ALADIN

A year of practical awareness

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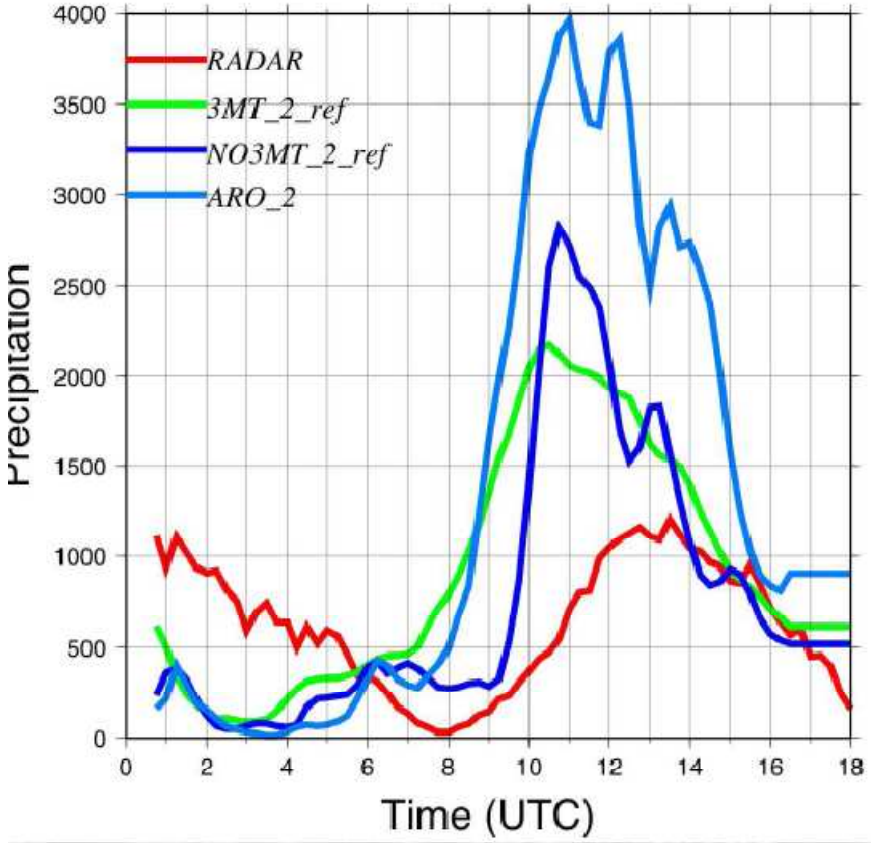
ALADIN 2008=>2009

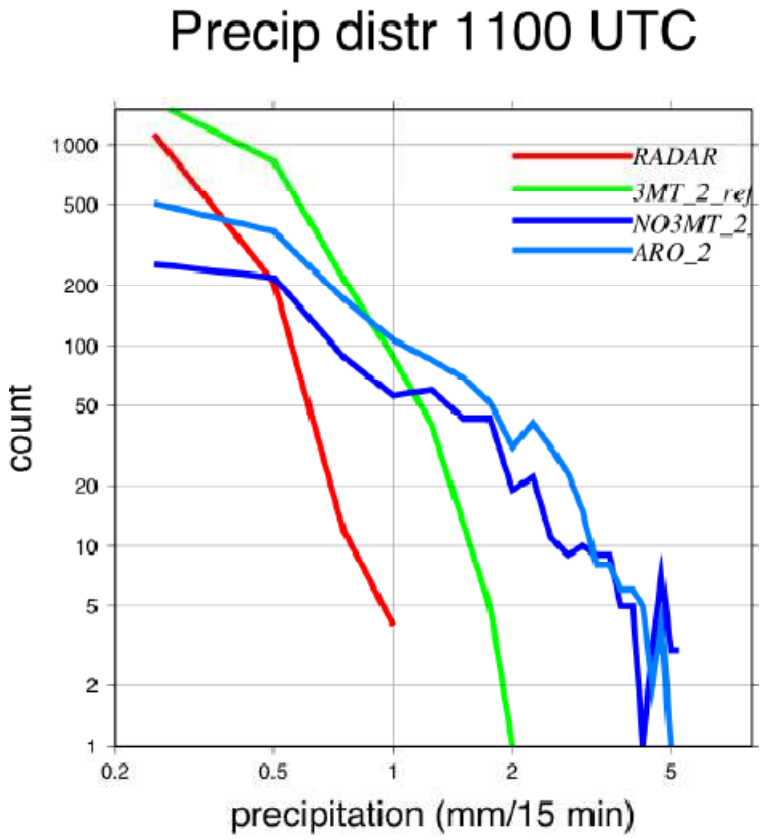
- HARMONIzation issues (on ‘system’ and on ‘physics’)
- AROME and ALARO-0 (with 3MT) reached operational status in 2008 => teething problems in 2009, as usual!
- But progress at Consortium level in LAM-EPS, TL/AD for 4D-Var, use of observations, ... [not shown here]
- Better awareness of problems in high-resolution phys-dyn interfacing, in nesting and initialisation strategies … but yet little concrete realisations.

