ALADIN – 2, organization and work plan :
Towards a more clear and consensual definition ?

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1. ALADIN-2: QUID ?

- Ensuring the continuity between the international ALADIN project and the French AROME project
- implementing operational NWP systems at scales around 2 km
  while
  maintaining operational skill in the range 7-10 km at best level
- for ALADIN partners :
  - a quicker march towards very high resolution
  - an enhanced decentralization
  - more exchanges with upstream research
- for the AROME project :
  - an international scope
  - more manpower, initiatives, and feedbacks
  - more care for operational issues
- keeping a consistent NWP chain
  - from IFS to AROME
  - thanks to the toolbox approach
- a "smooth" operational transition to AROME,
  - according to individual means,
  - in 2 steps, with a continuous improvement in-between.

2. From ALADIN to ALADIN- 2, which changes ?

- 1991 – 2003 : ALADIN(-1)

First acronym(s) :
- Aire Limitée Adaptation dynamique Développement International, or
- Aire Limitée Assimilation de données Développement International

Aim :
- ✓ building and putting in operations the *ALADIN* model
- ✓ towards an efficient international networking

Method :
- ✓ thematic axes of research :
  - going towards smaller scales for each scientific topic (downscaling)

- 2004 – 2014 : ALADIN- 2

New acronym :
- AROME Limited Area Decentralized International Network

Aim :

✓ building the "*ALARO"* library from the *ALADIN* one, so as to keep full benefit from developments at all scales (especially AROME ones) and by all partners

✓ putting AROME or (temporarily ?) another declination of *ALARO* in operations

New method :

✓ downscaling is replaced by an upscaling

✓ axes of research by scale range, with **3** domains identified :

7-30 km *(present operational horizontal resolutions)*
4 - 7 km *(so-called grey zone)*
2 - 3 km *(AROME target, resolved convection)*

for physics mainly !

✓ transversal actions :

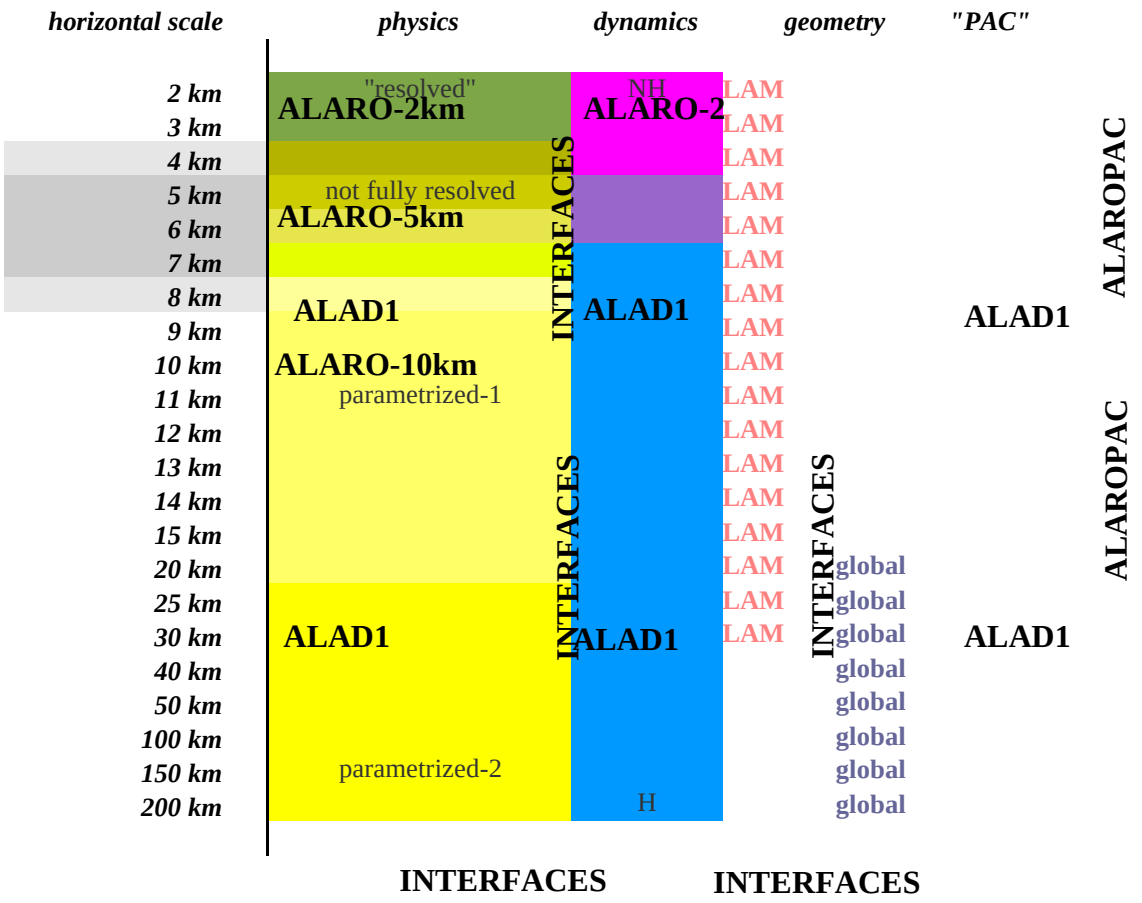
for coupling, data assimilation and predictability *(no grey zone)*
toolbox concept & maintenance /optimization *(to ensure a smooth convergence)*
validation (*to ensure operations do benefit from research at small scales)*

