Météo-France NWP developments and AROME

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- General NWP strategy
- ARPEGE/ALADIN MF progress & plans
- AROME progress & plans
- Cooperation strategy, seen from MF

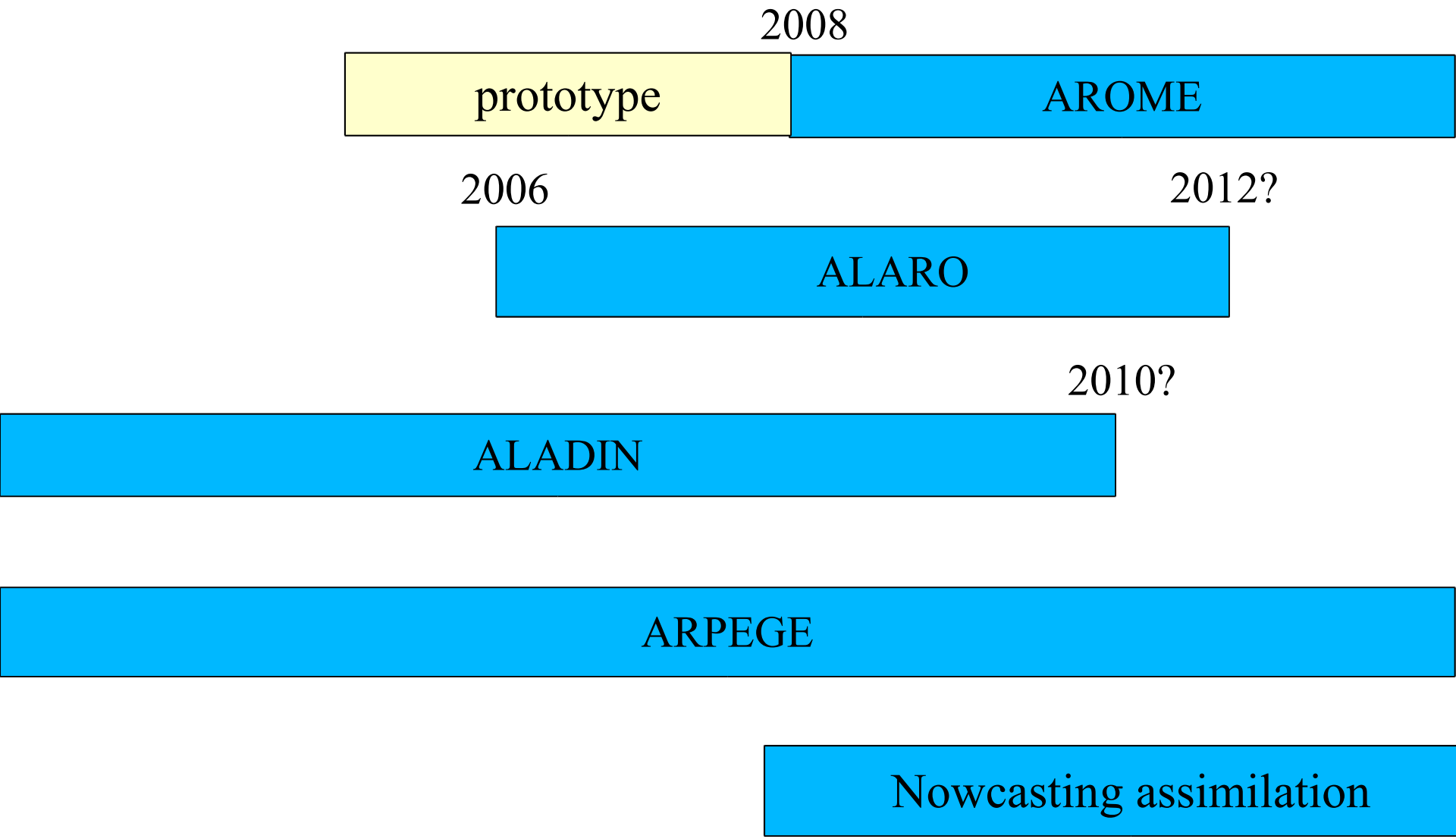
MF NWP strategy

- Cooperations (national and international) to bring together more **manpower & brainpower**
- increasing **competition** from ECMWF, WRF/MM5, etc.; increasing **demands from users** (non-traditional NWP products) and **labs** (need tools to work on modern scientific issues)
- **MF software will stay common with ECMWF:** helpful for computer optimization & satellite assimilation
- **MF will keep ARPEGE with its own physics & resolution = to optimize regional short-range NWP products beyond ECMWF.**
- **MF will keep a low-resolution regional system: ALADIN and its cooperation for software & scientific R&D around common reference cycles (the crux of our cooperation)**
- **MF will introduce a hi-res system: AROME** = ALADIN philosophy at dx=2km **but physics work restarted from MesoNH model**, and include non-NWP research cooperations (for better resources & more visible reputation)
- **MF welcomes HIRLAM cooperation:** similar, but with its own **'HIRLAM brand'**

