NWP in Croatian Meteorological and Hydrological Service

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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, 1.6 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

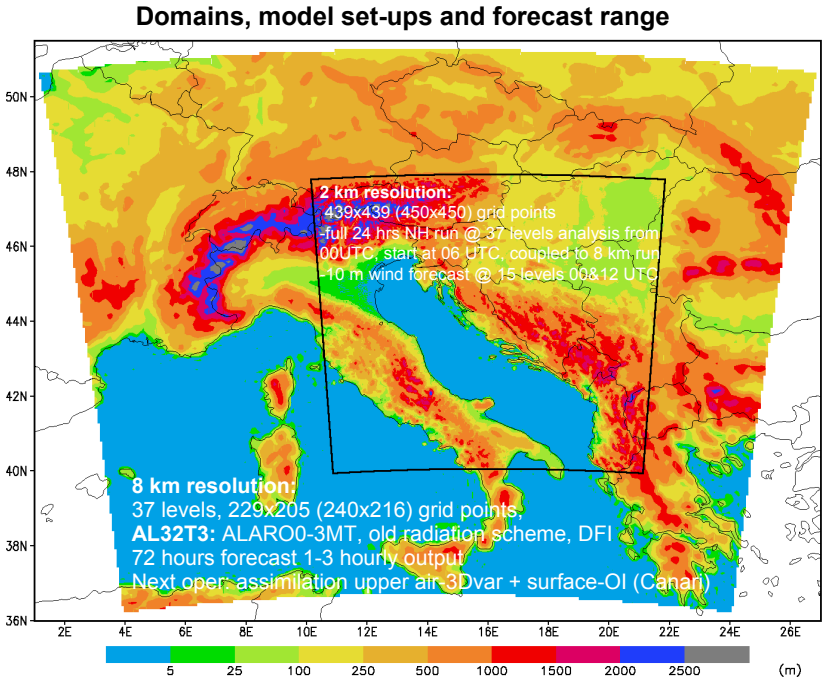
LBC files and lines

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-automatically generated

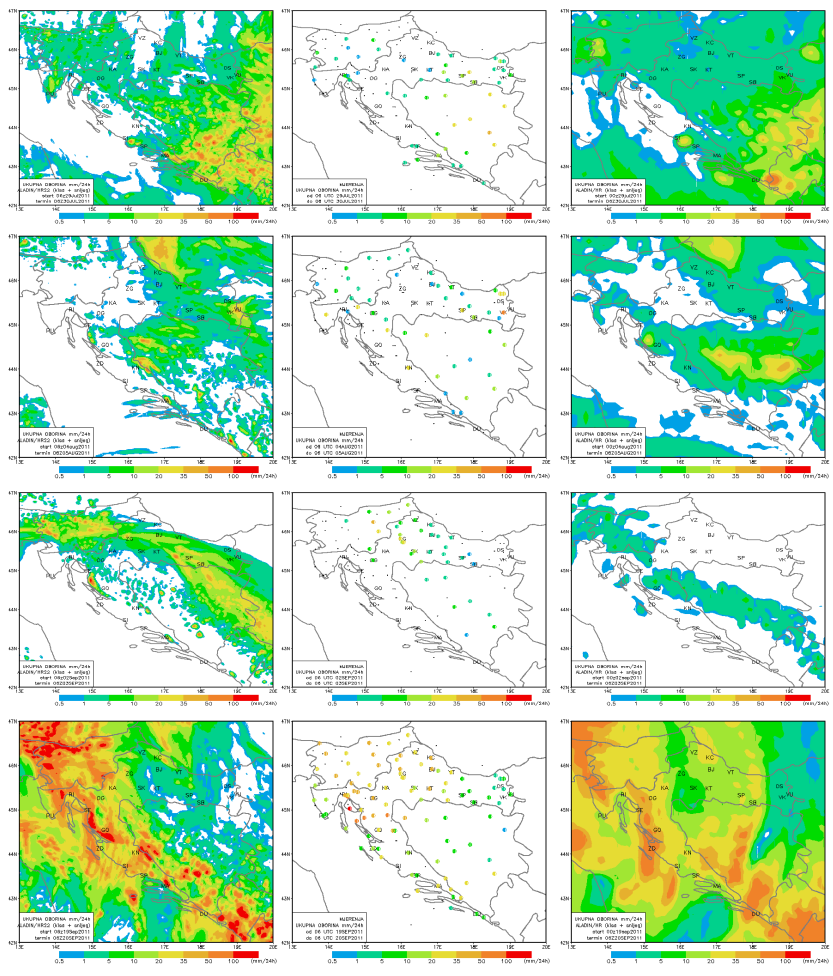
Fields--http://prognoza.hr/karte.php?id=aladin&param=&it=
Weather symbols--http://prognoza.hr/tri_karta_e.php?id=tri&param=Istarska&code=Pula
Marine forecast--http://prognoza.hr/nauticari_e.php?id=nauticari

