ALADIN related activities in SLOVENIA - 2009

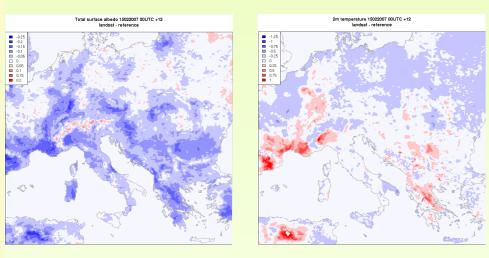## The computer system SGI Altix ICE 8200

Technical characteristics:

- 36 compute nodes in a single rack,
- 8 GB of memory and 2 Quad core Intel Xeon 5355 processors per node,
- 308 cores,
- two Infiniband DDR networks, one for IO and the other for MPI communication,
- additional 7 service nodes for login, management, control and IO operations,
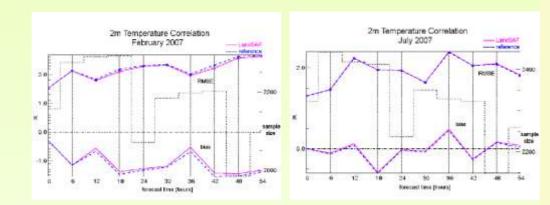- a dedicated NAS IO node with 28 TB FC disk array.

RESEARCH

Use of LandSAF retrievals for surface analysis

A simple Kalman filter based assimilation system (initially developed by Dominique Carrer, MF) was used to assimilate LandSAF albedo product in ALADIN. The albedo model values are considered constant in time (the model propagation matrix in Kalman filter is identity) and the observation vector is composed of the LandSAF albedo retrieval and a climatological value from ALADIN clim file (providing some sort of a safeguard). As seen from figures below, the impact can be quite substantial.

There has been a six month verification performed and the results show some improvement for screen level model scores in winter/early spring months and neutral impact in summer part of the year.

Difference between experiment (LandSAF albedo analysis) and reference for total albedo (left) and 2m temperature at 12 UTC (right) for February 15, 2007.
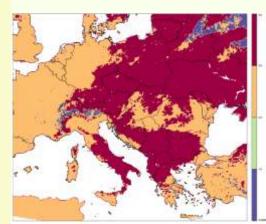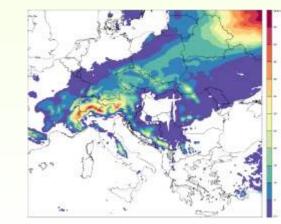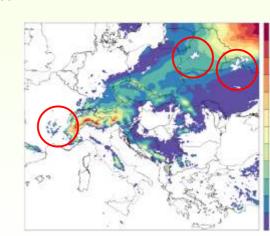
Objective verification scores on SYNOP data for 2 m temperature depending on forecast time for February 2007 (left) and July 2007 (right). Lower two curves are bias and upper two are RMSE. Experiments with LandSAF albedo are plotted in magenta and reference run is in blue (see legend).

The next challenge is to use a similar Kalman filter based technique for the snow amount in the model by using the LandSAF snow cover product.
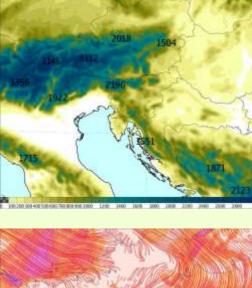

Left: LandSAF snow cover product for January 26, 2007, preprojected on ALADIN domain (snow covered terrain is in blue, partly snow covered ground are green pixels, light brownish colour is snowfree ground and dark red is no data). Middle: guess snow reservoir field for January 27, 2007, coming from ARPEGE and (right) the combination of two for the same date.
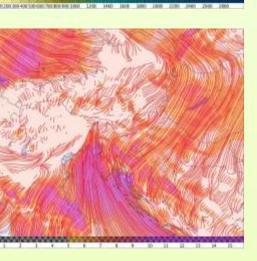
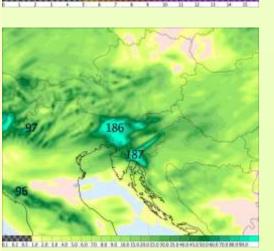### Influence of local orography in a flash flood case, September 18, 2007

The idea of the study was to modify the orography and investigate its influence on the development of a convergence line over the Adriatic sea, which was the main cause for this severe weather event. Two most interesting results with perturbed orography are:

- Julian and Carnic Alps in western Slovenia and northern Friuli region are flattened (middle column) and
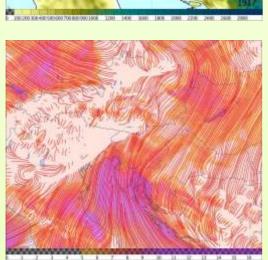- Dinaric Alps in western Croatia are removed (right column).

