Current Status of ARPEGE/ALADIN Dynamics

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Current status ARPEGE/ALADIN

VERTICAL DISCRETIZATION

Change of vertical discretisation in opérational ARPEGE and Aladin-France

- L60 instead of L46 (highest level at 10 Pa instead of 1 hPa)
  - more levels near the tropopause
  - no change near the ground
- Vertical Finite element discretization
  - based on the cubic spline VFE of IFS
  - higher order accuracy (formally 8th instead of 2nd)
  - better vertical structure of normal modes (?)
  - get rid of the questionned Lorenz grid staggering

Current status ARPEGE/ALADIN

HORIZONTAL DISCRETIZATION

Change of truncation in ARPEGE

- T538 instead of T358
  maximum resolution from ~23 km to ~16 km

No corresponding change in Aladin France
Dx = 9.5 km (ratio ~1.5 and ~4 for AROME)
General benefits in scores
  test suit together with significant increase of observed (ASCAT) data and Jb (ensemble) definition, and other things

Went in operations in february 2008

Current status ARPEGE/ALADIN

ALADIN NH (AROME version)

No major change in the initial prototype geometry
(Dx=2.5 km, L41, Dt=60s, 600x600 points)

- Predictor/corrector (ICI) scheme not used (SI used)
  This is due to quite small time-steps and stable SI
- Horizontal diffusion significantly decreased
  HD gave too coherent and intense convective structures
- some changes in options explored (LGWADV, SLHD)
- Installation of diagnostic tool DDH for physics tendencies

Current status ARPEGE/ALADIN

ALADIN NH (AROME version)

- Routine test suit on France domain since june 2007.
  => large panel of situations
- Intensive evaluation periods in partnership with forecasters
  with some very good forecasts , but also quite bad ones.
- Some problems discovered "live"
  (generally too intense moderate and heavy RR)

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Ongoing research and investigations

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Research on VFE-NH

Two main paths are explored:

- with existing prognostic variables (P, d4).
  trying to find linearly stable schemes without fulfilling algebraic constraint (C1) on integral operators by modifying the solver and/or BCs of VFE operators
- With new set of prognostic variables (w, Φ)
  no longer integral operators, less algebraic constraints
  trying to find linearly stable scheme by modifying the final laplacian operator in order to get negative E.V. only.

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Research on SLHD

- diffusive while still second-order interpolators

- Definition of damping interpolator in a K-type turbulent form, in order to "simulate" 3D-turbulent behaviour.

- Progressive evaluation of impact in AROME

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Research on LBCs

- No big hope of a well-posed transparent formulation in near future. But is it really the main challenge ?

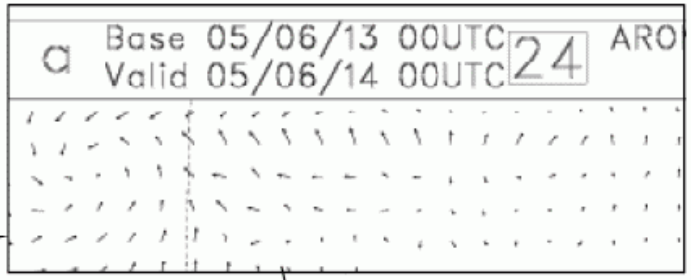
- Alternative ways to alleviate coupling problems to be applied still in Davies framework:

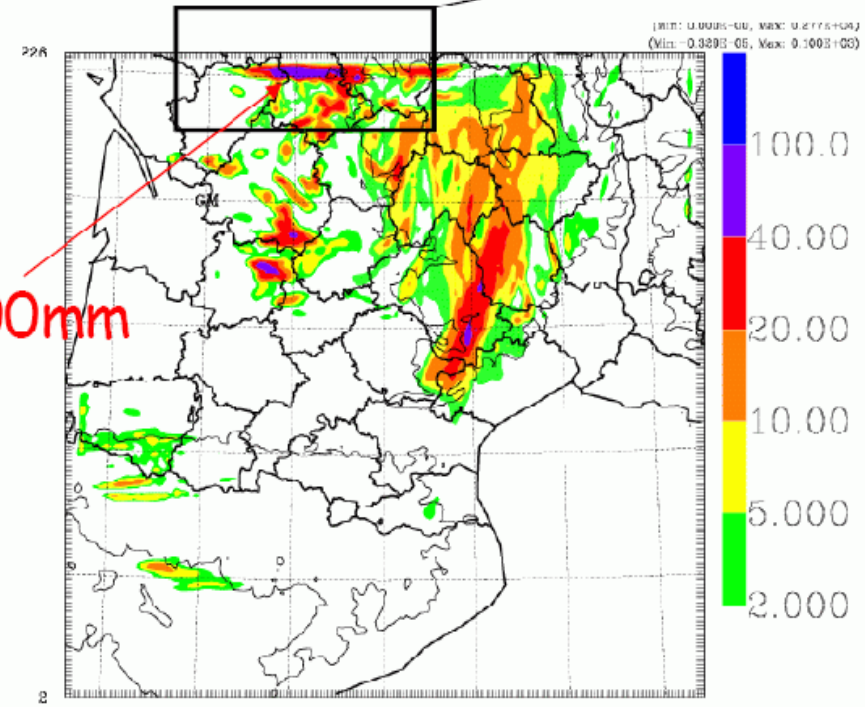
- "Window clipping" of LS field extension technique (Boyd) cleaner, more convergent than spline extrapolation.
- enlarging C-zone width
- relaxation of orography in C-zone