Domains, model set-ups and forecast range



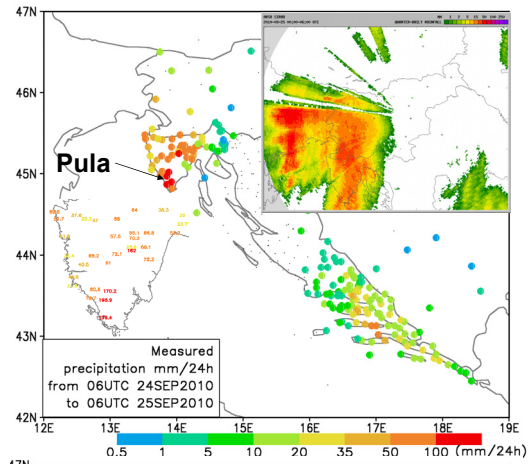
2 km ALADIN-NH version run

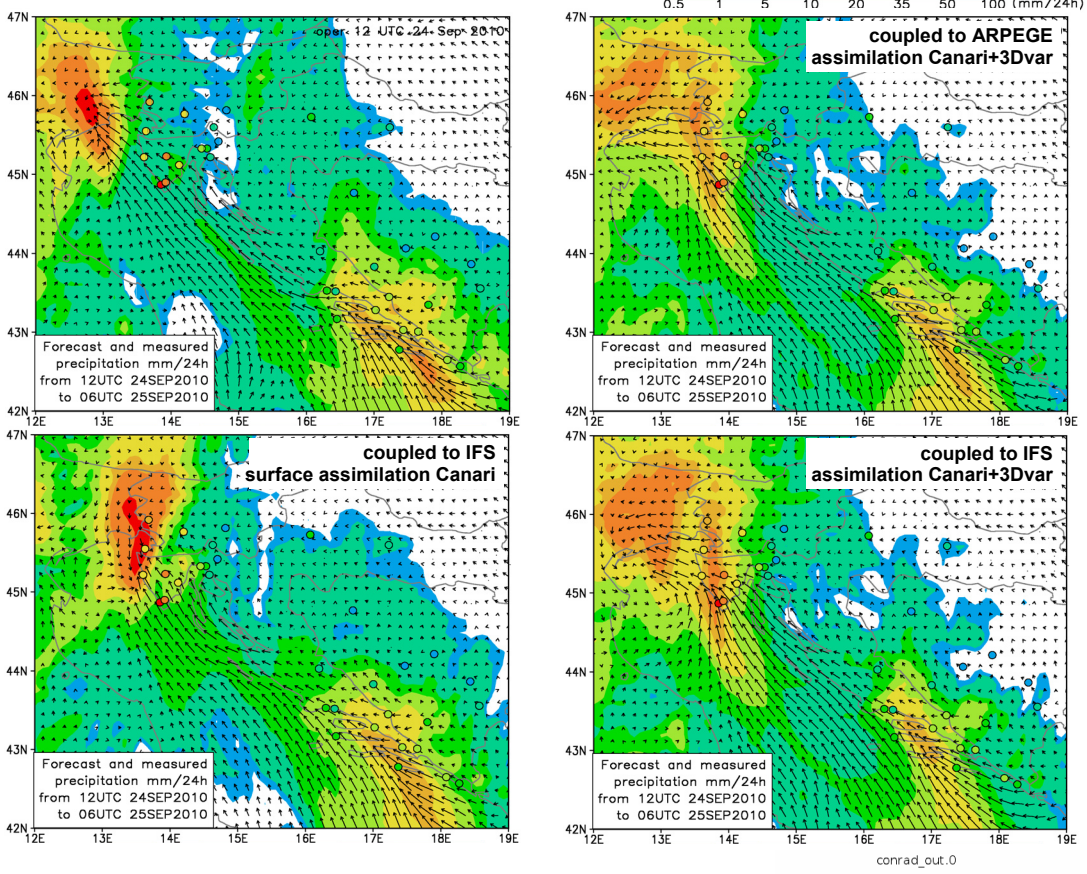
From the beginning of July 2 km NH runs starts. Operational 8 km model forecast are used as initial and boundary condition. The initial file is 6 hrs forecast from the 8 km run started at 00 UTC, LBC frequency is 1 hour. Comparison of measurements with, 8 km and 2 km results for 24 hrs precipitation are shown bellow for few examples. In general results are reasonably good. However, a lot of tuning is still needed. For sure there is a problem with heavy precipitation nearby steep orography.