3. 5 SUB-PROJECTS

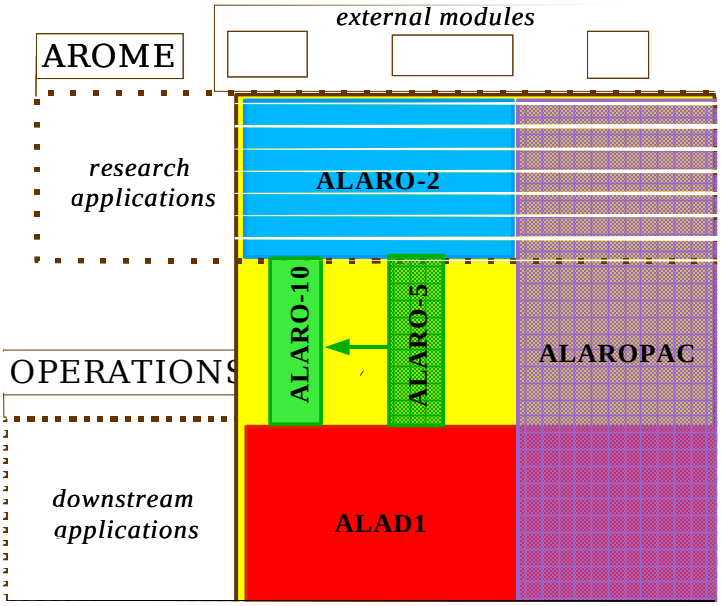
- Names may be changed if not convenient ! *(this is only the third "official" attempt)*
- **ALAD1** ➔ ***operations***
  update / improvement of operational suites
  maintenance
  verification, case studies
- **ALARO–2** (km)➔ ***very high resolution (forecast)***
  contribution of ALADIN-2 to the AROME project (model)
  improvement of (ALADIN) NH dynamics
  adaptation and refinement of (Meso-NH) physics
  a clean physics-dynamics interface in-between
- **ALAROPAC** ➔ ***Predictability, Assimilation, Coupling***
  most assimilation and predictability issues
  coupling problems for forecast and assimilation
  no identified "grey zone" for such topics
  downscaling rather than upscaling here
  AROME scales included
- **INTERFACES** ➔ ***Toolbox design***
  to allow a flexible use of ALARO via the "toolbox" approach
  to make exchanges between groups and models easier
  to allow testing and using various physical packages
  to face some efficiency and portability problems
- **ALARO–10** (km) ➔ ***Upscaling of developments in physics***
  to ensure that developments designed for smaller scales will improve forecast skill
  at the present operational scales at a reasonable cost
- **ALARO–5** (km) ➔ ***Grey zone problems (forecast)***
  specific problems in physics (convection, orography)
  improvement or development of a cheaper physical package
  specific coupling / dynamics problems

4. TRYING TO ILLUSTRATE THE PROJECT ORGANIZATION ...

Horizontal scales in NWP and relative positions of the sub-projects



Building ALADIN-2



3 big bricks :

ALAD1 : basis (*rooted in reality*)
ALARO- 2 km
ALAROPAC

2 pillars :

ALARO- 10 km : main
ALARO- 5 km : safety

cement : INTERFACES

The "toolbox" concept aims at being able to run operational NWP suites on a broad range of scales and with different assimilation methods, using a "single" source code (*IFS/ARPEGE/ALARO).* Strategy for physical parameterizations may be based on downscaling (e.g. from ARPEGE/Climat to ARPEGE/NWP), upscaling (ALARO-10) or both (ALARO-5).