MF global NWP strategy

- **ECMWF** keeps expanding its activities: better scores, shorter ranges, new products, higher resolutions: **15km in 2010 - less NWP for NMSs**
- **ARPEGE** : 17km on W Europe in 2008, faster & frequent delivery of products & LAM coupling files. **MF must keep improving ARPEGE with effort on physics & assimilation.**
- Emphasis on « **improving ARPEGE for LAMs** » (targeted EPS, assimilation for better short-range synoptics...)
- **'Arpegian ALADIN' i.e. the exact LAM version of ARPEGE will be kept & improved** : **renewed ARPEGE physics, higher vertical resolution, better assimilation, etc**
- **improve coupling** (new fields & higher resolutions)
- **partners may use ECMWF** as coupler but we work to keep ARPEGE competitive (timing, coupling software, physics consistency)

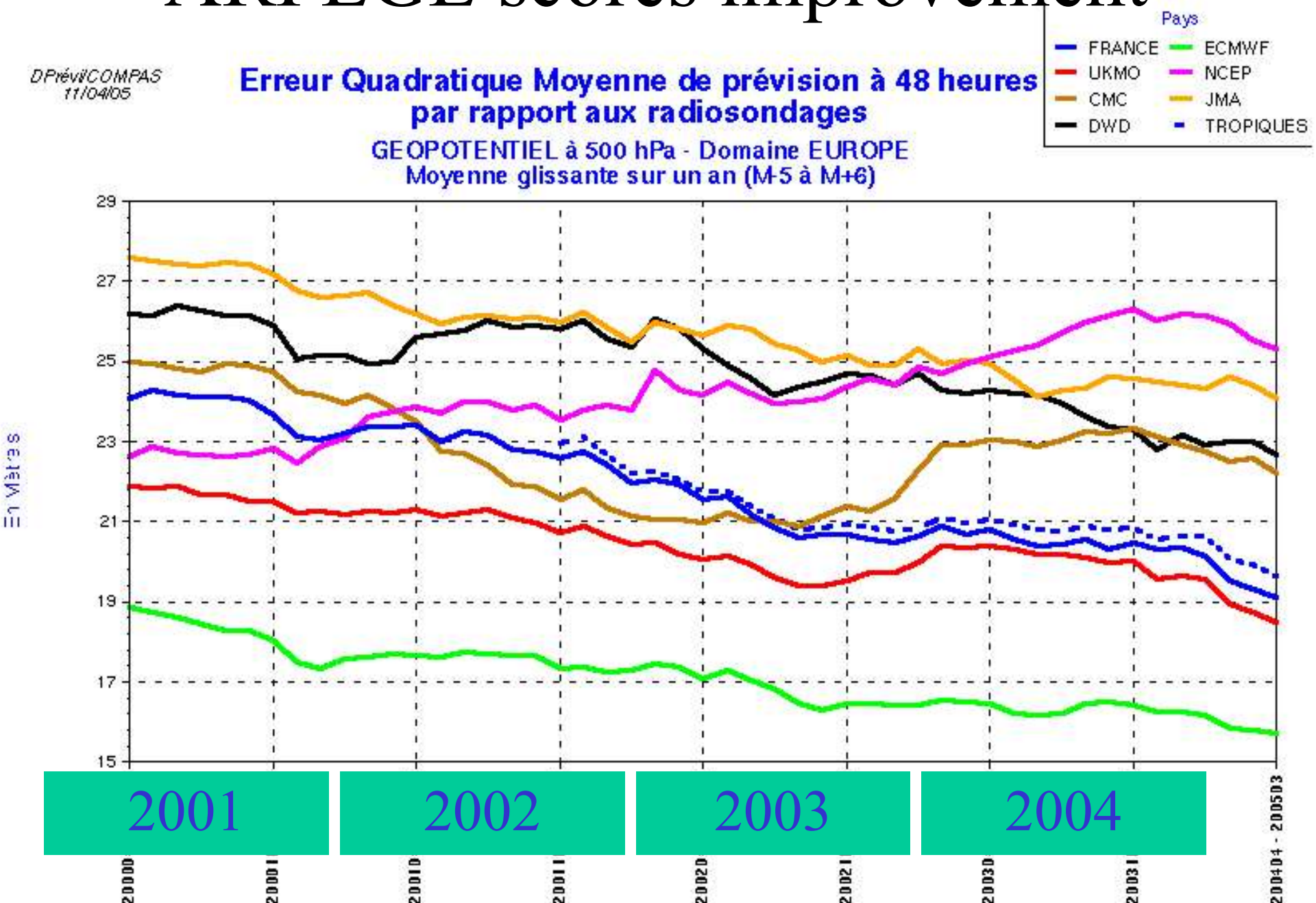
development schedule



ARPEGE/ALADIN MF progress (2004/2005)