Both perturbations have a large impact on a less pronounced development of low level convergence zone and consequently less precipitation in the target area, implicating that the orography itself is a key factor influencing the total amounts of precipitation.
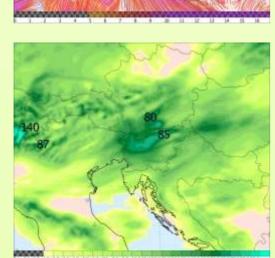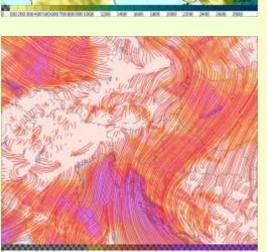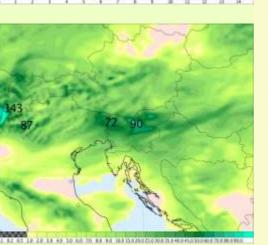

Figures show orography (top row), low level wind streamlines and velocities above 2 m/s at 9 UTC (middle row) and total precipitation amounts (bottom row) for three different domain orographies: reference (left column), with removal of Alps in western Slovenia and northern Friuli region (middle column) and with removal of Dinaric Alps in western Croatia (right column).
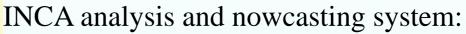
OPERATIONAL STATUS

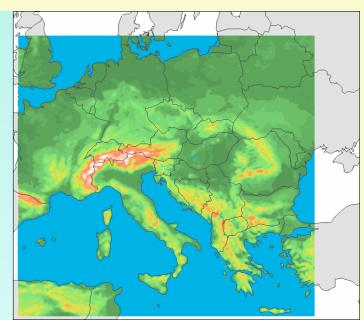Characteristics of the operational ALADIN/SI model configuration:

- model version: AL32T3 using ALARO with 3MT physics
- integration four times per day: 00 UTC (72 h), 06 UTC (60 h), 12 UTC (72 h), 18 UTC (48 h),
- 9.5 km horizontal grid spacing,
- 43 vertical model levels,
- linear spectral elliptic truncation (E134x127, 258*244 points, with extension zone 270*256),
- Lambert projection,
- 400 s time-step,
- initial and lateral boundary conditions from ARPEGE,
- LBC coupling every 3 hours,
- digital filter initialization.

Operational ALADIN/SI domain 9.5km

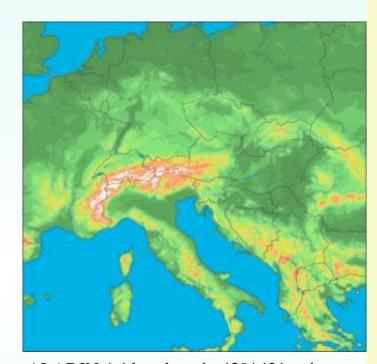Characteristics of the parallel ALADIN/SI model configuration, same as operational except for:

- integration two times per day: 00 UTC (54 h), 12 UTC (54 h),
- 4.4 km horizontal grid spacing,
- linear spectral elliptic truncation (E224x215, 439*421 points, with extension zone 450*432),
- 200 s time-step.

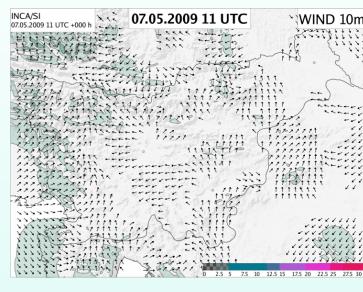INCA analysis and nowcasting system:

- running in pre-operational mode under SMS,
- resolution 1x1 km, 401x301 points,
- NWP input: ALADIN fields,
- observations: temperature, humidity, wind and precipitation from AMS, SYNOP and radar measurements,
- nowcasting initiated from the analysis and converging to NWP model after 12 hours,
- temperature, humidity, wind and several convective indices are updated hourly,
- precipitation type, rain and snow rate products are updated every half an hour.

ALADIN 4.4 km domain 439*421 points

INCA 10 m wind analysis valid at 7.5.2009 11:00 UTC.

Major highlights:

23.04.2008:   ALADIN 9.5 km in daily parallel run on SGI
27.04.2008:   INCA under SMS
16.06.2008:   ALADIN 9.5 km runs operationally on SGI
22.07.2008:   ALADIN 4.4 km in parallel
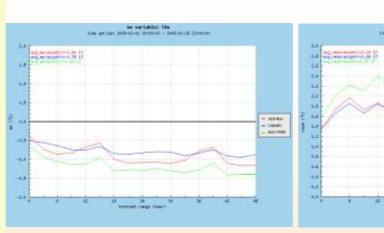Dec 2008:   first experiment ALADIN 4.4 km with CANARI
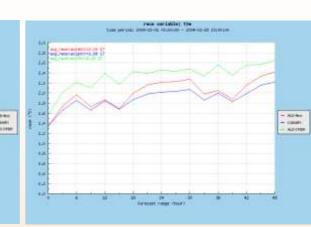Mar 2009:   first experiment ALADIN 4.4 km 3DVar
04.05.2009:   SGI upgrade (enlarged disk array, additional node)

DEVELOPMENTS - data assimilation:

Surface asimilation cycle has been set-up in the SMS environment (cy35t1, 4.4 km, 6 h frequency) and contains:

- CANARI surface assimilation to update soil fields (using 2 m temperature and 2 m relative humidity from OPLACE SYNOP)
- upper-air blending (100% ARPEGE),
- sea surface analysis from ARPEGE,
- long cut-off LBC from ARPEGE,
- 48 hour forecast runs 2 times a day, short cut-off LBC.

The experiment was validated for the time period between 1st - 28th February 2009. Objective verification against SYNOP data shows clearly visible improvements on T2m scores, compared to ALADIN-OPER or ALADIN-4km (with the same resolution). The impact on RH-2m was very low.

The **3DVar assimilation** cycle implementation:

- needed configurations (002, 131, BATOR) are successfully tested (cy35t1, 4.4 km),
- B matrix is computed based on the period of 1 month (April 2008, 60 difference pairs), using the ensemble method (ARPEGE EnVar),
- all kinds of observational data from OPLACE are being transferred and locally archived.

Environmental Agency of the Republic of Slovenia