5. WORK PLAN : DESIGN

- Valid till mid-2005
- Prepared in Jan.-Feb. 2004

  by D. Giard, G. Hello, J.F. Geleyn, C. Fischer
  according to available contributions
  following the partition in 5 sub-projects
  approved / refined during the AAA meeting (13/02/2004)
- First revision scheduled for the present workshop !

  status : according to available informations
  red : waiting magenta : stays scheduled blue : started green : completed
  only topics with priority 1 or 2 are presented,
  but significant effort was already devoted to issues with priority 3 !
  discussions during working groups and breaks expected
  so as to prepare an update and organize work

6. ALAD1

a. Update of the operational suites (all of them !)

Priority level : 1

a1. Update of the source code library to cycle 28T1

a2. First update of the operational namelists *(other problems addressed)*

Priority level : 2

a3. Update of the operational suites considering the outcome from research both in ALARO and in ARPEGE (both up- and down-scaling)

a4. First test : coordinated operational implementation of higher resolution databases for orography and surface

b. Changes in coupling files

Priority level : 1

b2. Enhanced compression of coupling files

b3. Implementation in ARPEGE of a monitoring of coupling files production (warning index)

Priority level : 2

b1. Evaluation of the impact of the change of cut-off times in ARPEGE

c. Verification

Priority level : 1

c1. Operational implementation of the “objective verification project”

Priority level : 2

c2. Definition and use of new verification methods

c4. Case studies, analysis of forecast failures or success

d. Source code maintenance

Priority level : 1

d1. Phasing : CY28T0 and CY28T1

d1. Phasing : CY29T1

d2. Update of ***gmkpack***
d4. Update of diagnostics for physics in ALADIN (DDH, physical tendencies in DM, model to satellite)

Priority level : 2

d3. Update and cleaning of configuration 923 (up to cycle 28T1), new diagnostic tools and scripts
d5. Documentation (pursuing the effort)

e. Finalization of the work on SLHD

Priority level : 1

Towards an operational implementation, as far as possible.

f. Improvement of the operational version of ARPEGE

Have a look at the poster !

7. ALARO- 2 km

a Dynamics

Priority level : 1

a1. Code maintenance , cleaning and optimization, validation aspects.

Priority level : 2

a2. Lower Boundary Condition
a3. Upper Boundary Condition : Radiative condition, adaptation to *d*4.

b Equations

Priority level : 1

b1. Definition of a consistent set of equations and hypotheses

Priority level : 2

b2. Thorough study of the time-discretization.

c Physics -1 : not requiring the AROME (3d) prototype

Priority level : 1

c1. Learning Meso-NH physics and performing inter-comparison experiments using the ALADIN and AROME 1d models.
c2. Introduction of the operational snow scheme in the AROME surface scheme

d Physics -2 : requiring the AROME prototype

Priority level : 1

d1. Stability and accuracy of AROME physics with long time-steps, control of the robustness of parameterizations

Priority level : 2

d5. Validation of clouds and precipitation using radar and satellite data at AROME resolutions
d7. Phasing with future evolutions of the Meso-NH physics (if any)
d8. Minimization of AROME development impacts on operational ALADIN applications. (if any)
d9. Evaluation of the AROME prototype in specific situations

e Plans for the French AROME team (model)

Priority level : 1

Building the AROME prototype
Validation on test cases
Going to longer time-steps.
Numerical optimization (interface)
Computer benchmarking
Improvements in physics

8. ALAROPAC

a. Data assimilation

a1. Algorithmic aspects

Priority level : 1

General maintenance (phasing and validation, evaluation of a new humidity variable)
Moving to 3d-FGAT
Evaluation of the CONGRAD minimizer