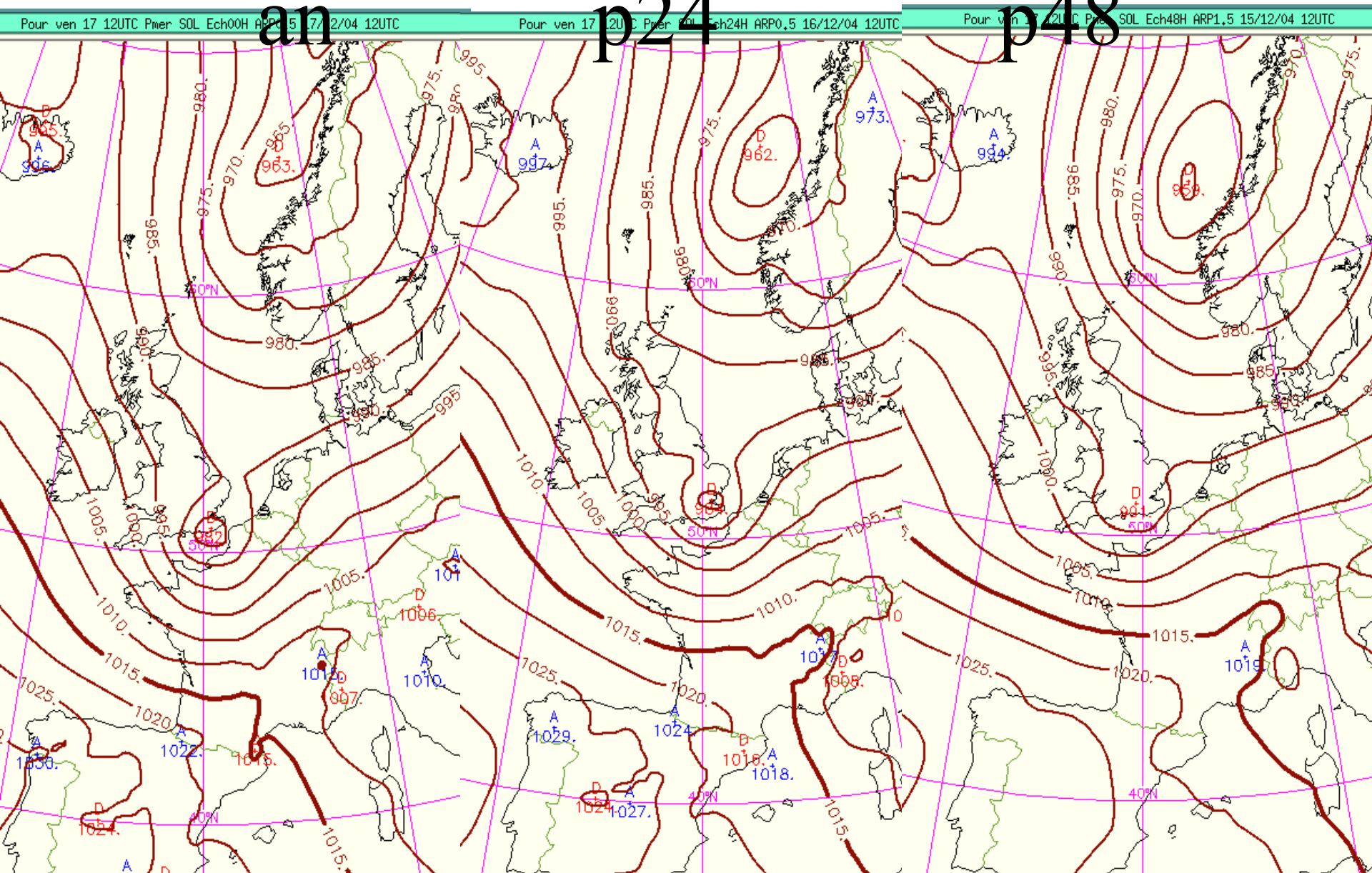
- **4DVar** algorithmic work (ensemble Jb, revised minimization, SST/ice analysis, revised soil analysis)
- **monotonous SL**, precip/cloud/soil inertia/turbulence **tunings**
- **FMR radiation** with revised ozone & aerosols
- **lots of new obs:** Quikscat, AMSU-B, Aqua AMSU-A, EARS, extra SYNOP, VarQC
- **very short cutoff** ARPEGE 00UTC (3D-Var FGAT)
- operational **ARPEGE ensemble prediction**
- preoperational 3DVar **ALADIN assimilation** with **Meteosat radiances and SYNOP T, HU**