Pula Case study – intensive rain

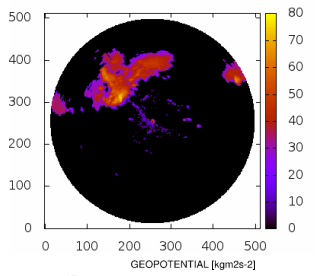
On 25th September 2010, just after midnight, intensive rain hit Pula city on the southern part of Istria Peninsula. The rain was intensive for several hours and the maximum measured rainfall rate at reached 43.9 mm per hour.
Maximum 24 hours precipitation amount measured at rain-gauge network in Istria were higher than 100 mm on several stations.
The 6 hours accumulated precipitation pattern from ARSO RADAR measurements (Thanks to Slovenian colleagues) shows one precipitation maximum over north-western Italy and second over Istria Peninsula.
The operational forecast without assimilation (coupled to ARPEGE) underestimated the precipitation intensity and put the rainfall maximum above north-western Italy. Similar results are achieved when ALADIN model was coupled with IFS with maximum precipitation little-bit closer to affected area on Istria Peninsula.
Improvement, spatially in structure of the precipitation was achieved if upper air assimilation (3D-Var) were used to produce initial conditions. Intensity was still too low, but the divergence from measured data is much smaller than without assimilation.





Radar data assimilation in ALARO

RC LACE countries use ALARO aimed for resolutions of 4 km or less. At this resolution radar data are essential source of information. To make implementation of different data formats used in national services a tool that prepares environment for new data format was developed. The core of the software is C++ classes called Radar Classes. These are general classes for handling radar data. This year LACE joint HIRLAM in development of CONRAD and Radar Classes are built in CONRAD. Further step in radar data assimilation development in ALARO is implementation of AROME reflectivity operator.



Assimilation and downscaling

From mid February 2010, assimilation suite is run as parallel suite in Croatian Meteorological and Hydrological Service. The B-matrix were computed by standard NMC method by taking 100 forecast differences for period 15. February 2008 until 25. May 2008. Model runs were initialized with a 24 hours time difference and forecasts were valid at the same time (36h and 12h forecasts). Testing of the longer 1-yr period (Feb 2008 - Feb 2009) for standard NMC and ensemble computation of the B-matrix is in progress.
Verification results for seasons from March 2010 till mid August 2011 for 2m temperature and 2m relative humidity and surface pressure are presented. The best improvement is achieved for winter period when BIAS, RMS and SD are much better for forecast that use initial condition made by assimilation. There is still some problem during the summer connected with unrealistic to dry soil during the day or to wet soil during the night resulting with wrong 2m temperature and 2m relative humidity forecast. We intend to make the assimilation suite operational before next year.

CV00-assim. CV00 stde, CV00 rmse, CV00 bias
AL00-down. AL00 stde, AL00 rmse, AL00 bias