NWP at Croatian Meteorological and Hydrological Service

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Alica Bajić, Kristian Horvath, Stjepan Ivatek-Šahdan, Tomislav Kovačić, Antonio Stanešić, Martina Tudor

Current status of the operational suite

Computer

- SGI Altix LSB-3700 BX2 Server with 56 Intel Itanium2 1.6GHz/6MB
- 112 GB standard system memory
- 2x146 GB/10Krpm SCSI disk drive, 3 Tb scratch disk
- Storage: 32Tb online data + tapes
- OS SUSE Linux Enterprise Server 9 for IPF with SGI Package
- Compilers: Intel Fortran version 9.0.031 & C++ version 9.1.053
- Queuing system (PBS Pro version PBSPro_11.1.0.111761)
- Main users: NWP, Air-quality modelling & Climate modelling

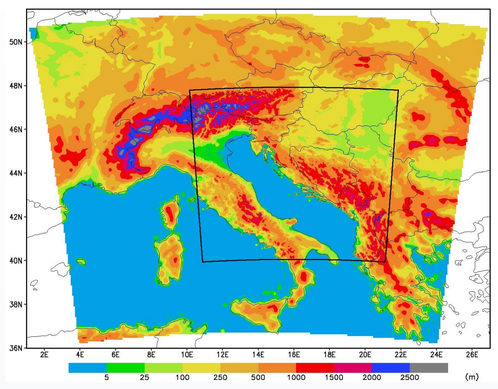
LBC files and transmission lines

- global model ARPEGE, coupling frequency 3 hours
- Internet and RMDCN through ecgate as backup from July 2006
- IFS coupling files from October 2010, used for Case studies

Products on Internet-automaticaly generated

- Fields: http://prognoza.hr/karte.php?id=aladin&param=&it=
- Weather symbols: http://prognoza.hr/tri_karta_e.php?id=tri&param=Istarska&code=Pula
- Marine forecast: http://prognoza.hr/nauticari_e.php?id=nauticari

Domains, model set-ups and forecast range

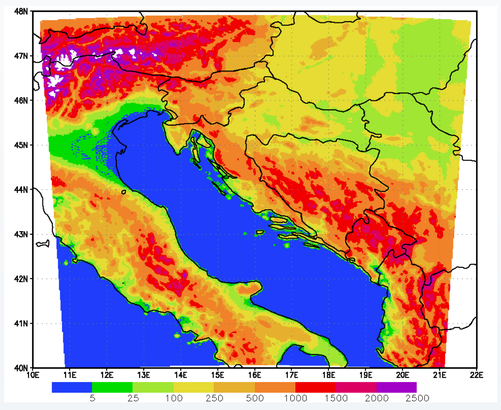


ALADIN HR domain:

- 8 km horizontal resolution
- 37 levels, 229x205 (240x216) grid points
- 32T3: ALARO0-3MT, old radiation scheme, DFI
- 72 hours forecast, 1-3 hourly output
- data assimilation operational from end of 2011
- settings of CANARI analysis revised
- RCTVEG coefficient tuned

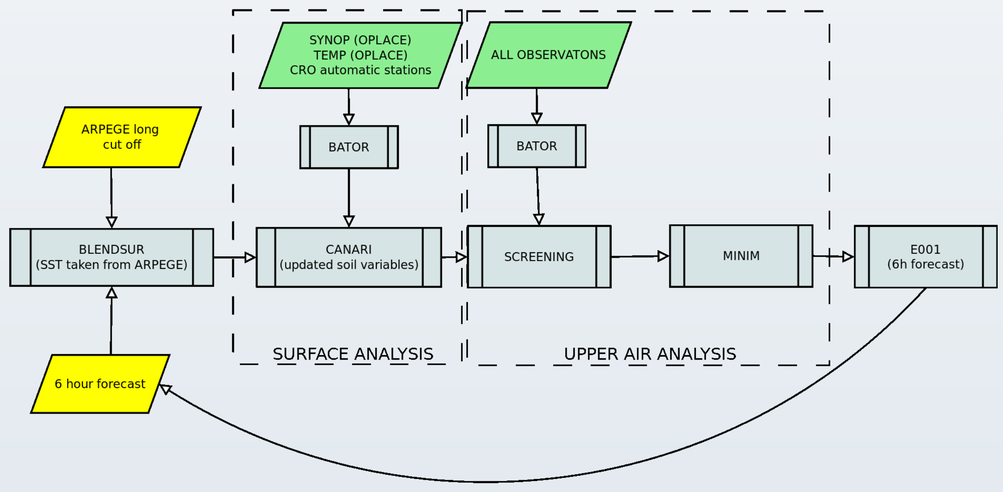
HRDA domain (2 km horizontal resolution: 439x439 (450x450) grid points):