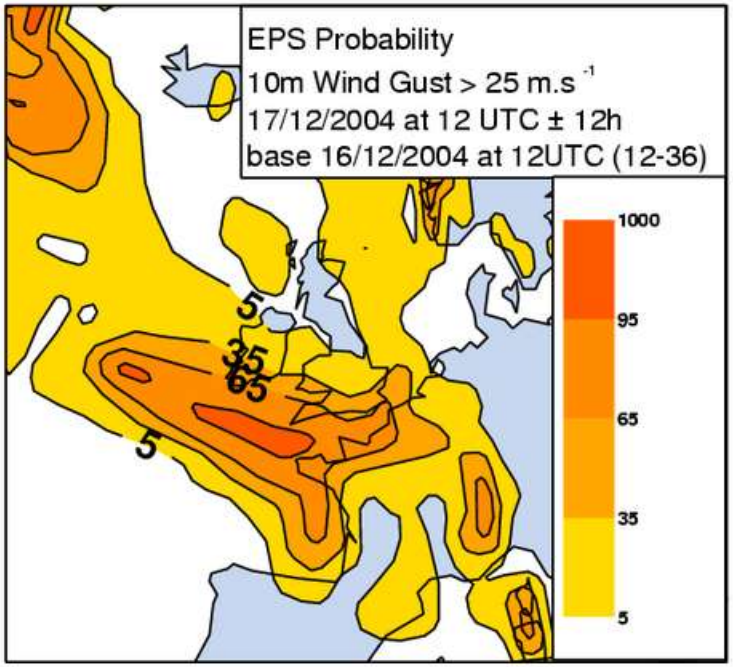
ARPEGE scores improvement



17 Dec 2004 storm ARPEGE forecast

an p24 p48




EPS Probability
10m Wind Gust > 25 m.s -1
17/12/2004 at 12 UTC ± 12h
base 16/12/2004 at 12UTC (12-36)
1000
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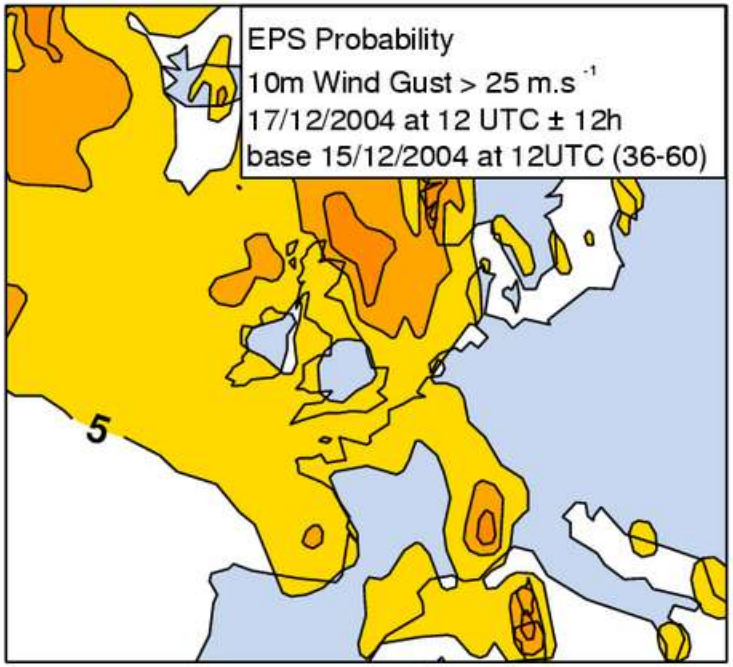
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17/12/2004 at 12 UTC ± 12h
base 15/12/2004 at 12UTC (36-60)
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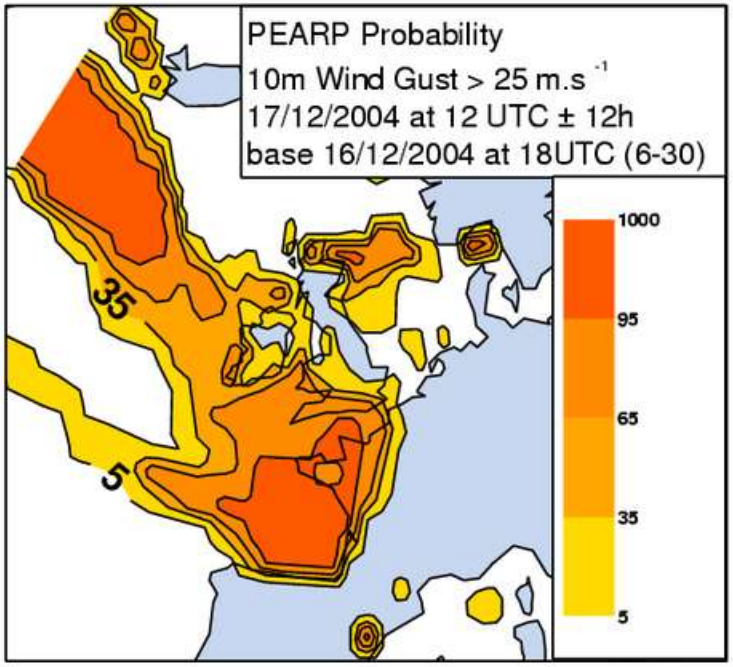
PEARP Probability
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base 16/12/2004 at 18UTC (6-30)
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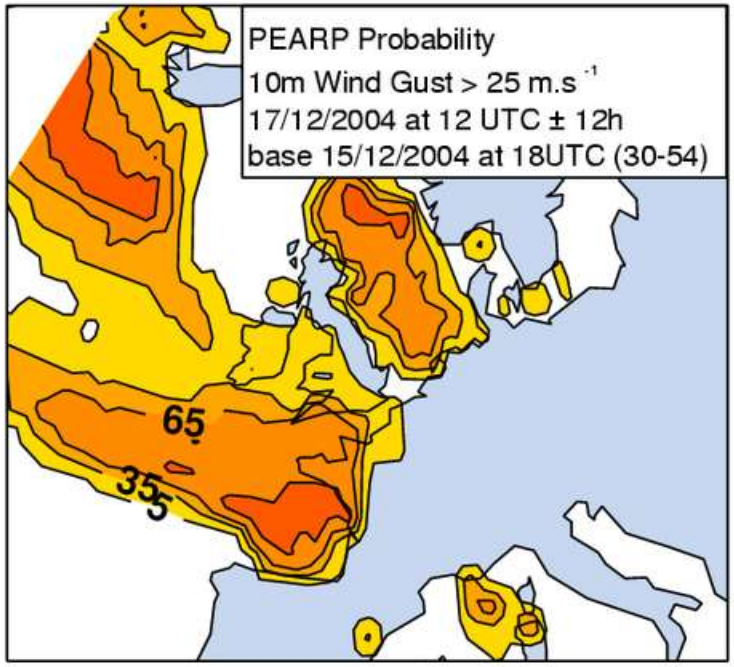
PEARP Probability
10m Wind Gust > 25 m.s -1
17/12/2004 at 12 UTC ± 12h
base 15/12/2004 at 18UTC (30-54)
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ARPEGE/ALADIN MF plans

