

LACE Working Group for Physics

Research plan for the year 2008 proposal

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1 Introduction

In this document the topics for research and development in the field of physics for the year 2008 are presented. Many of them will continue also in 2009. The primary objective of this working plan stays the same as previous one, to improve the model performance at the so called grey-zone. In the current configuration ALARO-0 (including 3MT, February 2008) most of the schemes are now prepared for use at the present operational resolution (around 9 km of mesh-size). Interested centers can start with the implementation and evaluation. For running model at scales around 5 km of mesh-size further developments on various parameterizations are needed. Activities linked with ALARO-0 are coordinated also within ALADIN plan.

Some information about INCA nowcasting system where the proposal for the INTERREG project will be submitted are also included.

2 Research topics

When moving on higher resolutions many physical processes remain unresolved and need to be parametrized. Models still need a parametrized representation of deep/shallow convection, turbulence, microphysics, radiation and land surface processes. This year work on 3MT, turbulence and radiation scheme will continue, DDH can be also improved. Study on lake modeling in SURFEX is starting.

2.1 Parameterization schemes

The ALARO-0 is a well designed basis for further developments and tuning of the schemes inside. 3MT (Modular Multi-scale Microphysics and Transport) framework for moist processes enables studying various processes connected to convection, cloudiness and precipitation. Also other parameterizations (turbulent scheme, radiation) can be upgraded/improved for a step to higher resolutions. Cloudiness description should be revised and can profit from new prognostic water condensates.

Work is coordinated inside ALADIN project with other non-LACE countries (Be, Pt, ?).

3MT

Some weak points have been already noticed, there are too much high clouds (too much moisture at 200-300hPa), too weak wind strength below 600hPa, slightly too violent extreme precipitation amounts. Proposals for topics are:

- to check the condensation-evaporation of precipitation, we expect this is linked with observed to high pressure at the ground;
- to validate historic entrainment and the implementation of prognostic entrainment, which was not touched yet, can follow;
- to carefully examine the downdraft part;
- to study possible choices available in convective closure assumption (which is used to determine the area fraction of the updraft).

Before the usage of this scheme at scales around 5 km of mesh-size studies about resolution independence, life-cycle of convection clouds, triggering of convection have to be done.

Comment: The proposal for LACE project “Operational ALARO configuration at scales around 5km of mesh-size” should include all this topics.

Priority: high

Realization: LACE stay in Prague(?), local work

Estimated efforts: 5 person x month

Contributor: R. Brožková (Cz), D. Banciu (Ro), ??

Schedule: whole year

Microphysics

Study of various details of the statistical sedimentation scheme can continue. It is intended to re-assess currently unused combinations of formulations of individual components of the sedimentation process.

Priority: low

Realization: local work

Estimated efforts: 0.5 person x month

Contributor: M. Janoušek (Cz)

Schedule:

Turbulent scheme

Present turbulent scheme (pTKE) in ALARO-0 can be further extended to the full TKE formalism. Theoretical study how to compute TKE from TKE equation instead of using diagnosed one was done previous year (I. Bašták), also procedure how to compute BL89 mixing length is prepared (F. Váňa). Now both developments should be put together, validated and tested (new acronym: eTKE for emulated TKE). If everything go well improved scheme can be included into operational by the end of the year and scientific paper can be written.

There is also an interest from HIRLAM to cooperate on turbulence topic.

Priority: medium-high

Realization: local work, 4 weeks LACE stay in Prague (17 Mar – 18 Apr)

Estimated efforts: 5 person x month

Contributor: F. Váňa (Cz), I. Bašták (Sk)

Schedule: starting March

Radiation scheme

Modularization of radiation scheme (ACRANEB) has already started. This will allow to implement new modifications much easier. Next tasks are completing the work in the radiation scheme on transmission functions (see plan for 2006) and improvement in aerosol's optical properties.

Priority: high

Realization: local work,

Estimated efforts: 5 person x month

Contributor: T. Kral (Cz)
Schedule: whole year

Updating of cloudiness parameterizations.

Priority: medium

Realization:

Estimated efforts: 3 person x month

Contributor:

Schedule:

2.2 ALARO-0 evaluation

ALARO-0 without 3MT is already in the operational use in two services (Cz,At). The first stable model version (ALARO-0 with 3MT) is (almost) available for distribution in the February 2008 (cy32t1, cy32t3). The ALARO-0 developments (including 3MT) are going to be phased into cycle 33.

The aim of the evaluation is to show how good the model is, to find out how model is performing at various horizontal mesh-sizes, and to find remaining areas where an improved tuning or small modifications are needed. The outcome should be a proposed strategy for operational implementation (for example: a way of initialization of new prognostic variables (4 water condensates)).

