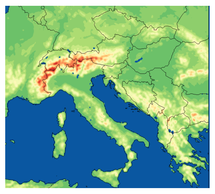

Data assimilation in Croatia

Antonio Stanešić, Tomislav Kovačić, Kristian Horvath and Stjepan Ivatek-Šahdan
Meteorological and Hydrological Service, Gric 3, 10000 Zagreb, Croatia
Emails: stanesic@cirus.dhz.hr, kovacic@cirus.dhz.hr, horvath@cirus.dhz.hr, ivateks@cirus.dhz.hr

DHMZ

Status, experiences and plans

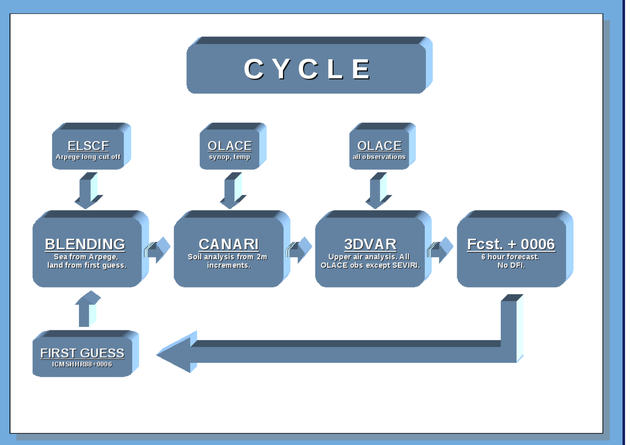

***Figure 1**: Schematic of assimilation cycle.*

Assimilation is done in experimental setup with cy32t3. Cycling is schematically shown on the left figure. Surface analysis over land is done with CANARI using data from OLACE (LACE preprocessed data) and SST from Arpege long cut off file. Upper air analysis is done with all OLACE data (except SEVIRI). 6 hour forecast is done with operational namelist (without DFI). Production (right figure) is done in similar way except that SST comes from Arpege short cut off file.

Verification showed some improvement in 2m parameters (most probably due to surface analysis). Upper air statistic are not so good. Still no case studies were done. Also impact studies of various data sets has to be done too.

Further plans include installation of new cycle (cy35) in order to use variational bias correction, calculation of ensemble B matrix, improvement in screening, usage of radar data...

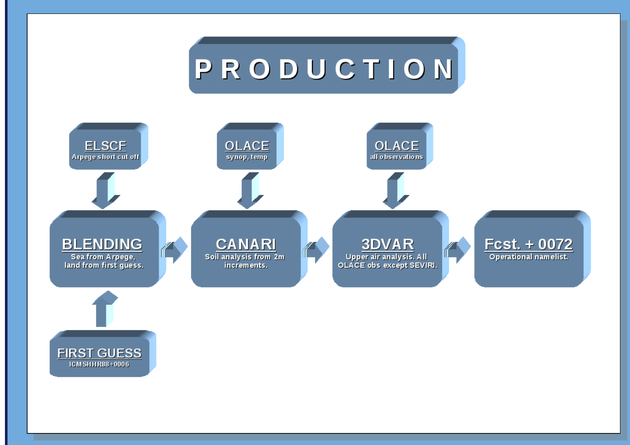

***Figure 2**: Schematic of production from assimilation cycle.*

B matrix

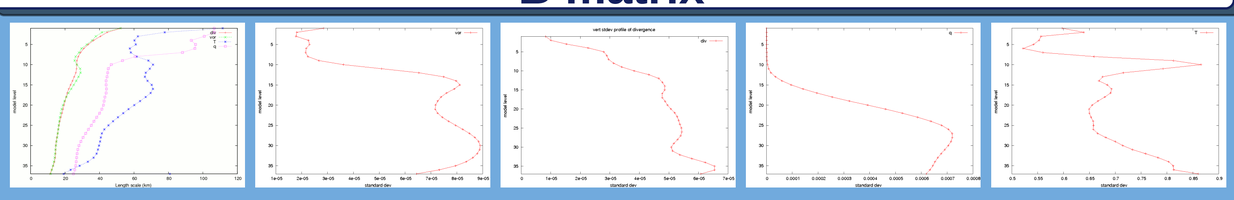

***Figure 3**: On the first plot is a profile of horizontal length scale of control variables. Other four plots are profiles of standard deviations of vorticity, divergence, temperature and q.*

