

# **LACE Working Group for Physics**

## **Research plan for the year 2007 proposal**

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## 1 Introduction

In this document the topics for research and development in the field of physics for the year 2007 are presented. The primary objective of this working plan is to improve the model performance at the so called grey-zone. Main attention is put to further developments on various parameterizations inside ALARO-0. The implementation and evaluation has already started after the first stable model version (ALARO-0 without 3MT) was available in begin of February 2007. Activities linked with ALARO-0 are coordinated also within ALADIN plan. Few other topics where coordination inside working group is not necessary are development of INCA nowcasting system and implementation of multiphasic reference equation system.

To enlarge the knowledge on ALARO-0 training course is going to be organized in March 2007 and documentation will be prepared.

## 2 Research topics

Under the present situation the traditional grouping in five project is modified. Treatment of PBL cloudiness and prognostic cloud water is now integral part of 3MT and are treated together. Proposed topics are gathered in few groups.

### 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, gravity wave drag scheme) can be upgraded/improved for a step to higher resolutions. Cloudiness description should be revised and can profit from from new prognostic water condensates.

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

Momentary basic topics without detailed description are listed:

3MT, addressing specific cloudiness problem

**Priority:** medium-high

**Realization:** 6 weeks LACE stay in Prague, local work

**Estimated efforts:** 2 person x month

**Contributor:** D. Banciu (Ro)

**Schedule:** autumn

To improve known weakness (to weak low level winds) of gravity wave drag parametrization by retuning some values inside scheme ( the drag coefficient, the overall multiplying constant) or with some modification inside scheme.

**Priority:** medium-high

**Realization:** local work

**Estimated efforts:** person x month

**Contributor:** T. Kral (Cz)

**Schedule:** 1<sup>st</sup> half of the year

To improve cloud representation in the upper part of the PBL studies how to link turbulent scheme and convection are needed.

**Priority:** medium-high

**Realization:** local work, 4 weeks LACE stay in Prague

**Estimated efforts:** ? person x month  
**Contributor:** I.Bastak (Sk) - newcomer  
**Schedule:** after April

Completing the work in the radiation scheme on transmission functions (see plan for 2006)

**Priority:** high  
**Realization:** local work, 4 weeks LACE stay in Prague  
**Estimated efforts:** ? person x month  
**Contributor:**  
**Schedule:**

Stability test of pTKE scheme (see plan for 2006).

**Priority:** high  
**Realization:** local work  
**Estimated efforts:** 1 person x month  
**Contributor:** M.Tudor (Hr)  
**Schedule:** 1<sup>st</sup> half of the year

*Updating of cloudiness parameterizations.*

**Priority:** high  
**Realization:** local work, 6 weeks stay in Prague (ALADIN Flat-rate inside LACE budget)  
**Estimated efforts:** 3 person x month  
**Contributor:** J.Rio (Pt)  
**Schedule:** March-May

## 2.2 ALARO-0 evaluation

The first stable model version (ALARO-0 without 3MT, in cycle 29T2) was available for distribution in begin of February. The ALARO-0 developments (including 3MT) are going to be phased into cycle 32 till the end of February, export version cy32T1 will be generated shortly afterwards. Some services have already implemented ALARO-0 into cy29, some will wait for cy32.

The aim of this tests 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.

**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

Full English documentation for DDH (Diagnostic par Domaines Horizontaux) diagnostic package is needed. This will be relevant for all models ARPEGE, ALADIN and AROME.

The current status of AROME DDH in CY32 is that AROME DDH works in "variables only" mode, but crashes in "variables and full budget of prognostic variables" mode in CPCUDDH. To solve this problem the code code in "variables and full budget of prognostic variables" mode has to be debugged and the full budget has to be validated (i.e. check that the residuals of all variables budgets are small).

**Priority:** medium-high

**Realization:** 6 weeks LACE stay in Toulouse, local work

**Estimated efforts:** 3 person x month

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

**Schedule:** February-April

## 2.4 Multiphasic reference equation system

A revised multiphasic reference equations system (Malardel et al., 2005, Catry et al., 2006) is going to be implement in the code. Afterwards, an evaluation of its overall impact and testing in several contexts of numerical weather prediction will follow. In a second stage, the impact of the classical hypotheses, which were adopted for this re-examination of the reference equations (as e.g. the hypothesis of thermodynamic equilibrium of the water phases) can be studied at various meteorological scales in order to clarify the effect of these approximations in several meteorological contexts. This second stage of the work is related to AROME, the supervisors are Sylvie Malardel and Pierre Benard.