Methods can be selected by each team according to their ability. Possibilities are:

- use of 1D model comparison,
- real-case studies (frontal, orographic precipitation, convection, fog, low cloudiness, strong wind events, etc.),
- long periods (parallel suites, precipitation comparison, etc.),
- to include results into common ALADIN verification application.

A comparison of precipitation with INCA analysis is planed. Iwona Lelatko from Poland is the new contact person for QPF-based score computations on ALADIN precipitation outputs. She has been discussing the scientific and technical issues with Eric Bazile during her stay in Toulouse (2007). The software is installed and adapted to local environment and she is ready to compute verification scores. Our task is to prepare INCA analysis and requested input files with model precipitation. Proposed periods are March 2007, June 2006 and July 2006.

Priority: medium-high

Realization: local work

Estimated efforts: 6 person x month

Proposed Contributors: local teams from At, Hr, Cz, Ro, Si, Sk

Schedule: whole year

2.3 Diagnostic tool DDH

DDH (Diagnostic par Domaines Horizontaux) diagnostic package is relevant for all models ARPEGE, ALADIN, ALARO and AROME.

Debugging and verification of DDH for AROME is in process and should be ready before AROME training (March).

The changes in the model physics routines has to be followed. If the order of calling routines is changed (for example microphysics computation) computation of DDH budgets has to be verified.

As DDH tool proved to be very useful more and more developers use it. Guide for users and developers is in preparation, ALARO part should be added.

Priority: high

Realization: 4 weeks stay in Toulouse (6 Jan-2 Feb), local work

Estimated efforts: 3 person x month

Contributor: T. Kovačić (Hr); supervisor J.-M. Piriou

Schedule: first half of the year

2.4 Lake modeling in SURFEX

The goal is to study the effect of large lakes in the AROME forecast. The prognostic lake model Flake has been recently implemented in SURFEX (Oct 2007).

Work has already started with collection of observation data and atmospheric conditions for the lake Balaton. Next step is validation of the scheme in the off-line version of SURFEX (1D test), after 1D and 3D validation using AROME and the in-line version of SURFEX will follow. Case studies will focus on the large shallow lake (Balaton) impact on the forecast, especially for convective and fog or low level cloud situations. With these studies lake scheme can be improved (one already known weakness is treatment of snow during winter).

Priority: medium

Realization: local work (PhD work), visit to Toulouse

Estimated efforts: 6 person x month

Contributor: M. Vörös (Hu)

Schedule: whole year

3 INCA

The nowcasting system INCA, developed in Austria, has become a useful tool and is now also used by other services (Cz, Sk, Si). Local nowcasting group is usually in charge for its local implementation, local NWP group is requested to prepare ALADIN input fields and can also help in developments.

A detailed proposal for the INTERREG project 'INCA Central Europe' (INCA-CE) is in preparation. The submission will be in March, the decision about the funding will come in July. Partners in the project are all LACE countries (except Romania) and Poland. If the project is funded (50% of 13 PersonYears), it will allow to develop INCA/ALADIN into a state-of-the-art

Central European nowcasting system. The INCA export version is available to partners and each partner contribute with developments depending on their interests and priorities. The end product should be an improved INCA that is run decentralized in each country and which can be put together into a large central/eastern European domain for applications on the internet.

Developments in this year will focus on precipitation nowcasting, where priority will be given to the convective cell development algorithm, and on improvements in the wind analysis. For more details see the project proposal.

4 Overview of activities depending on founding

At the moment only one longer research stay is arranged and few short ones (gather knowledge, discussion). LACE will support Miklós Vörös to attend Workshop on "Parameterization of Lakes in Numerical Weather Prediction and Climate Modelling" and one participant per country to participate AROME training.

List of stays:

Christoph Wittman – Prague – 4-6 Februar 2008 – 3MT

Neva Pristov – Prague – 4-6 Februar 2008 – 3MT

Ivan Bašták – Prague – 17 March – 18 April (4 weeks) – turbulent scheme

Miklós Vörös – Toulouse – 1 week – FLake

from ALADIN Flat-rate:

topics linked with ALARO-0 scientific maintenance

List of events:

- 2nd AROME Training Course, 4-7 March 2008, Lisbon, Portugal
- ALADIN – HIRLAM Workshop, 7-10 April 2008, Brussels, Belgium
- Workshop on "Parameterization of Lakes in Numerical Weather Prediction and Climate Modelling" 18-20 September 2008, Zelenogorsk
- PAN-GCSS meeting on "ADVANCES IN MODELING AND OBSERVING CLOUDS AND CONVECTION", Toulouse
- Seminar on Physical parametrization processes and their dynamical interactions, 1-4 September 2008, ECMWF
- EWGLAM and SRNWP Annual Meeting 2008, Spain