LACE working group for physics
Working plan for 2005
Draft version

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Research and developments topics in the frame of LACE working group for physics for year 2005 are listed. The list is not final, at the moment basis for discussion.

Contributions on physics-dynamic interface and on externalized surface module are still to be defined.

Parameterization of turbulence

Objective:

Improve diagnostic treatment of turbulent flux with introducing prognostic equation for turbulent kinetic energy.

Methods:

Implementation of ARPEGE 1D TKE scheme with specific work to make it stable at high Courant numbers (longer integration time steps).
Contribution: M.Tudor (Hr), F.Vana (Cz), J.Cedilnik (Si) ? mm

Work on "mixed" radiation scheme

Objective:

To achieve good cost/efficiency ratio in the radiative computation.

Methods:

Find out the geographical dependence for parameter alpha.
Contribution: N.Pristov (Si), 1mm
Using the gaseous RRTM transmission function for computation of optical depths.
Contribution: A.Trojakova (Cz), 3 mm

Triggering of convection

Objective:

Improve the convective rainfall forecast of ALADIN, especially in mountainous areas. In summer, ALADIN often forecasts convective rainfall on days where none was observed.

Methods:

Test predictive value of INCA fields (ALADIN forecast+surface obs) for convection triggering, compare with radar and MSG data, and with ALADIN forecast
Contribution: F. Wimmer (At), T. Haiden (At), 4mm

Simulate the initial growth of convective towers in a more realistic way by modifying the entrainment parameterization (EP). The idea is to carry some 'memory' of the convective process from one time step to the next.
Contribution: M. Bellus (Sk), 2 mm (short stay in Vienna to start)

Prognostic cloud water + orographic precipitation

Objective:

Improve ALADIN forecasts of orographic precipitation. The model over forecasts rainfall amounts at windward slopes and on peaks and ridges, and under forecasts precipitation in valleys. There is also a tendency of the model to overestimate rainfall from low stratus (drizzle).

Methods:

Implement a simple microphysics scheme with auto conversion, accretion in ACPLUIE (with the compromise on the pseudo-fluxes, including the prognostic precipitating water and ice) or use ALARO 10 km prototype
Contribution: F. Wimmer (At), T.Haiden (At), 4mm.
Test the scheme on a number of orographic precipitation cases (both rainfall and snow) to determine whether it improves the mountain/valley biases
Contribution: C. Wittmann (At), 3mm.
Test the scheme on stratus cases. Determine whether the over forecasting of light rainfall from the stratus is reduced
Contribution: A.Kann (At), 1mm.

Evaluation of ALARO prototype

Objective:

To find the reason for time step dependence for precipitation amounts.

Methods:

Effect of iterations of microphysics will be tested on non-convective case, to avoid possible interactions between convective and microphysics schemes. It is believed that dependence on time step is the problem of accuracy of the time integration of microphysical scheme. Possibility to use a higher order scheme will be investigated.
Contribution: T.Kovačić (Hr), 4mm

Diagnostic tool DDH for AROME and ALARO.

Objective:

Introduction of new cloud prognostic species into DDH.

Methods:

Contribution: T.Kovačić (Hr), stay in Meteo-France

Stratus prediction

Objective:

Improve the ALADIN forecast of low stratus. A large improvement was already achieved with the Seidl-Kann scheme but a few open questions still need to be clarified.

Methods:

Test if a strongly reduced horizontal T diffusion (found important for a good stratus forecast in basins and valleys) can be used operationally

Contribution: A. Kann (At), 1mm.

Test if a modification in vertical diffusion (E. Bazile) has a beneficial effect on stratus

Contribution: A. Kann (At), H. Seidl (At), 2mm

Soil moisture sensitivity

Objective:

Reduce ALADIN T2m forecast errors related to soil moisture.

Methods:

Set up a scheme for modifying initial soil moisture from real history of precipitation

Contribution: H.Seidl (At), 2mm.

Model application and validation in the nowcasting range (INCA)

Remark:

This is not a physics topic per se but will provide a lot of information on model performance, relevant for ongoing and future physics developments.

Objective:

Detailed quantitative validation of ALADIN strengths and weaknesses with regard to very short range forecasts (up to +6h).

Methods:

Use the INCA analysis and nowcasting system to diagnose the three-dimensional spatial and temporal structure of ALADIN forecast errors

Contribution: C. Wittmann (At), T.Haiden (At), 4mm.

Testing new parameterization schemes

Objective:

Include recent improvements (e.g. from ALADIN/CZ operational model) into other local operational models.

Methods:

Implementation of the new cloudiness and radiation schemes into ALADIN/HR and testing them on a synoptic case marked by a strong temperature inversion in inland part of Croatia lasting for several days. Improvements are expected in the low cloudiness and the surface temperature (2m AGL) diurnal pattern.

Contribution: M.Tudor (Hr), V.Tutis (Hr), D. Drvar (Hr), I.Stiperski (Hr), 2mm

Test the modified subgrid-scale orography representation on ALADIN/HR for several cyclone and bora cases.

Contribution: M.Tudor (Hr), V.Tutis (Hr), D. Drvar (Hr), I.Stiperski (Hr), 2mm

Experiments with atmosphere-wave-ocean model

Objective:

Find an impact of ocean and wave model data on Aladin forecast.

Methods:

As a first step to coupled atmosphere-wave-ocean model, there will be an attempt to use data from the wave and ocean model as input to Aladin (roughness length, surface temperature) and see the impact.

Contribution: M.Tudor (Hr), I.Janekovic (Hr), 1mm

Publication

M. Tudor is planning to write a paper about the tests on numerical stability of a physics parameterization package in ALADIN.

Stays/Visits in 2005

The modeling group at ZAMG encourages people to come for short (or longer) visits on the following topics:

- Prognostic cloud water + orographic precipitation
- Deep convection
- LAM-EPS

Since January 2005, the modeling group at ZAMG has an additional office available to accommodate 1-2 visitors around the year.

Open topics:

Further evaluation of ALARO at gray zone resolutions - J.Cedilnik

Simulations of some extreme cases with ALADIN NH at 2.5 km with current physics parameterization - R.Brozkova

Equivalent ALADIN tests to the one of the ALARO prototype, to examine respective roles of ACPLUIE and ACCVIMP at different resolutions, interactions with dynamics, quality of the budget closure, ...

Vertical structure of the Dinaric Alps flow during the MAP IOP 15:

Measured flow structure (flight data) is planned to be compared with simulation from the ALADIN/HR hydrostatic mesoscale model run at the horizontal resolution of 8 km and the COAMPS nonhydrostatic model runs at the horizontal resolutions of 9 and 3 km.

Branka Ivancan-Picek, Stjepan Ivatek-Sahdan and Vanda Grubisic (Desert Research Institute, Reno, NV, USA)