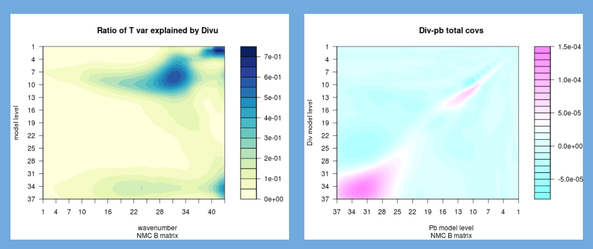

***Figure 4**: Left: ratio of explained variance. Right: total covariances*

Model error statistics was estimated by NMC method from 100 operational forecasts (ALARO0 without 3MT) in period starting with 15 Feb 2008. Covariances were calculated by method from Berre (2000) which is coded in festat, a software for statistical calculation. The method is standard in ALADIN countries. We compared our results with Berre (2000) and with Hungarian forecast error statistics. In main features our forecast error statistics agrees with others. Some of our statistical results are shown on Fig. 4. The only bigger difference is noticed in explained variance for specific humidity at horizontal scales between 20 and 100 km (Fig. 5). In our case more variance is explained by (T,ps)u.

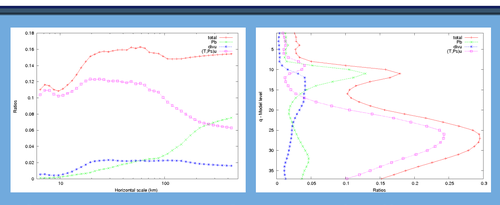

***Figure 5**: Left: Vertically averaged explained variance of temperature as function of horizontal scale. Right: Profile of explained variance of temperature averaged over wave numbers.*

CANARI

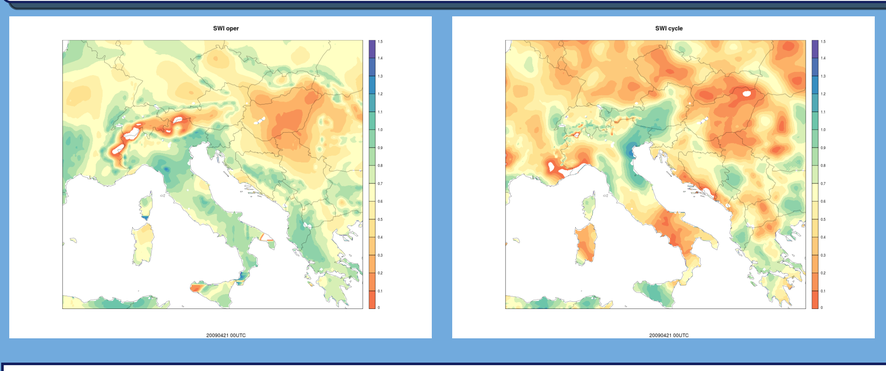

***Figure 6**: SWI from operational setup(left) and SWI from assimilation cycle (right). One can notice that SWI is lowered in assimilation cycle.*

First assimilation cycle using CANARI for soil analysis started at beginning of October 2008. Data that is assimilated includes 2m temperature and 2m relative humidity from SYNOP and Croatian automatic stations. Currently we stopped to use locally preprocessed SYNOP data and we use data from OLACE.

3DVAR

For testing of the 3DVAR setup a single obs experiments were done with temperature or relative humidity observation at location of Zagreb and 500hPa level. Impact of temperature innovation of 1K is shown on figures below.

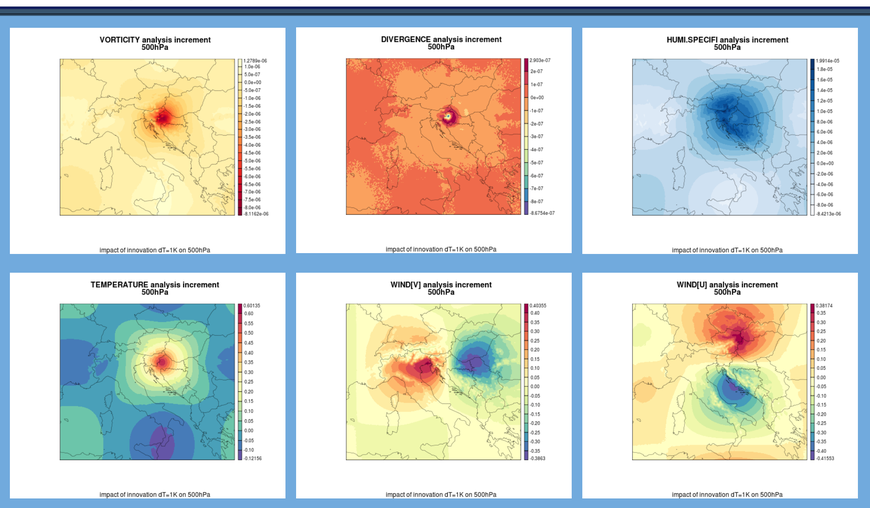

***Figure 7**: Analysis increment in horizontal plane for vorticity, divergence, specific humidity, temperature and two wind components coming from 1K temperature innovation at 500hPa level.*