This is a short description of subject for PhD thesis, in 2007 implementation of equations into code is planed.

**Priority:** medium

**Realization:** local work (PhD work)

**Estimated efforts:** 4 person x month

**Contributor:** M. Vörös (Hu)

**Schedule:** whole year

## 2.5 INCA

The nowcasting system INCA, developed in Austria, has become a useful tool and is now also used by other groups (e.g. INCA-SK, INCA-CH). Besides operational use for nowcasting INCA analyses can be used for verification and as benchmark for model improvements (ALADIN/ALARO/AROME). INCA convection nowcasting results can be used as a feedback for model convection treatment. Although this is not a pure physics topic developments are mentioned here and the parts linked with physics are booked for.

INCA is operational but it is also still very much under development and co-operations (both operational and in research) with interested groups is possible.

With regard to methods and algorithms, the main developments will be:

- Improve the temperature analysis in inversion cases (already partially completed)
- Improve the wind analysis, taking into account topographic an-istropy.
- Improve the wind nowcasting by moving from statistical extrapolation to dynamic trend extrapolation based on analysed pressure trends.
- Improve the nowcasting of precipitation. The fixed weights for the merge of the nowcast with the ALADIN forecast should be replaced by adaptive weights responding to the most recent (last hours) forecast error of the ALADIN model.
- Implement an estimation of icing potential on structures (COST 727).
- Make INCA fully portable (already partially completed)

There are plans, to port the system to the Slovenian Weather Service.

**Priority:** high

**Realization:** local work

**Estimated efforts:** 6 person x month

**Contributors:** Austrian team

**Schedule:** whole year

### 3 ALARO-0 training

To learn and spread information about latest developments in ALARO-0 the training course is going to be organized. It is scheduled from 26 March till 30 March 2007 in Radostovice, Czech Republic. Local organizer is CHMI, the program is coordinated by ALADIN program manager and assisted by physics WGL of LACE. Programme is divided in three parts: lectures, practical work and working groups. Responsible persons were nominated for the preparation of documentation on various topics to be presented during the working group sessions. The same persons will continue to follow scientific progress in their fields.

**Priority:** high

**Realization:** local work, participating to training

**Estimated efforts:** 7 person x month,

**Contributors:** D. Banciu (Ro), R. Brožkova (Cz), J. Cedilnik (Si), M. Janoušek (Cz), J. Mašek (Sk), N. Pristov (Si), M. Tudor (Hr), F. Vana (Cz), C. Wittmann (At)

**Schedule:** February-March

*Participants: S. Leroch (At), D. Klarić(Hr), T. Kovačić(Hr), A. Stanešič (Hr), M. Voros (Hu), R. Habrovsky (Sk), E. Larrieu Rosina (Sk), B. Strajnar (Si)*

### 4 Overview of activities depending on founding

Research stays for all together 5 months are planed. LACE will also support Mark Žagar to attend Workshop on Cloud covered Boundary Layer and one participant per country to participate ALARO-0 training.

List of stays:

Tomislav Kovačić – Toulouse – 6 weeks – DDH

Doina Banciu – Prague – 6 weeks – 3MT

Ivan Bastak – Prague – 4 weeks – turbulent scheme

4 weeks are reserved for a work on transmission function in the radiation scheme

from ALADIN Flat-rate

Joao Rio – Prague – 6 weeks – cloudiness

List of events:

[Joint NetFAM / COST-722 Workshop on Cloud-covered Boundary Layer](#) 12-14 March 2007, Toulouse, France

ALARO-0 Training course, 26-30 March 2007, Radostovice, CZ

[HIRLAM ALADIN Workshop](#), 23-27 April 2007, Oslo, Norway

4th European Conference on Severe Storms (ECSS 2007), 10-14 September 2007, Trieste, Italy:

EWGLAM and SRNWP Annual Meeting 2007, Croatia