- 24 hrs 2 km full NH model run @ 37 levels -operational since 1st July 2011; starts at 06UTC
- AL36T1 model version with the ALARO0 set-up of the physics parametrizations
- initial file is 6 hrs forecast from the 8 km run started at 00 UTC, LBC frequency is 1 hour
- scale selective digital filter for initialization



- hourly 2 km dynamical adaptation up to 72 hrs @ 15 levels for 10 m wind forecast, model version AL29T2-mxl

Data assimilation

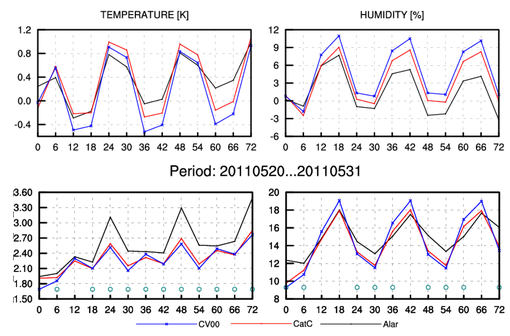


Scheme of the assimilation cycle setup at DHMZ.

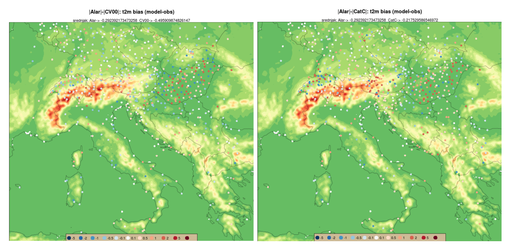
- operational since November 2011.
- Cycling: 4 times per day; LBC: long cut off ARPEGE files; before production last 3 cycles are re-run to have as much as possible data used
- Production: twice per day at 00 and 12 UTC, 72h forecast; LBC: short cut off ARPEGE files
- Observations used: SYNOP, TEMP, AIREP, GEOWIND, satellite radiances (NOAA, MSG)
- Data source: OPLACE and Croatian automatic stations
- B matrix: SNMC method, ~100 days, no tuning
- B matrix - computed also with ensemble method for same period as SNMC and for seasons
- CANARI settings revised

CANARI tuning

- problems with T2m and RH2m verification scores for summer period
- better results obtained when soil from ARPEGE analysis is used - problem with CANARI?
- tuning of CANARI analysis:
  - model standard deviations, horizontal length scale, orolim and orodif
  - blacklisting of suspicious observations



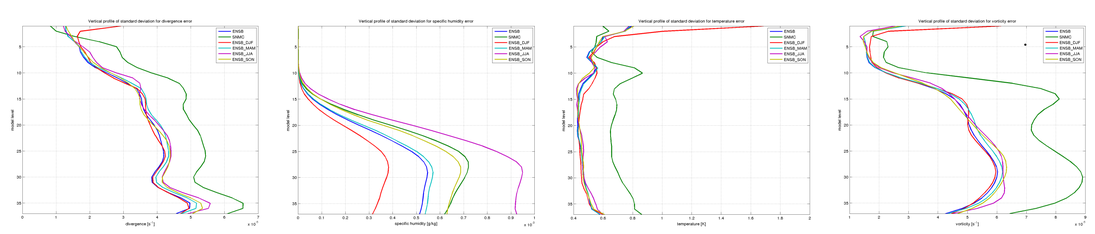
Evolution of BIAS (top row) and RMSE (bottom row) with forecast range. Alar (black) - dynamical adaptation, CV00 (blue) - assimilation cycle (old setup), CatC - assimilation cycle (new setup)



Difference between absolute value of t2m BIAS for Alar and absolute value of t2m BIAS for CV00 (left) or CatC (right) calculated for SYNOP stations in model domain, for period 20110520-20110531 and for +12h forecast range.

Seasonal B matrix

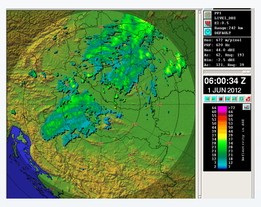
- Ensemble B-matrix generally shows smaller standard deviations and covariances than standard NMC
- Considerable seasonal dependence exists with respect to humidity-related standard deviations and balances



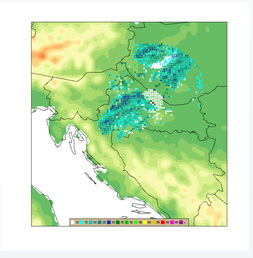
Standard deviations of divergence, specific humidity, temperature and vorticity errors. B matrix-calculation periods: SNMC (15 Feb – 25 May 2008), ENSB (15 Feb – 25 May 2008), Seasonal ENSB (2008: MAM, JJA, SON, 2008/09: DJF).