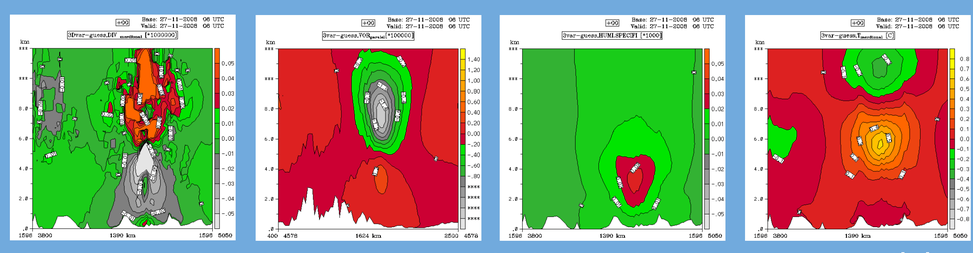

***Figure 7**: Analysis increment in vertical plane for divergence, vorticity, specific humidity and temperature.*

VERIFICATION

Verification is done against SYNOP and TEMP observations. CANARI is used to make quality control and to calculate model departures from observations. These data and additional one are stored in binary data base from which special programs take data and calculate statistics. Period for which data base exists and statistics below are calculated is 22.02.2009.-17.04.2009..

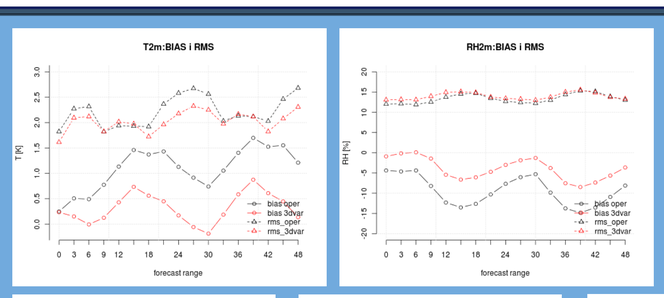

***Figure 8**: Dependency of RMS and BIAS of 2m temperature and relative humidity on forecast hour. Model is compared to SYNOP observations (~18000 data per forecast hour) every 3 hours. Impact on 10m wind is small (not showed).*

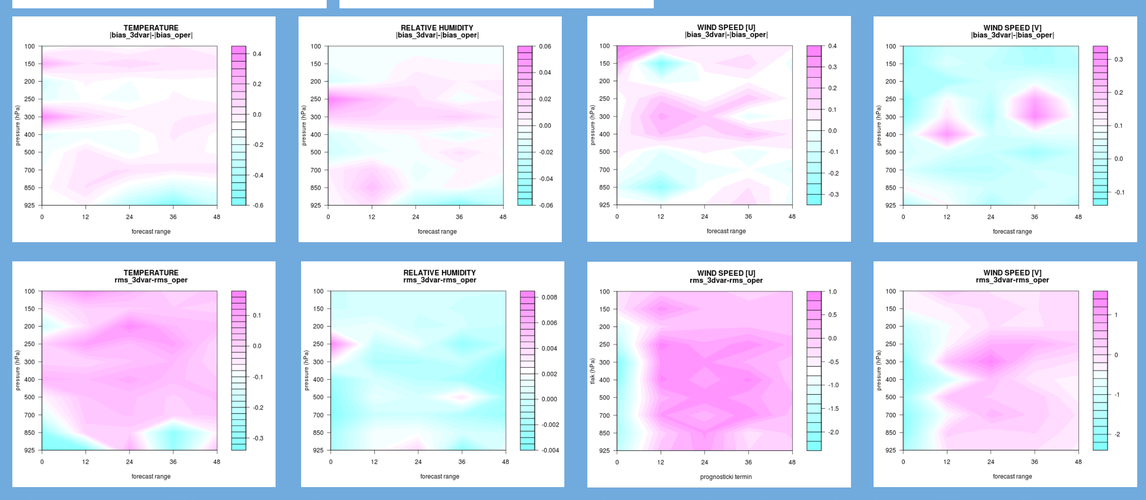

***Figure 9**: Differences between 3DVAR and operational vertical profiles of RMS and BIAS of temperature, relative humidity and two components of wind vs. forecast hour. Blue means 3DVAR is better. Model is compared to TEMP observations (~1200 data per forecast hour) every 12 hours.*

Special thanks to: Gergely Boloni, Alena Trojakova, Sándor Kertész, Roger Randriamampianina.