University of Ljubljana
Faculty of Mathematics and Physics
Department of Physics, Chair of Meteorology
Nedjeljka Žagar
http://meteo.fmf.uni-lj.si/

Univerza *v Ljubljani*
Fakulteta za *matematiko in fiziko*
Oddelek za fiziko

Jadranska 19, (p.p. 2964)
1000 Ljubljana, Slovenija
tel.: (01) 47 66 500
fax: (01) 25 17 281

e-pošta: fizika@fmf.uni-lj.si
http://www.fmf.uni-lj.si/

Mini Workshop on NWP Modelling Research in Slovenia

15 December 2011

Faculty of Mathematics and Physics, Kuščer Seminar Room

Programme

9:00 Nedjeljka Žagar (UL-FMF)
Welcome and Opening

9:15 Benedikt Strajnar (ARSO)
Data assimilation of high-resolution aircraft observations in ALADIN

9:45 Vanja Blažica (UL-FMF)
Quantification of divergence in ALADIN

10:15 Luka Honzak (CO VESOLJE)
Lateral boundary conditions and forecast errors in the mid-latitudes

10:45 Coffe break

11:00 Jure Cedilnik (ARSO)
Impact assessment of daily satellite derived surface albedo in a limited area NWP model

11:30 Matic Ivančič (NatInsChem)
Dispersion modelling in complex terrain: Sensitivity studies with the CALMET model

12:00 Lunch break

13:00 Nils Gustafsson (SMHI)
Recent progress in developments of data assimilation for HIRLAM and HARMONIE

14:00 Gregor Skok (UL-FMF)
Object-based precipitation analysis: application to tropical cyclones and Slovenian radar data

14:30 Nedjeljka Žagar (UL-FMF)
Quantification of the flow dependency of background-error variances

15:00 Discussion

16:00 Closure

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Abstracts

Data assimilation of high-resolution aircraft observations in ALADIN

Benedikt Strajnar (ARSO)

An important component of the high-resolution data assimilation is the availability of high-frequency or dense observations. An example of such data are aircraft wind and temperature measurements, available through the Mode-S air-traffic control system composed of a ground radar and transponders on-board the aircraft. The data quality is estimated by their comparisons to the AMDAR and radiosonde data. Results of the first data-assimilation experiments and their evaluations with the Slovenian high-resolution version of the ALADIN model will be presented.

Quantification of divergence in ALADIN

Vanja Blažica (UL-FMF)

This study aims to quantify the divergent energy on the mesoscale based on the NWP model ALADIN/SI. The goal is to provide a picture of average distribution of divergent versus vortical energy as a function of the horizontal scale and the vertical level. Results show that divergent energy increases as the horizontal scale becomes shorter and closer to the surface. The vertical distribution is more complex. The sensitivity experiment shows a major impact of the applied diffusion scheme on the divergent energy at smallest resolved scales.

Lateral boundary conditions and forecast errors in the mid-latitudes

Luka Honzak (CO VESOLJE-SI)

The impact of lateral boundaries on the magnitude of forecast errors inside the limited-area model domain has been studied by running a mid-latitude (35°N-70°N) channel simulation over a three-month period. Initial and boundary conditions are obtained from the operational ECMWF analyses and the limited area model is run at the same resolution (0.25°x0.25°). Simulation results are verified against the ECMWF analyses in terms of conventional statistical parameters. The mid-latitude channel is then compared with simulations on two smaller domains, one covering the half of the globe (100°W-60°E) and another extending between 45°W and 35°E.

Impact assessment of daily satellite derived surface albedo in a limited area NWP model

Jure Cedilnik (ARSO)

A simple Kalman filter optimally combines the MSG satellite product, albedo climatology and prior information given by persistence. Results of short-range forecasts over one-year period reveal the capacity of satellite information to reduce model bias and RMSE on screen level temperature (during daytime and in the intermediate seasons). The impact on forecast scores is larger when considering the analysed surface albedo rather than by using any climatology-based albedo product.

Dispersion modelling in complex terrain: sensitivity studies with the CALMET model

Matic Ivančič (Nat. Ins. Chem.)

At the National Institute for Chemistry in Ljubljana the modelling system CALPUFF has been coupled with the operational forecast fields obtained by using the ALADIN model at ARSO, and the two-day air-pollution prediction is now available online (http://www.okolje.info/portal2/index.php/napoved-onesnazenja). This study will present results of the sensitivity exercise with respect to three different strategies of the wind-field initializations in the CALMET model. In the first case, the wind field is initialized using meteorological data from six surface stations around Šoštanj TPP and one vertical radio-sounding measurement. The second experiment involves the initialization by the operational prognostic ALADIN fields whereas and the third initialization experiment is a combination of the data from surface stations and the mesoscale model fields.

Object-based precipitation analysis: application to tropical cyclones and the Slovenian radar data

Gregor Skok (UL-FMF)

An object-based analysis method, originally developed to track mesoscale convective systems in the low- and mid-latitude Pacific Ocean using three-hourly satellite precipitation data, is modified to be able to successfully estimate the precipitation associated with tropical cyclones (TC). The IBTrACS TC database is used to define the locations of TC centers and the object-based method is used to associate the nearby precipitation with locations of TC centers. 11 years of satellite and IBTrACS data is used to compose a global map of TC precipitation. The method is also modified and used to track the areas with hail precipitation using volumetric data from meteorological radar on the Lisca mountain, Slovenia. An analysis of tracks is performed using 9 years of available radar data.

Quantification of the flow dependency of background-error variances

Nedjeljka Žagar (UL-FMF)

I would describe the application of the normal-mode function framework to the representation of the time-averaged and time-dependent structure of the short-term forecast-error variances. Results will be shown for a 20-member ensemble based on the 4D-Var assimilation system of ECMWF. Flow dependency is quantified by the flow-dependency coefficient (FDC) which measures correlation between the forecast-error variances and the mean flow energy in two-dimensional modal subspaces.