Radar data assimilation

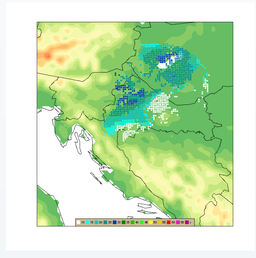
- row data from local radar converted to MF bufr
- modified BATOR (sensitivity and constant hardcoded to some value) used for reading MF bufer in ECMA database
- screening performed; observation operator works well but still all data rejected - further investigation neeeded



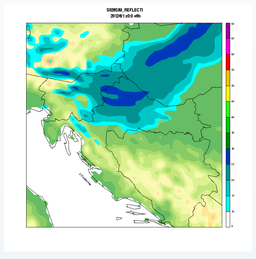
Radar reflectivity from Bilogora radar at 0.5° elevation on 1. June 2012 at 06 UTC.



Observational data for 0.5° elevation extracted from ECMA database.



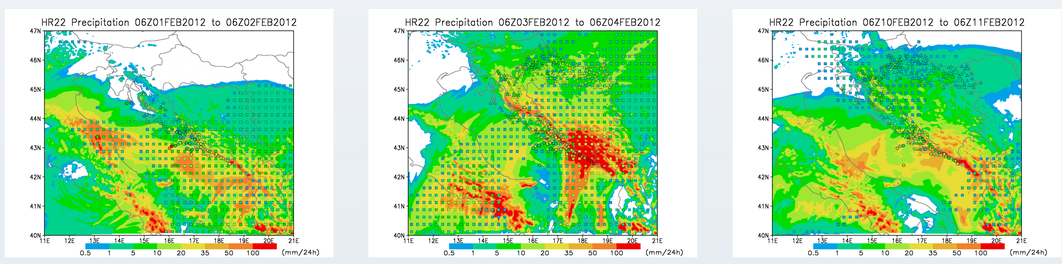
Model reflectivity after screening (calculated with observation operator).



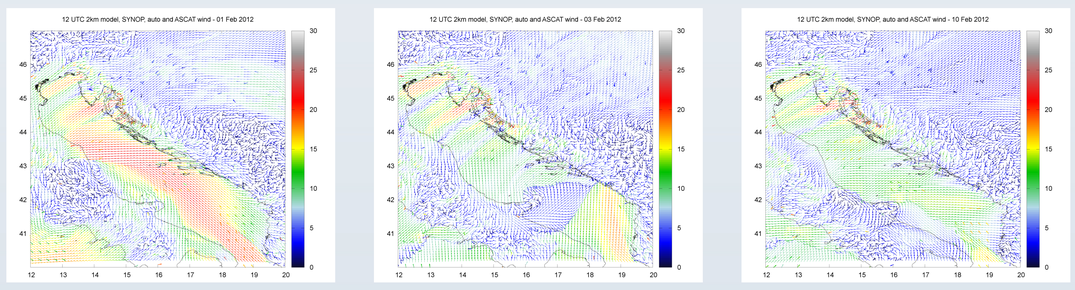
Simulated reflectivity at model level 26 (~2km) from ALARO 00UTC run using fullpos.

2km ALARO NH operational forecast

In severe winter conditions

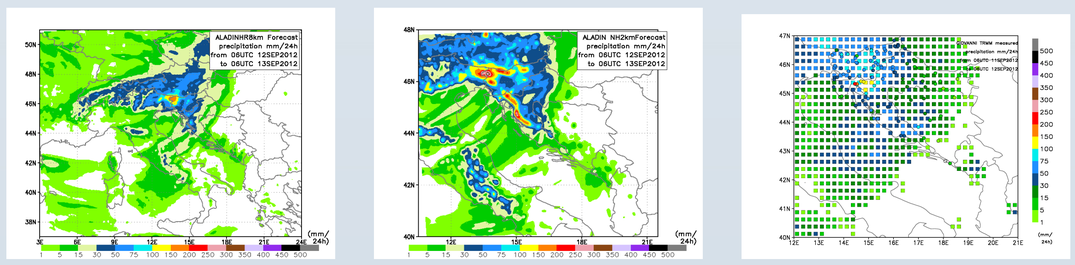


Accumulated 24 hourly precipitation field from 2km res forecast (shaded background), measurements TRMM (squares) and rain gauges (triangles for snow, circles for rain).



10m wind from model (thin arrows), and measured on SYNOP and automatic stations and from MetOp ASCAT (thicker arrows).

HYMEX SOP case of 12th September 2012



During the first HPE of HYMEX SOP1, 220 mm of rain accumulated in Rijeka, mostly during 3 hours in the night. Figure show forecast rainfall in 8 and 2 km resolutions and measured rainfall on rain gauges (circles) and from TRMM (squares).