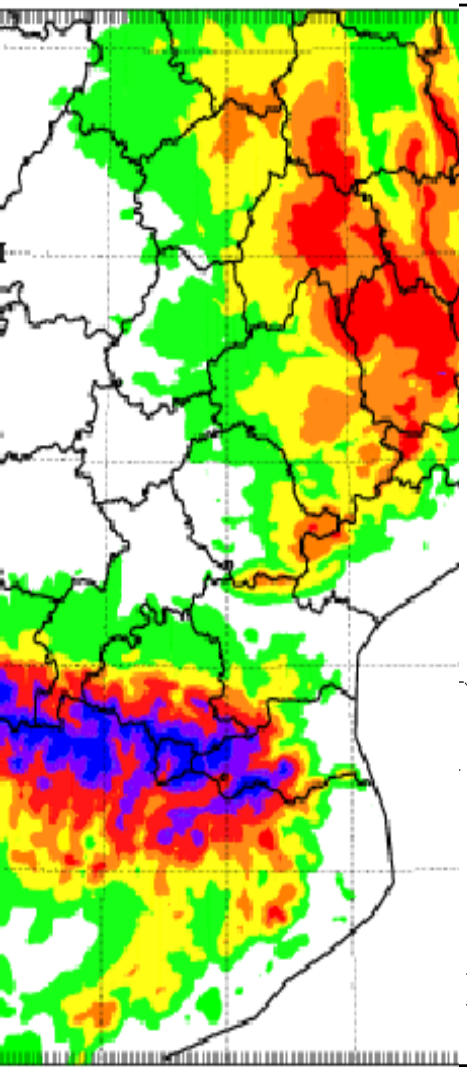
- improved SYNOP cloud cover postprocessing
- vertical stratospheric resolution **L46**
- **physics:** GWD+orography, IR RRTM, **modified Lopez prognostic microphysics**
- radiosonde bias correction, Modis SATOB winds
- AIRS, GOES bufr SATOB, Meteosat radiances in ARPEGE
- **ALADIN 3DVar:** FGAT, Jk, cloud bogus, **nowcasting 3DVar**
- higher **ARPEGE horizontal resolution** on next computer
- **prognostic TKE**, test **SURFEX**
- **migration to new computer in 2006**

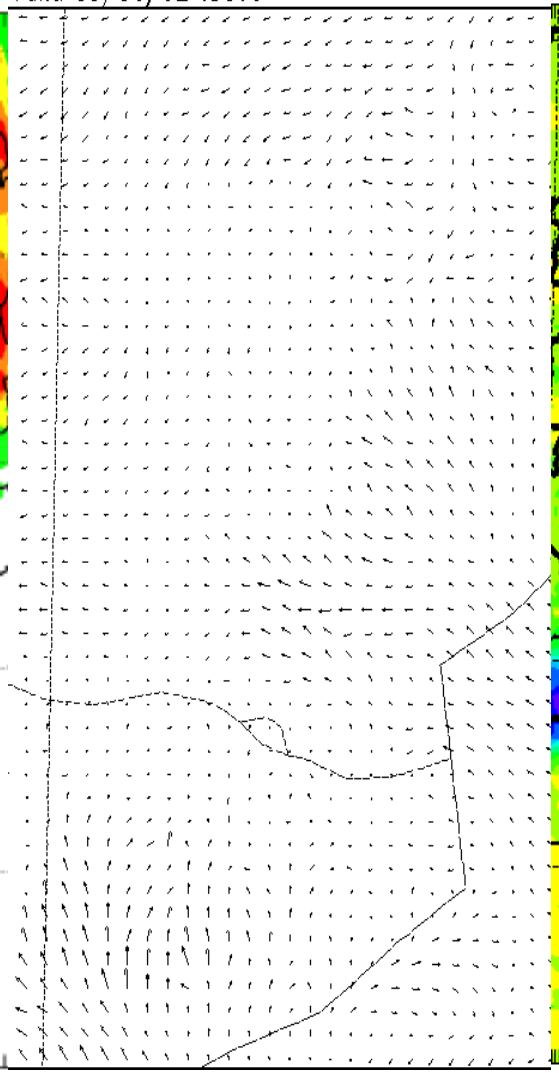
AROME status

- see G. Hello's talk and Newsletter articles for details
- **model quality** is ≥ ALADIN but still needs **a lot** of extra validation & scientific work for extra robustness & quality
- **technical aspects** well advanced: in common cycle, ported to VPP and IBM, efficient, relocatable, **but still missing a clean 923, 927, postprocessing and verification**
- **scientific aspects: all test cases look okay but need more validation. Many weather types not yet tested.**
- **baseline AROME assimilation = ALADIN 3DVar: nearly oper in Toulouse! (cf. C Fischer's talk)**
- **a test-version of the model is running every working day on SW France (500km domain).**

