powder, oil and amber tincture.

PUB-22

MALACHITE IN MITH, MEDICINE AND ART

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Malachite, Greek μάλάχη or μολόχη, known as melothites or melotitis or in the Middle Ages, sometimes known as emerald and chrysocolla in Antiquity, a deep bright green copper carbonate mineral, found in aggregates, is an opaque and soft rock, suitable to carve decorative art objects. Malachite also had great impact in myth and medicine in different ancient civilizations. It is a metaphor of Nature, love, life, and fertility. Its concentric aggregates and banding in various shades, resembling eyes, have made of it an amulet since ancient times. It was used in the Neolithic, during the Han Shan Dinasty (c. 8500-2070 B.C.), for its magical and apotropaic properties. As a medicine, it was largely prescribed in the Ebers Papyrus (written around 1500. B.C.) in the cleaning of wounds, ulcers, to treat eye diseases, teeth ailments and internal disturbances. Malachite, the greenest gem, a copper carbonate hydroxide, has been used as a source of copper or for itself. Copper´s biocidal activity is its main feature, responsible for its therapeutic success, in different civilizations, through the ages. In art, malachite was very appreciated by Russian czars, and reached its greatest splendor in the nineteenth century with the construction of 'The Malachite Room', the state drawing-room of Empress Alexandra Fiodorovna, the wife of Nicholas I.

PUB-23

THE TOUCH OF HEALTH IN THE RECIPES TAKEN FROM THE 'LAPIDARIUS' BY PETER OF SPAIN

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Peter of Spain, Latin Petrus Hispanus (c. 1215-1277), doctor, philosopher, and the consecrated Pope John XXI, gives numerous recipes of minerals, metals, and animal concretions taken from several authors in his work 'Treasury of the Poor'. He always names his sources, and he claims his own authorship for some recipes. Notwithstanding, some of his sources are difficult to identify in the extant publications of the cited works. One of his sources for stone´s recipes is simply called 'Lapidary'. He refers to 'De Lapidibus' by Marbode Bishop of Rennes' (1035-1123), one of the most popular and widespread works of medieval literature. Peter of Spain gives five recipes from this source. One of the recipes concerns two stones. The sources for the recipes were sought either in Marbode's Lapidary or in later versions. The recipes have a similar feature. Stones act by being worn or touched. In the Greek Lapidary 'Orphei Lithica', stones are said to be very powerful because the Mother that created has endowed them with a soul that never gets old and never dies. By touching stones, man is trying to protect himself, recover from illness, and live sparkles of eternity and divinity, projecting, through the stones, his deepest yearnings, striving for health and eternity, his most ancient and long lasting myths.

PUB-24

A BETTER PRECISION OF HEALTH IMPACT USING INDIVIDUAL EXPOSURE DESIGN INSTEAD OF ECOLOGICAL DESIGN

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Introduction. Five percent of the released cesium-137 (Cs-137) from the Chernobyl nuclear power plant accident in 1986 was deposited in Sweden. We studied the total cancer incidence using parish versus individual levels of exposure. Results from the two methods will be compared at 1986. Strength and limitations with the two methods will be discussed in terms of ecological bias and statistical power.

Methods. A digital map on the deposition of Cs-137 in kilo Becquerel/m^2 (kBq/m^2) from the Geological Survey of Sweden was used to create a surface-weighted average at parish level (parish = 612) for 9 counties in 1986. An individual 5-year cumulative exposure value was calculated from the deposition at the annual dwelling coordinate, in the three most contaminated counties, taking into account the physical decay of Cs-137 and changing of the residence 1986-1990 (n=734,537). From the National Board of Welfare 222,467 cancer cases 1986-2009 and 82,495 cancer cases 1991-2010 was retrieved, respectively. The total cancer incidence rate ratio (IRR) was calculated with Poisson regression and Hazard Ratio (HR) with Cox regression, respectively. The risk estimates were adjusted for several potential confounding factors.

Results. In the ecological study design no obvious exposure-response using IRR was revealed for five exposure categories. But using individual exposure data, the adjusted HRs (95% CI) were 1.03 (1.01-1.05) for intermediate exposure; and 1.05 (1.03-1.07) for highest exposure comparing to the reference.

Conclusions. Using individual exposure assessment revealed a weak exposure response trend, not seen in the ecological study design.

PUB-25

DIABETES APPEARANCE IN ANOMALOUS MAGNETIC FIELD

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Introduction and Aim. All that exists in the Earth magnetic field (EMF) has paramagnetic characteristics and gets magnetized.