Plans for a better synergie of maintenance practices in HARMONIE

- More HIRLAM involvment in the ARPEGE=>ALADIN anchoring step;
- Less ALADIN ‘official export versions’ but with more cooperation on the associated HIRLAM ‘QA effort’;
- Wider expertise in HIRLAM for core (IFS/ARPEGE) phasing actions;
- Coordination mechanism (meetings?) for the planning of contributions to the next cycles;
- Distinction to be made more clearly (in the HARMONIE world) between ‘preparatory’ and ‘pre-phasing’ code contributions.

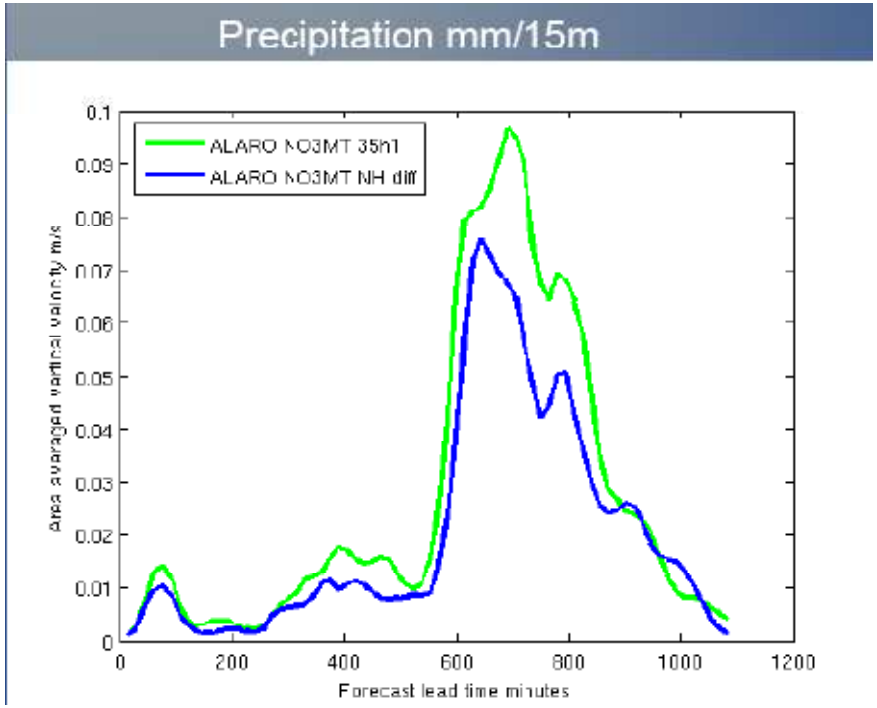
Diagnostic by HIRLAM of AROME and ALARO-0 weaknesses at high resolution (1/3)