Priority level : 2

Implementation and evaluation of a variational quality control
Update and evaluation of the TL/AD models

a2. Cycling

Priority level : 2

Analysis-only : further work on 3d-var in ALADIN-HU, first version of 3d-var in ALADIN-France and ALADIN-Roumanie
Large scale update : DFI-blending, explicit spectral blending, Blendvar, in ALADIN-NORAF, variational control via the Jk cost-function

a3. Background error covariance description

Priority level : 1

Sampling : Ensemble versus NMC methods
Tunings, a posteriori diagnostics, Loennberg -Hollingsworth approach
Structure functions : bi-periodic increments, compactly supported correlations, isotropy and off-diagonal terms in B, multivariate humidity analysis, β-plane, wavelet basis, single-obs experiments

a4. Observations and observation operators

Priority level : 1

Radar (reflectivity)

Priority level : 2

ATOVS (AMSU-A, AMSU-B, HIRS, SSM/I(S)), MSG, AIRS, Screen-level data, Wind profiler data, AMDAR data, QUICKSCAT data

a5. Surface analysis

Priority level : 2

Improvements in the initialization of surface variables (data assimilation in ARPEGE or ALADIN, smoothing of the soil wetness index, introduction of soil wetness indices in Full-Pos, ...)

b. Predictability

Priority level : 2

b1. ALADIN-France EPS

b2. Ensemble Kalman filter at ZAMG
b3. ALADIN-Hungary LAMEPS project

c. Coupling

Priority level : 1

c1. Spectral coupling
c2. Transparent boundary conditions in a spectral model

Priority level : 2

c3. The never-ending story of the tendency-coupling for surface pressure (new domains, new options ?)
c4. Update and validation whenever new fields are introduced

9. INTERFACES

a. Physics-dynamics interface & time-step management

Priority level : 1

a1. New physics-dynamics interface
a2. Organisation of the time-step
a3. Definition of the set of required diagnostics for upper-air physics

b. Externalisation of the surface

Priority level : 1

b1. Further work on the externalization of surface for AROME
b2. Optimization for the lower-resolution configurations
b3. Definition of the required diagnostics

Priority level : 2

b4. Update of I/Os for surface fields : choice of the optimal configuration, coding and first tests

c. Assimilation

Priority level : 2

c1. “from Diag-Pack to Var-Pack”, or “do we need an O.I." ?

d. Efficiency and Portability (overlapping ALAD1)

Priority level : 1

d1. Further improvement of the xrd library and of the consistency of tools
d2. Management of the extension zone (avoiding calling physics there)

Priority level : 2

d3. Further externalizations : biperiodization, Full-Pos, ?
d4. New file structure

e. Validation tools

Priority level : 1

e1. Development or refinement of validation / verification tools using radar and satellite data, or new methods (e.g. probabilistic scoring of precipitation, improved use of regional observing networks).
e2. Development (or adaptation) of a set of diagnostics available to all physical packages (the wider

the better).

10.ALARO- 10 km

described in the next presentation on ALARO-10 prototype.

11.ALARO- 5 km

a. Deep convection

Priority level : 1

a1. Enter grey zone (more comparison experiments on 7 km, 4 km, and 2.5 km), maybe it is not as "bad" as anticipated)

a2. Prognostic scheme of Luc Gerard

a3. Study of the triggering and development stage of deep convection, using radar and satellite data.

Priority level : 2

a4. Interaction with the representation of orography (envelope versus mean, first tests)

b. Shallow convection and low cloudiness

Priority level : 1

b1. Convergence between Xu-Randall and Seidl-Kann schemes, 3d tunings.

b2. Experiments on inversion formation and sustenance (including 3d cycling experiments).

b3. Requirements for vertical diffusion and vertical resolution to simulate formation of sharp inversions.

c. Orographic drag and envelop

Priority level : 1

c1. Experiments with, and validation of, newly revised scheme without envelope

c2 Validation of wind forecasts at high mountain stations.

Priority level : 2

c3 Evaluation of the "quality" of orography description, new definition of the semi-envelope.

d. Prognostic cloud water

Priority level : 1

d1. Sensitivity studies on orographic precipitation cases.

d2. Interaction with other developments (Meso-NH micro-physics, "Functional Boxes", data assimilation, ...)