To confirm AMF presence in the beds of people suffering from D and AMF correlation with body organs in charge of glycose metabolism in two groups of patients (30+30).

Work Method. Magnetic field measurements have been performed with a protonic magnetometer, in D type 1 and 2 patients' beds. EMF and AMF intensity of both groups have been measured. Furniture rearrangement has been done in order to place "A" group into EMF and health of both groups was observed during 3 years. D etiopathogenesis has been studied.

D patients in "A" and "B" groups are 20-64 years old. "A" group health has been observed in a natural EMF. Health of group "B" has been observed in AMF.

Results. Health of "A" group, in EMF has improved but in group "B" in AMF, got worse. High level of difference has been found (X^2=32; $p<0.001$), also correlation of AMF and the body organs responsible for glycose contents in blood.

We present sketches of AMF in beds of the diseased and healthy ones. Motion of glycose towards referent quantities in group "A" has been found. Many literature obscurities are explained, such as: insuline in circulation deficiency, why does insulin resistance occur. Function of IS is explained, as well as, the appearance of AID. Etiopathogenetic factors' influence upon D is presented.

Conclusion. Summing up all the data leads to the conclusion that cause of D is AMF in the diseased people's beds.

The main measure treatment of D is staying in EMF.

PUB-26

ATHEROSCLEROSIS OCCURS IN ANOMALOUS MAGNETIC FIELDS

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Introduction. The Earth as a planet possesses spherical Earth's magnetic field (EMF). Everything that has paramagnetic properties gets magnetized. EMF has its natural intensity from 20000-70000 nT. Anomalic magnetic fields (AMF) are present in urban areas and they are originated by magnetic and electromagnetic substances. AMF are direct cause of atherosclerosis (AT).

Objective. Prove that AT occurs in the AMP. Explain that the risk factors are result of the AMP and not the cause of the AT. Explain predisposition of the AT in diabetes patients. Explain the aging process as a factor in many diseases and AT.

Method. In the current 25 years labour on more than 600 patients, aged 40-70 years, suffering from heart attack, atherosclerosis, and cardiomyopathy, measurements were carried out with a proton magnetometer in AMF and natural EMF in the beds of patients, and their health status was followed up. In the psychiatric hospital were formed rooms with 10 beds without AMP. Every 30 days patients were rotated (40 patients), with control of the laboratory analysis before entering and after leaving the room where they were staying.

Results. Established the correlation between AMF and disease location in the body (they're presented in sketches of 22 patients). Patient health in a natural EMF is visibly improved. Theoretical confusion in the literature about AT is explained. Also spectacular results of the experiment from psychiatric hospital are presented.

Conclusion. The cause of the AT are AMF in patient residential areas.

PUB-27

ANALYSIS ON THE POTENTIAL LANDSLIDE PLAN INLET MULTIPURPOSE DAM SPILWAY AND OUTLET KARIAN DISTRICT BANTEN PROVINCE

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Karian sub area of Lebak Banten Province is planning the construction of a dam, where the stability of slopes in construction of the dam is one very important factor. On the system construction is sometimes found small avalanches that could lead to occured a large avalanche, generally caused by the presence of discontinous area that interferes the construction of the dam.

To prevent the occurrence of such avalanches, then that can be done is the analysis of the stability of slope classification method of rock mass. The method used is the Rock Mass Rating (RMR) and Slope Mass Rating (SMR). Opinion Bieniawski (1989), parameters RMR dan SMR is Uniaxial Compressive Strength (UCS), Rock Quality Designation (RQD), spacing of discontinous,condition of discontinous, groundwater, Orientation of discontinous.

From the results of the analysis rmr on the location of Inlet and Outlet, Spillway in General is 41 > rocks are said to be sedang although there are some conditions that bad with rating of 35 – 40. After analysis of the RMR further analysis SMR, with dip direction of discontinous as well as dip direction of slope. The results of the analysis of the SMR on three (3) site in General is >42 the mean condition medium rocks, slopes are relatively steady partly, and avalanches controlled by the presence of burly.