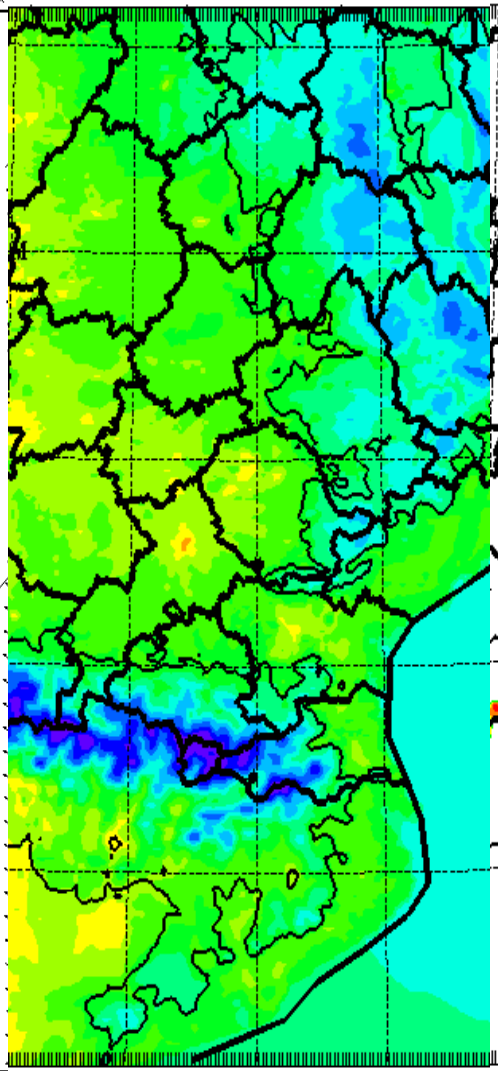
AROME routine forecast

orography

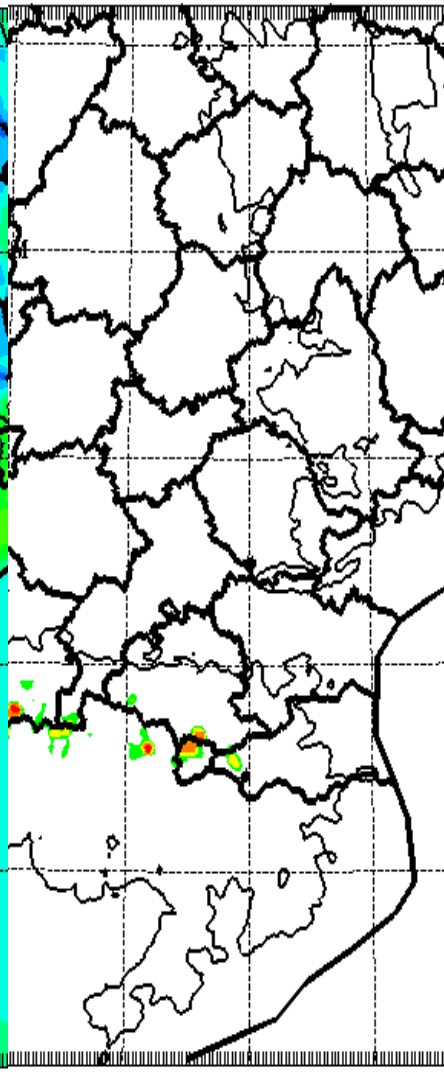




T2m



3h-rain



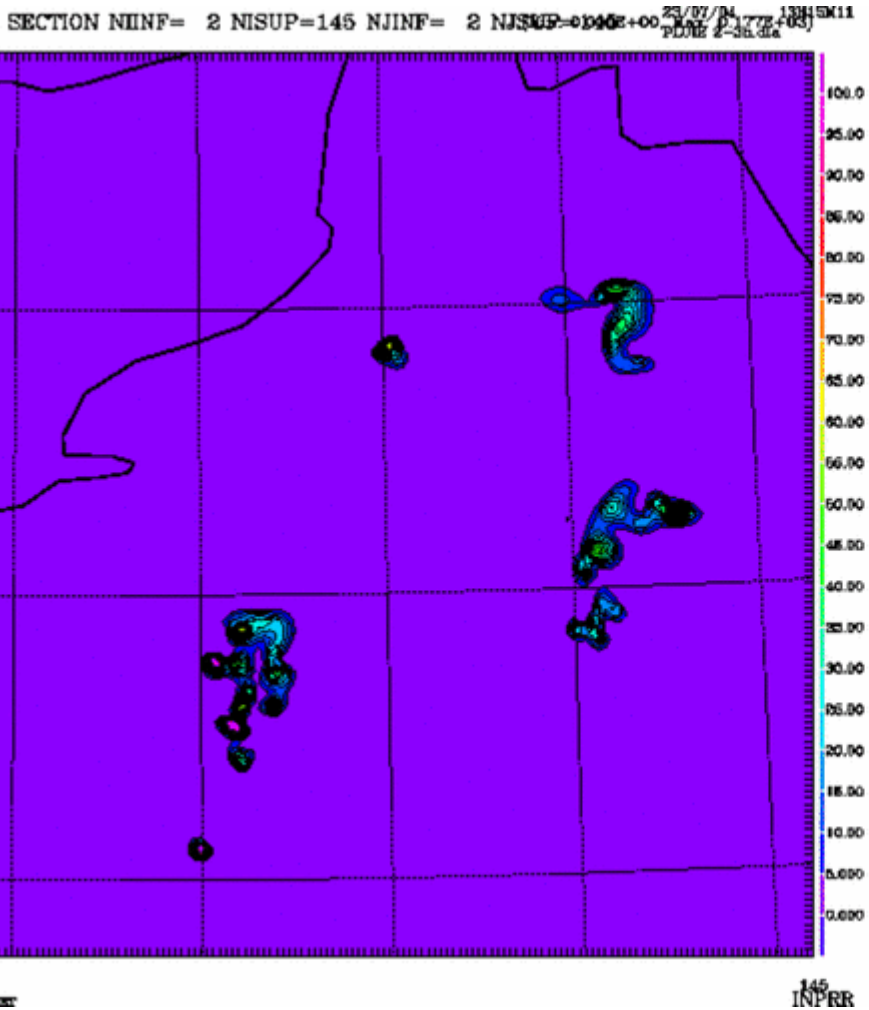
AROME plans

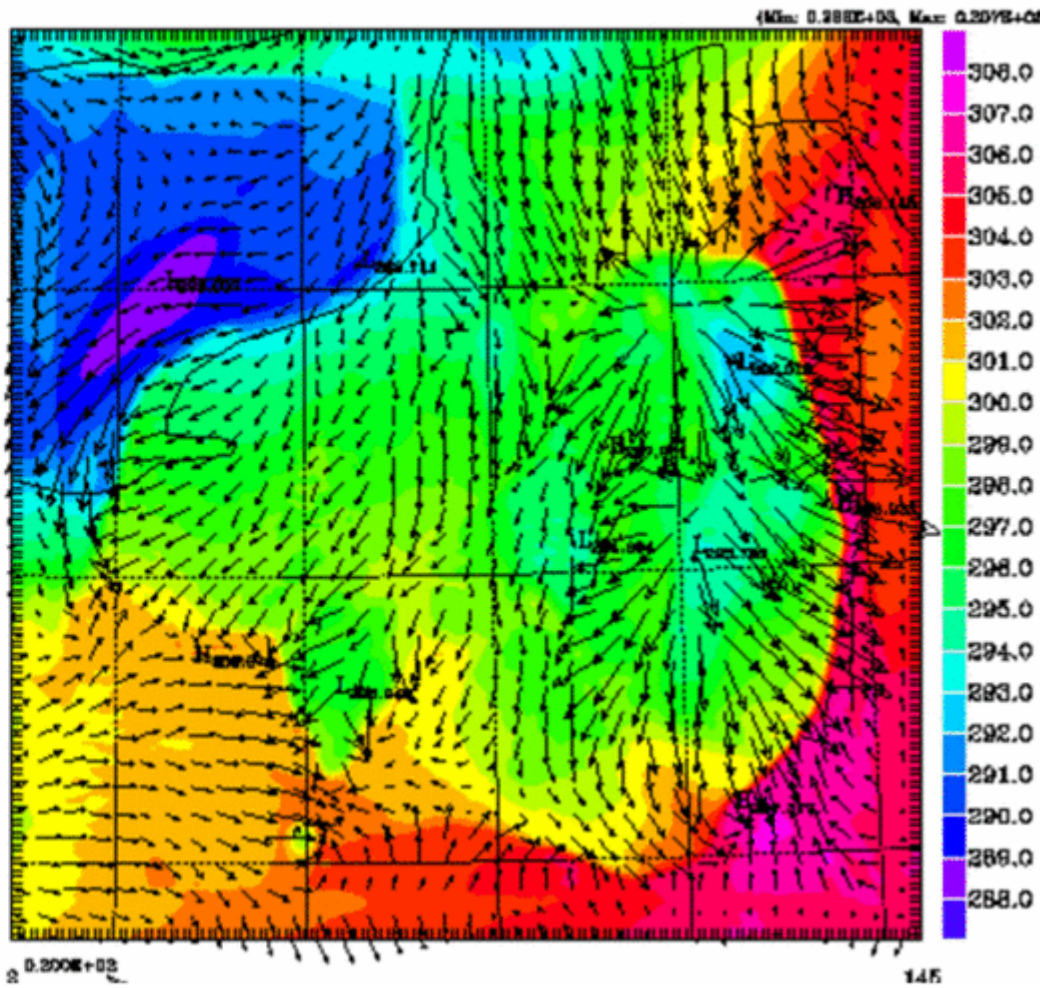
- finish operational-styled **technical cleanup for external users**
- **AROME training course** in Romania, Nov 2005 (G. Hello/D. Banciu)
- start **combined assimilation/forecast** 2.5km experiments
- assimilation: **cloud bogusing and radar** (precip & Doppler)
- start deeper scientific work on physics and numerics (more core GMAP involvement after summer 2005): **MésoNH physics no longer a 'black-box'**
- 2006: **migration to new supercomputer** and evaluate user products

Thunderstorms simulated by Arome, 2.5km resolution started from mesoscale analysis