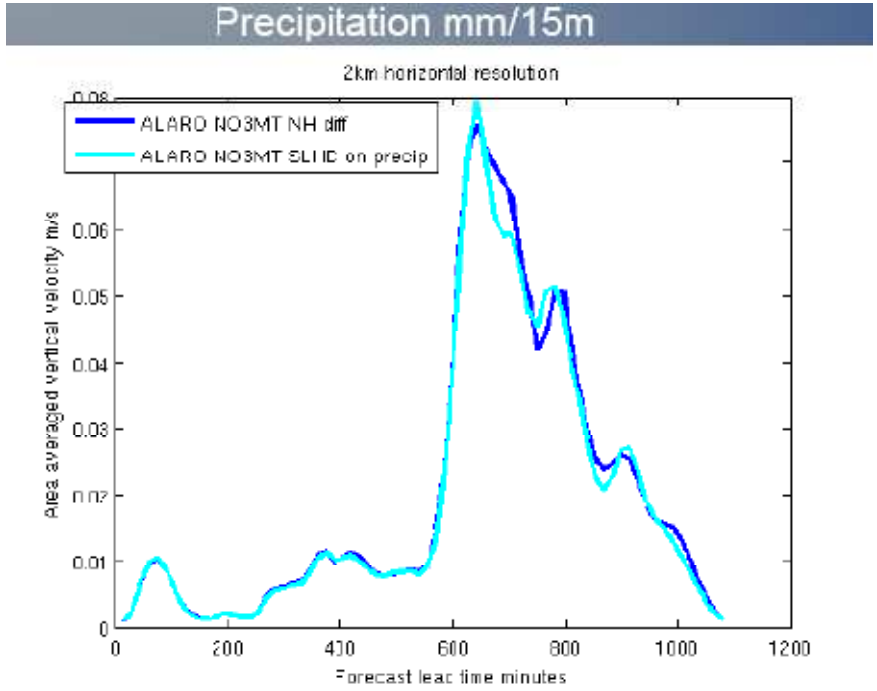




At 2km, excessive activity in both cases: too much heavy RR in AROME while worse timing in ALARO-0 without 3MT. Results with 3MT show some 'lack of convergence in ALARO-0' and the need of some 'parameterization' still at that scale.

Diagnostic by HIRLAM of AROME and ALARO-0 weaknesses at high resolution (2/3)



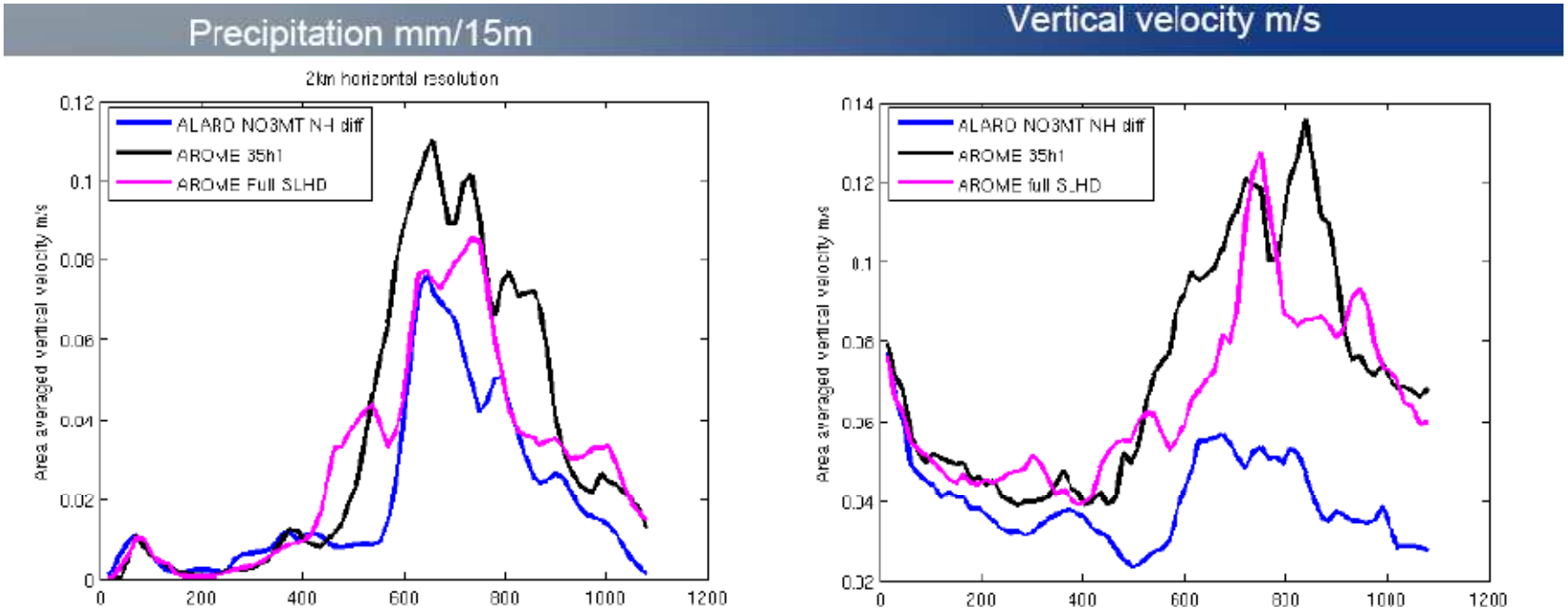


At 2km, ALARO-0 shows a bit of sensitivity when changing horizontal diffusion (for an AROME-type of set-up)