PUB-28

MEDICAL GEOLOGY APPLICATIONS OF AN AFRICA GEOCHEMICAL DATABASE

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The significance of a complete, high quality Africa Geochemical Database (AGD) for addressing the range of Earth and environmental science issues (e.g., mineral exploration, resource evaluation, agriculture, land use planning, processes of crustal evolution, modelling of environmental systems) cannot be over-emphasized; because, for such applications to be made in a robust fashion, we need to understand how the Region's unique and complex geochemical landscape was carved out in the first place. The distinctive nature of Earth processes such as intense tropical weathering, leaching, erosion, podsolization and gleying, as well as later imprints of urbanization and industrialization, have engendered the mobilization and clear redistribution of all but the most refractory elements. As a consequence, it is not uncommon to find large tracts of the Continent's surface environment containing anomalous trace element contents or deficiencies in essential micro-nutrient elements. Through water and food crops, extremes in trace element variation in soils are transmitted into the food chain, with often undesirable consequences for human and animal health. It is thus considered that one of the most important applications of an AGD would be in understanding the hydrological, chemical and biological processes that determine the behavior of nutritional and toxic elements in the surface environment, in relation to how they may affect the health of man and animals (Medical Geology). This is so, because most of the population still live close to the land, and depend on it for their daily sustenance.

Important scientific problems that would confront the construction of an AGD include defining and understanding "regional background", and the evolution of appropriate sampling and analytical protocols that would take into account the Regions' unique and complex element distribution patterns. These problems are apparently intractable, but are not unsolvable.

Longstanding operational and logistical problems that have impeded previous (largely uncoordinated) efforts at an AGD compilation include the limited availability of state-of-the art analytical instrumentation and requisite laboratory infrastructure. An even more important limitation is the dearth of a sufficient number of highly skilled analytical geochemists and other technical personnel located at appropriate regional centers, who are able to install, operate, trouble-shoot and maintain modern analytical equipment. These problems are compounded by the lack, up to now, of adequate international funding to undertake such a high precision and systematic mapping exercise.

In this presentation, recommendations are put forward for carrying out a successful and complete compilation of a high quality AGD that would be invaluable for studies in Medical Geology, as well as in an array of other multipurpose, multi-national environmental applications; and proposed measures given for counteracting potential limitations in its development.

PUB-29

THE OCCURRENCE AND THE RISK OF ORGANOPHOSPHORUS PESTICIDES IN JIANGHAN PLAIN GROUNDWATER

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To investigate the distribution characteristics of organophosphorus pesticides (OPPs) in groundwater, 38 groundwater samples based on the established field site with 13 monitoring points and 4 surface water samples were sampled in June, 2015 in Jianghan plain,China. According to the determination of some main chemical parameters and OPPs contents, the distribution characteristics and influencing factors of OPPs in Jianghan plain groundwater were studied .The results showed that groundwater in this area presents mainly HCO_3-CaMg type with strong reducibility. OPPs were ubiquitous in our studied area ranged from 31.5 to 264.5ng/L, with the average of 86.5 ng/L. Three of higher OPPs concentrations were omethoate, methamidophos and diazinon, with the average of 54.3, 32.1 and 27.8 ng/L, respectively. Not only single one but the sum of OPPs concentrations were below MAC standard in "*Groundwater Pesticide Residues in Water*" (EEC80/778) and the threshold of drinking water "*Hygienic Standard for Drinking Water*"(GB 5749-2006) to prove less effect on the local ecological environment. The vertical distribution of OPPs concentration followed as: 50m>25m>10m, while the horizontal distribution following: nearby river farm area> farm area> nearby river area. The distribution characteristics of OPPs were also influenced by many factors, such as application amount of OPPs the interaction between the surface water and groundwater the fluctuation of hydrochemical parameters in groundwater and the biological and non-biological degradation.

PUB-30

DETAILED CHARACTERIZATION AND AMINE BINDING CAPACITY OF NATURAL CUBAN ZEOLITE AS WELL AS ITS ORAL AND TOPICAL APPLICATIONS IN THE MEDICINE

