Geochemical anomalies in stream sediments of the upper Sava River drainage basin (Croatia, Slovenia), determined by statistical methods

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Introduction

Sava River is a transboundary river of supraregional interest, draining 95,719 km^2 in Slovenia, Croatia, Bosnia and Herzegovina and Serbia. It is a typical Alpine river, flowing from Julian Alps. It becomes a typically lowland river when entering Croatia. The upper flow of Sava River can be compared with Soča/Isonzo River, which flows from the other side of Julian Alps toward Adriatic Sea.

The aim of the work was to extend the mineralogical and geochemical dataset of stream sediments from Upper Sava River and to study the possible influence of sub-basins of Savinja, Krka and Kupa rivers on main course of Sava River.

Methods

Mineral composition was determined by X-ray diffraction and chemical composition by inductively coupled plasma mass spectroscopy (ICP-MS). Two different procedures to identify anomalous geochemical data were used: the box plot method and the median absolute deviation (MAD).

Results and discussion

Results obtained by the box plot method showed that anomalous concentrations (extreme or outlier) of Zn, Pb, In, Cu, Co, Se, Zr, Cd, As, K, Na, Tl, Ba, B, Mn, Fe are present in sediments of the Celje region, of Cr, Ni, S, In, Cu, Mo, Pb in Moste Dam (pollution traced down to camping Šobec), and of Hg in Litija-Zagorje mining region. The MAD method is more sensitive. It depicts the same polluted areas, but with more anomalous values, which are above threshold values for toxicity. Both statistical methods (box plot and MAD) show two anomalous values for Hg in Sava River near Kranj and Zagorje. The concentrations are much higher than those causing significant toxic effects (>2 ppm). The two locations of Sava River in Croatia show very clean environment with respect to trace elements, although Sava River passed big cities of Zagreb and Sisak. The results clearly indicate self-purification mechanisms of Sava River.

Recommendations and perspectives

Similar future sediment study is recommended on middle and lower Sava drainage basin of interest for Croatia, Bosnia and Herzegovina and Serbia to detect possible pollution centers. In the case of significant pollution, remediation of sediments and watershed management should be applied.

Isotopic and geochemical evidence of gas producing microbial ecosystems in coal seams and gobs in the SW Upper Silesian basin, Czechia

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Gas habitat

Gas samples were collected from coal seams of Namurian A-C age, gobs and overburden reservoirs in the Late Carboniferous Upper Silesian basin (USB), NE Czech Republic. The $\delta^{13}C$ values of methane and $(C_1/(C_1+C_2)$ ratios suggest occurrence two genetic types of gases. (Fig. 1).

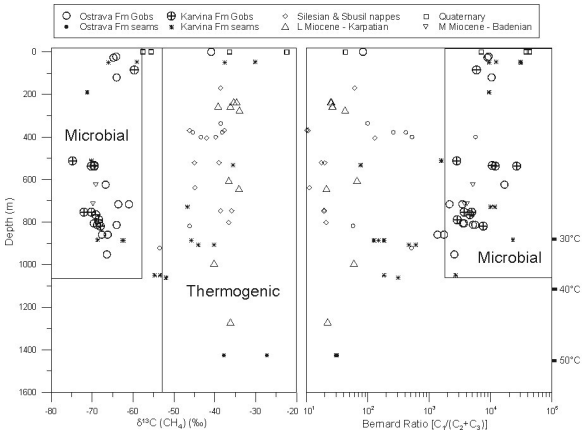

Figure 1: Isotopic and molecular composition of gases versus depth in different geological setting.

Discussion of the results

Thermogenic ^{13}C enriched and wet gas is extracted from the unmined seams in the Ostrava Fm. Dry and isotopically light gas is encountered in the gobs as reported also from Polish mines (Kotarba 2001).

Conclusions

Presence of microbial gas in the USB evidences activity of deep biosphere down to depth of 1000 m. Supply of oxygenated compounds and H_2 is the limiting factor of microbial activity (Horsfield *et al.* 2006). The temperature conditions of are favorable for methanogenesis at dept range up to 2 km (70°C).

References

Horsfield B., Schenk H.J., Zink K., Ondrak R., Dieckmann V., Kallmeyer J. Mangelsdorf K., di Primio R., Wilkes H., Parkes R.J., Fry J., Cragg B. (2006), *Earth Planet. Sci. Letters*, **246**, 55-69.

Kotarba M.J. (2001), *Organic Geochemistry* **32**, 163-180.