…

… within this, quasi zero sensitivity to the application of SLHD on falling hydrometeors (while this point is crucial in AROME)

Diagnostic by HIRLAM of AROME and ALARO-0 weaknesses at high resolution (3/3)



The quasi-inverse operation (full SLHD, still also on falling species) shows a bigger impact in AROME and some ‘closer match’ with ALARO-0 without 3MT for RR …

… while a strong difference remains for vertical velocities (which may explain the previous findings)

AROME-France progress and plans
1) production status in Sept 2009

- first AROME version was declared operational at Météo-France in Dec 2008
  - *four 30-h forecasts per day over France (600x512 grid, **2.5km resolution,** 41 levels)*
  - *3-hourly **3DVar assimilation** cycle including radar doppler radial winds, Meteosat radiances, synop T, Hu, wind*
  - ***NH model** with 5-species "ICE3" microphysics, 1D TKE scheme, "EDKF" shallow convection, ECMWF radiation*
  - *"SURFEX" surface model with tiles: soil/vegetation, sea, lake, town*
- other AROME models (often nicknamed "**HARMONIE**") are in preoperational evaluation at many ALADIN and HIRLAM centres *e.g. Finland, KNMI, Denmark, Norway, Sweden, Austria, Hungary, Spain*
- experimental **1-km L60 AROME** model ran in winter 2009 over French Alps
- for some docs, see:

www.cnrm.meteo.fr/arome/
www.cnrm.meteo.fr/gmap/
www.cnrm.meteo.fr/aladin/
www.hirlam.org
(journal articles in preparation, manuscripts available)

AROME-France progress and plans
2) Recent results

One year of operational evaluation:

- **objective scores** are a bit better than the older ALADIN-10km system
- **forecaster feedback** is positive, AROME brings added value on convective events (esp. orography-related), low clouds, sea breezes, etc, plus many new useful products (e.g. 3D hydrometeor maps, simulated reflectivities)
- still some weaknesses: overactive convection, absence of fog/Sc analysis, some low-level biases
- 1-km system brings relevant detail in mountain areas (esp. wind)

Main experimental results:

- large-scale coupling at model top is beneficial
- having an intermediate model (ALADIN) between global ARPEGE and AROME may do more harm than good to the LBC coupling (at « about » the same resolution of coupling systems) => LBC errors and frequency
- overactive "fireworks" convection problems are partly shared with other models => intricate problems of dynamics/physics/their interfacing.

AROME-France progress and plans
3) Confirmed plans

New version ready for implementation in Dec09/Jan10:

- increase vertical resolution in lower troposphere (from 41 to 60 levels)
- direct LBC coupling to ARPEGE (upgraded to 10km resolution)
- improved diagnostics: gusts, clouds (linked to timestep organization)
- use AIRS and IASI radiances
- use radar reflectivities (Bayesian 1D humidity retrievals)

Scheduled for 2010:

- SURFEX data assimilation
- revised shallow convection scheme, microphysics, orographic effects
- treatment of overactive convection (mods in SL & diffusion to start with)
- +50% extension of AROME-France geographical domain
- variational 3DVar "Jk" coupling to large-scale model
- high frequency observations data assimilation (3D-FGAT algorithm)
- test of rapid-refresh cycle for nowcasting (3h forecasts at least every 2h)
- test high-resolution local assimilation system for air traffic management
- spatially heterogeneous background error covariances for rainy areas

Study of the 3MT's first version main weakness (lack of convergence with the 'resolved' equivalent at high resolution)

- The 'resolved' solution (no 3MT in ALARO-0) for describing deep convection is well behaving only for stationary cases. In transient cases, it looses its capacity to simulate sub-grid crucial aspects.
- At the opposite, 3MT is rather 'too convective' for stationary cases, but keeps the advantage of 'parameterizing' in transient situations, even at high resolutions when it seems to be really needed.
- Best of two worlds ? A 3MT solution that integrates the transient aspects ab-initio and automatically switches itself off for stationary cases => towards 'ALARO-1'.

Outlook (until next EWGLAM at least)

- For “ALADIN” (AAA):
  - Try to convert plans (like for instance concerning ‘Convergence’) into more steady actions.
  - Continue to increase the efforts on ‘dynamics’ (in a wide sense and with more and more high-resolution orientation).
- For “HARMONIE”:
  - Re-equilibrate the physics work between ‘diagnostics’ and ‘development’ on each side (⇔).
  - Start practical steps for ironing out the unnecessary ‘cultural’ differences in maintenance practices (already ongoing).

The end