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The use of natural zeolites for medicine requires a detailed analysis of their chemical composition, phase purity, ion-exchange properties and microstructural harmlessness as described (1). This Cuban zeolite contains clinoptilolite and mordenite as major phases (ca. 80%), exhibits large BET surface area (140 m2 g -1), high histamine binding capacity of about 12 mg (pH 1) and 15 mg (pH 7) per gram of zeolite (1) and anti-inflammatory properties (2). The medical application is focused to the gastrointestinal tract. Serotonin is well known as the 'hormone for fortune' in the brain, but excessive peripheral blood levels (produced by neuroendocrine tumors, usually known as "carcinoids") cause severe diarrhea. As zeolite is an anti-diarrheic drug (3), it has been applied to patients suffering from severe diarrhea. While histamine is nearly irreversibly bound to zeolite, serotonin shows initially a much higher binding affinity to zeolite which declines gradually over time. The use of zeolite in patients suffering from carcinoid syndrome can reduce significantly the number of bowel movements, but not in all patients. An anhydrous zeolite paste for topical application (Detoxsan® Paste) has been prepared (4). The formulation is based on petrolatum and contains additionally squalane as natural lipid component. The paste is used in mycosis, intertrigo, psoriasis and inflamed skin areas. In mycosis and intertrigo the improvement of skin area was visible after 2 to 5 days, in psoriasis between 1 and 3 weeks. Thus, Detoxsan® Paste reduces inflammation promotors (histamine), prevents microbial growth (water adsorption) and promotes healing of the affected skin areas.

PUB-31

BIOGEOCHEMISTRY OF INDOOR DUST FROM KINDERGARTENS IN THE CITY OF ESTARREJA (PORTUGAL) AND ITS IMPACT ON CHILDREN'S EXPOSURE TO POTENTIALLY TOXIC ELEMENTS

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Potentially toxic elements (PTE) keep being released into the environment and a major pathway of exposure to environmental pollutants is through the ingestion of contaminated dust. Due to hand-to-mouth and object-to-mouth activities, frequently observed among the youngest children (under 6 years old), these are likely to ingest higher amounts of indoor dust. Ergo, an interdisciplinary study encompassing five kindergartens of the Estarreja municipality is currently underway.

Indoor dust, playground dust, and garden soil samples were collected from the kindergartens. Each sample was sieved into the <65 μm and 65–250 μm particle size fractions. The masses of both dust fractions were combined to calculate the total dust load (<250 μm). Near total concentrations of PTEs were determined by ICP-MS while total contents of carbon and sulphur were determined on an ELTRA CS 2000 Carbon Sulphur Analyzer.

Dust daily loading rates vary between schools, ranging from 7.8 to 491.9 (mg m^{-2} day^{-1}). Estimated dust metal loadings show that values are not elevated, excepting those of Zn. Although loadings of Pb, Cu, Zn, and Cd are more elevated in the fine fraction, the differences between particle size fractions are not significant.

In general, PTEs concentrations are significantly higher ($p < 0.05$) in the indoor dust relative to exterior dust and soil. Preliminary data from the oral bioaccessibility testing suggest that Pb in indoor dust is more bioaccessible than Pb in soils or outdoor dust. Carbon, in its different forms, is also significantly higher in indoor dust samples.

Data on concentrations are further utilised to identify indoor sources of PTEs.

PUB-32

MINERAL COMPOSITION AND PHYSICO-CHEMICAL CHARACTERISTICS OF CURABLE MUDS AND CLAYS

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Clay and mud, produced by rock transformation, have long been used as curable substances which have adsorptive, warming and anti-inflammatory properties. Clay, which is part of ointments, masks and nutritive additives, is used to neutralize toxins in dermal and gynecologic diseases and the malfunction of the locomotor apparatus. The mineral and organic constituents of mud deposits have a profound influence on the human organism. Their analgetic and warming effect help resist inflammatory processes of varied origin.

The mineral compositions and physico-chemical properties of curable muds and clays were analyzed and compared, using samples from some well-known deposits. Mud samples from the Dead Sea (Israel), Lake Tambukan (Northern Caucasus) and Lake Gabozero (Karelia), clays from Borovichi (Novgorod Region), Nikolskoye (Leningrad Region), Ladvinskoye (Karelia) and Tsarevichi (Karelia) and kaolin (Ukraine) deposits and cosmetic products were used in our experiments.

The substance was studied using scanning electron microscopy (Vega Texscan microprobe), X-ray phase analysis (ARLXTRA diffractometer), combined scattering spectroscopy (Nicolet Almega XP Dispersive Raman spectrometer), IR spectroscopy (Specord M 80 spectrophotometer) methods and methods for the study of thermophysical characteristics were employed.

Our study has shown that:

1. There are differences in mineral and chemical composition. Mineral microinclusions indicate the genesis of mud and clay deposits.
2. The physico-chemical characteristics provide a quantitative basis for comparing muds and clays by their ability to stay on the skin, to retain heat and to adsorb useful and remove harmful substances.
3. Addition of fine talc-bearing rock fractions to muds and clays improves their heat-accumulating properties.

