

Proposed roadmap for the implementation of the externalized surface module in operations

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1. Introduction

This paper results from several internal discussions at Météo-France, and is expected to launch enlarged ones, within the ALADIN partnership. There are still many question marks. So, comments and proposals are welcome, as well as commitments for help (especially as concerns validation).

The proposal aims at preparing the so-called "jump to ALARO", as discussed along the AAA meeting (Prague, February 2004), even if it may include only technical changes for the surface. The timetable is very tight : everything should be ready for the first semester of 2006.

The framework is :

- models and scales : operational and climate ones, ARPEGE and ALADIN/ALARO,
- configurations : all,
- "atmospheric" physics : the present ones and short-term changes (in 2005),
- as few changes as possible to the operational backgrounds,
- simultaneous jump for all operational suites.

The parallel work for the AROME prototype is not described here, since its timetable and technical constraints are very different. Work has already started, there is something working, and the target for an operational implementation is two years beyond. However this proposal aims at preserving the present solution and potential evolutions for AROME, as well as the other applications using the "externalized surface module" (SURFEX in short).

2. Work plan for 2005

Four main actions may be identified. The first two can (and did) start independently. The third one shall consider the preliminary analysis for the coupling between atmospheric and surface physics, and won't start before March 2005.

The required validation effort is mentioned in (a) for pure SURFEX issues, and in (c) for mixed ARPEGE/ALADIN+SURFEX configurations. For this task, help from all ALADIN teams will be necessary.

a. Adding new options in SURFEX

Coordinator : Eric Martin, GMME

Actions :

Introducing new grids : ARPEGE , ALADIN "tilted rotated Mercator"

Introducing new I/Os (FA/LFI first)

On-demand time-update of physiographic fields

Reading physiographic fields (already on the model grid) in an external file (e.g. clim file) as an alternative to using ECOCLIMAP data and recomputing fields for each run

Adding the snow scheme operational in Toulouse (work started in November)

Adding the description of air-sea exchanges operational in Prague

Improving portability if required

Management of orographic fields.

Validations

Any other problem not yet identified ...

"Working team" :

Patrick Le Moigne (GMME)
Jean-Daniel Gril (GMAP)
Michel Pottier (DSI)
Andrey Bogatchev (stay in Toulouse)
Martin Bellus (stay in Toulouse and deported work)

"Side work / team" :

Dominique Giard (GMAP) : Update of 923

"Advisory committee" :

? (DSI/OP)
Stéphane Martinez (COMPAS/GCO)
Jean-Marc Audoin (GMAP)
Maria Derkova (ALADIN-2)

Required effort :

7 persons × month ?

b. Implicit coupling with atmospheric physics in ARPEGE/ALARO10

Coordinator : Pascal Marquet, GMGEC

Actions :

Analysis step, identifying the required developments (Pascal Marquet)
→ first work plan expected for end February, 2005

Coding and validations, in 1d then 3d frameworks, introduction in the most recent cycles (for NWP and Climate libraries), study of the interactions with the code modifications scheduled by Mats Hamrud, ... (more details in March !)

"Working team" :

Pascal Marquet (GMGEC)
Eric Martin, Patrick Le Moigne (GMME)
Jean-François Geleyn
Piet Termonia (short stay(s) in Toulouse and deported work)

"Advisory committee" :

François Bouyssel, code expert ?, Gwenaëlle Hello (GMAP)
Bart Catry ?

Required effort :

12 persons × month ?

c. Coupling SURFEX to the various ARPEGE/ALADIN configurations

Coordinator : Dominique Giard, GMAP

Actions and teams :

✓ Working group for the study of data flows and the definition of tasks.

"Working team" :

Ryad El Khatib, Jean-Marc Audoin, François Bouyssel, Françoise Taillefer, Dominique Giard (GMAP)
Eric Martin, Patrick Le Moigne (GMME)
Pascal Marquet (GMGEC)
Andrey Bogatchev

"Advisory committee" :

Valery Masson (GMME)
? (DSI/OP)
Stéphane Martinez (COMPAS/GCO)
Maria Derkova (ALADIN-2)

✓ Modifications in Full-Pos

"Working team" :

Ryad El Khatib (GMAP)
help from ALADIN partners (stay in Toulouse ?)

✓ Modifications for upper-air assimilation (3D-Var, 4D-Var, Diag-Pack, Var-Pack, ... , observation operators)

"Working team" :

Ludovic Auger, Patrick Moll (GMAP)

✓ Modifications for surface/soil assimilation (minimum modset, as a first step)

"Working team" :

Françoise Taillefer ?, François Bouyssel (GMAP)
Mohamed Jidane (stay in Toulouse)

✓ Validations : for all developments and all configurations, climate and NWP ones (forecast, data assimilation, coupling issues, post-processing, restart, ...)

"Working team" :

Pascal Marquet (GMGEC)
Ryad El Khatib, Jean-Marc Audoin, ?? (GMAP)
help from ALADIN teams, in Toulouse or deported

Required effort :

25 persons × month ?

As a first guess, the overall effort on these 3 issues is around 43 persons × months, distributed as :

DSI+DP : 1 ; GMAP : 14 ; GMME : 9 ; GMGEC : 6 ; **ALADIN non MF : 14**

d. Learning SURFEX

Further training actions are required to make the operational switch easier. They may be of various kinds :

- some more training stays in Toulouse, combined with research actions or some of the tasks listed here (as for Martin Bellus),
- a short intensive training for all partners, either during the ALADIN training course in Bucarest (November ?) or sooner if one manages to organize it (Bratislava, June ?),
- an improved documentation.

Code management issues must also be considered.

3. Work plan for 2006

a. Framework

This is to be considered as an input to the definition of the next research plan, to be further debated

and covering only part of the work dedicated to surface.

There should be less stress next year, due to :

- a looser timetable (once the operational jump achieved),
- the availability of a reference code everywhere,
- a better spread knowledge on SURFEX,
- an enhanced involvement from HIRLAM ?,
- external help ?

This will allow addressing longer-term developments.

b. Externalization of soil/surface assimilation ?

This looks like the logical next step, with 2 facets : "surface" analysis (for screen-level fields), and the initialization of soil/surface fields (soil temperature and moisture, SST, snow variables, ...) via the various available algorithms (standard O.I., dynamical O.I. alias simplified 2D-Var, off-line forcing, ...).

Here is a preliminary list of issues to be addressed in this framework :

- ✗ coupling to upper-air assimilation (3D & 4D-Var),
- ✗ link with Diag-Pack or Var-Pack,
- ✗ interaction with HIRLAM tools (e.g. for analyses of 2m fields and snow cover),
- ✗ management of advanced configurations (tiling, vertical discretization, new variables).

c. What else could be done ?

Here are just a few "technical" issues :

- further validations for the ECOCLIMAP database,
- introducing new I/Os if required,
- management/improvement of the switch between various SURFEX options : e.g. how to compute coupling files for a LAM suite using tiling and 4 layers in the soil from ARPEGE forecasts based on the simplest version ?