Problems in the coupling area : 13 June 2005

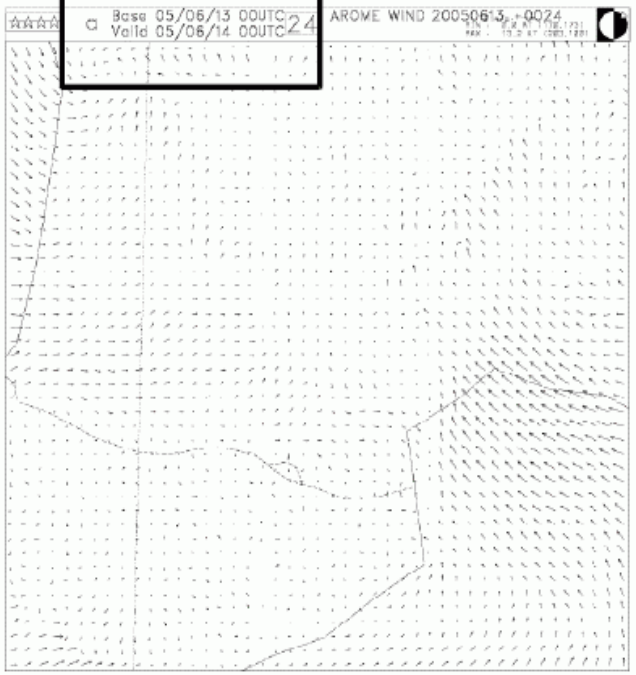
13 June 2005

21-24 TU cumulated rainfalls

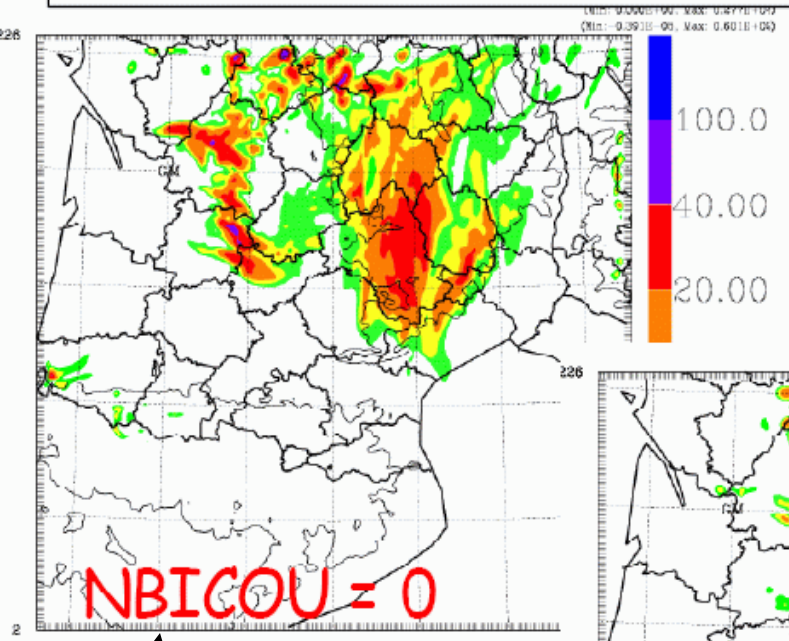




>100mm



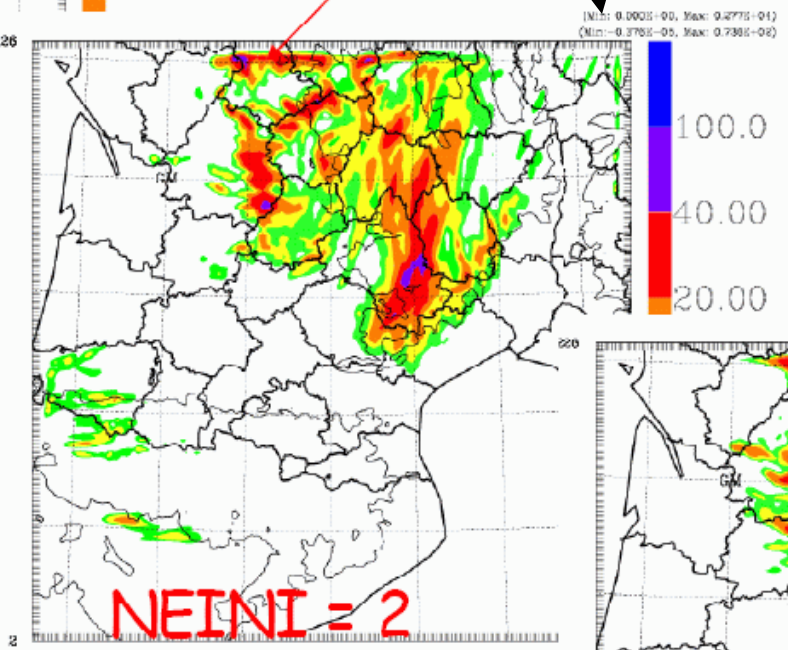
Problems in the coupling area : 13 June 2005



No cpl of wind

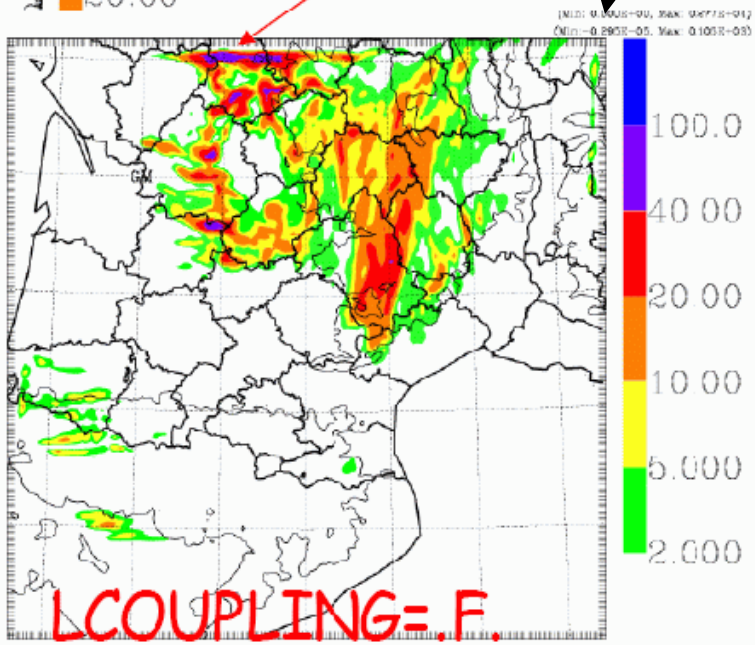
With DFI

< 50 mm



No cpl of GP vars

>100 mm



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Research/developments on other topics:

- Toward higher resolutions (500m in alpine region)

- more conservative SL interpolators (mass, 2 approaches)

- Scale-selective DFI (see Piet's talk)

- investigate sensitive HDiff

- Dynamics sources in DDH budgets

Current status ARPEGE/ALADIN

Question for longer term:
" Should we begin to build a Finite-Difference horizontal discretisation as an option ?"

- Inclusion of orographic terms in SI scheme
- Inclusion of map-factor in the SI scheme
- makes easier the problem of LBCs
- two-way nesting, ….

- But what about VFE-NH then ?

The question should be open now…
(since it's a big work)