PUB-33

DIATOMITE. ORIGIN. PROPERTIES. APPLICATION

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Diatomite is a sedimentary rock, which inherited its name from the diatom algae. In place of the detection of Tripoli (Libya) it is called tripoli and diatomaceous earth, mountain flour, Celite. Large deposits of diatomite were founded in Denmark, Sweden, Finland, the Volga region, Siberia, the Urals and the Far East.

Diatomite is formed in water bodies from the mud, representing leaf diatoms, remains of shells cemented by opal, mineral and organic impurities. Made from amorphous silica shells have a variety of forms with numerous pores through which the exchange of substances goes with the environment. Porous rock does not sink in water, has a high adsorption capacity, resistant to acids, the refractoriness, low heat and sound conductivity. The properties of diatomite determine its application. Diatomite is demanded for chemical, pharmaceutical, manufacturing, food, construction, electrical and electronics industry. Interest in them is manifest architects, scientists in medicine and material study.

The particle size distribution and physical and chemical characteristics of Karelian lacustrine diatomites were studing with the help of microanalysis, X-ray and laser diffraction, Raman and IR spectroscopy and other methods. Diatomite shells pore distribution on area and radius indicate that a natural diatomite is nanomaterial.

Covering for protecting wooden structures against fire and decay was developed with the use of diatomite as a filler and pigment and liquid silicate glass as a binder. On the basis of diatomite powder the technologies of producing of liquid filters, mineral paints and light ceramics were tested.

The possibilities of the use of diatomite as food additives in animal husbandry and fur farming, cosmetics and a delivery drug in medicine are discussed. Copy forms of the diatomite shells may be a promising direction in architecture. In nanotechnology diatomite can be used as a screen for selection of nano-objects on size and as a matrix at replacement of silicon dioxide on other materials, for example, to develop new effective catalysts.

PUB-34

DISTRIBUTION OF ANTIBIOTICS IN ALLUVIAL SEDIMENT NEAR BREEDING AREA AT JIANGHAN PLAIN, CENTRAL CHINA

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Antibiotics have been increasingly detected in groundwater, but the distribution of them in deep sediments of underground are still poorly understood. In this study, the occurrence of sixteen antibiotics in different layers of sediments were revealed in various breeding areas in a small region of Jianghan Plain, such as pig farm, chicken house, fish pond and river bank, which were collected for environmental comparison. The spatial distribution of each compounds in surface sediments has much difference and the partial pollution is serious, the pollution pattern was as follows: river bank > fish pond > pig farm > chicken house. Compared the sediments collected in different depth of layers within 1.5 m, the concentrations of targets were not obvious decreased with depth, and even increasing between 0.6 m to 1.0 m as significant fluctuation. Aquifer sediment analysis indicated that most antibiotics retention within 8 m and little increase between 12-16 m, which were consistent with the depth of sandy aquifer layers. All of the compounds were not detected in deep layer of 20 m, except SDZ and CTC. Tetracyclines and Fluoroquinolones were the two groups observed at higher concentrations in most sediment layers, although the residual level was in a range of several to dozens of ng g^{-1}. The results provided field evidence that antibiotics widely existed in underground environment along with groundwater migration and particle adsorption. It suggests that the effect of deep pollution on ecosystem should be assessed, which is considered as a big challenge to groundwater remediation.

PUB-35

INVESTMENT OPPORTUNITIES FOR THE BOTTLED MINERAL WATER INDUSTRY IN NIGERIA

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Nigeria is the largest country in Africa with population of over 180 million. Apart from the population, Nigeria is also endowed with numerous resources among which are springs of various types which can serve as raw materials for bottled mineral water industries. Bottled mineral water is known globally as a source of essential macro and micro nutrients, and is consumed in many developed countries of the world for its dietary attributes. However, in Nigeria, no single brand of mineral water is sold in the market. Establishing bottled mineral water industries will not only improve the dietarynutrients but serve as a huge profit making venture for investors. This researchestablished the investment opportunities in bottled mineral water in Nigeria by sampling the opinion of people on their knowledge and desirability to use bottled mineral water. Results show that there are huge investment opportunities especially at a time when Nigeria government is making effort to industrialize and diversify the economy to non-oil sector. Majority of responses shows that there is high rate of affordability in purchasing bottled mineral water at 150cl and 75cl if sold at N300 and less that N200 respectively. This work is first of its kind for bottled mineral water market evaluation in Nigeria, hence, serving as an important reference document for all intending investors for this commodity in Nigeria.

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