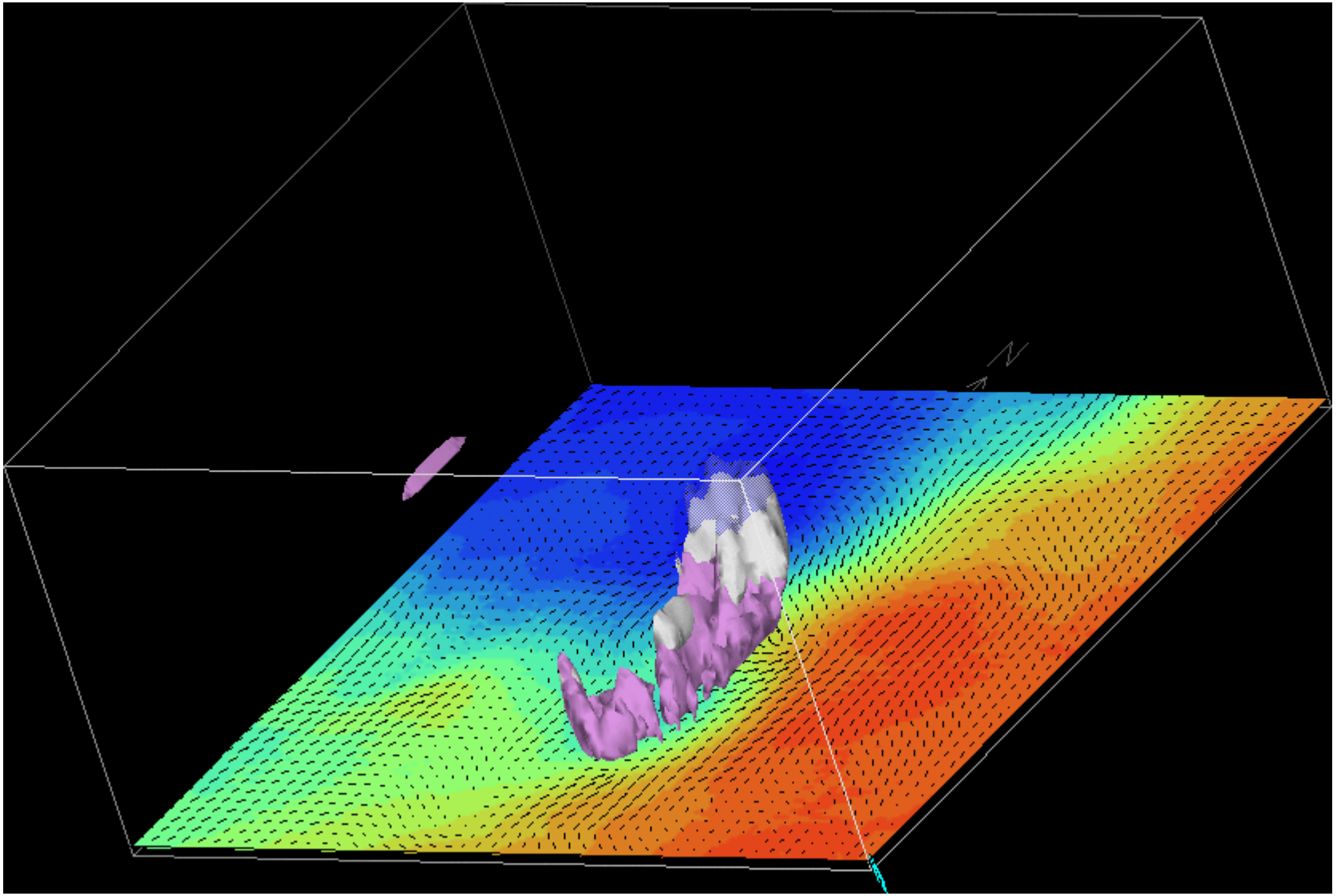
Rain rate

Low-level potential temperature and wind





Orages simulés par Arome



MF investment in ALARO

- Arpegian ALADIN and AROME will have **a large gap** in computer cost and scientific content (ARPEGE is strongly constrained by its global nature)
- this gap will stabilize since ARPEGE is improving
- **ALARO is not a new model**, it is a new framework to reduce the gap : **no competition** with Arpegian ALADIN, nor AROME
- main topics:
  - **non-Arpegian ALADIN physics** by revisiting AROME and ARPEGE components
  - a traditional ALADINesque emphasis on **algorithmics**
  - uniformisation of coding practices (**cf. Interfaces project**)
  - to deliver usable 'gap filling' packages around 2006 **(suggestion: simply call them 'ALADIN model' ?)**
  - to encourage cross-fertilization with other projects (ARPEGE, AROME, Méso-NH HIRLAM, etc) in a **non-destructive manner** (a Darwinian diversification/selection of options, not a wasteful competition !)

MF investment in INTERFACES and HIRLAM

- **Interfaces** is a long-term « meta-project » to rationalize physics/dynamics interfacing practices beyond the (rather short-sighted) AROME exercise
- Interfaces is close to ALARO, but is not limited to it (longer term, relevance to HIRLAM)
- Interfaces is organized as thematic **work streams** (equations, timestep organization, diagnostics, etc) and MF is investing in them

- **HIRLAM** cooperation (see CSSI for topics & working practices) for everyone's benefit

- **software management practices to be** clarified: should MF remain the 'phasing big brother' ?

software management

- **common cycles will remain a defining aspect of the ALADIN cooperation**
- AROME involves **synchronization of ALADIN vs MésoNH 'masdev' cycles**, performed internally at Météo-France
- to share the code with HIRLAM raises **serious practical questions:**
  - one or several 'phasing coordinators' ? (a big job now !)
  - one or several '**phasing centers**' ? (lots of office space & travelling)
  - how will HIRLAM contribute to the phasing manpower ? who ?
  - how to communicate with ECMWF ?
  - can we avoid the 'endless phasing syndrome' of increasignly complex cycles ?

MF cooperation issues

- **MFs top priorities are the achievement of AROME, or the preservation of the ALADIN consortium**
- **involving the research community** despite the implied overhead
- **openness to research users = an opportunity for partners** (money from EU, Eumetsat, ESA, etc)
- **large differences in computer & manpower resources** between ALADIN partners is a problem but **MF will keep helping**.

Food for thought...

what will be the purpose of national NWP teams in 2010 ?