The ALADIN consortium

P. Termonia

Outline

- Organizational matter in the consortium

- Short-term priorities

- A word about scientific evolutions

- SRNWP points to be discussed

Organizational matter

- *Strategy meeting*, Brussels 27-29 September, to check whether our Strategies are on track:

  - The outcome of the Brač HR meeting in 2010 (+ post-Brač discussions of the group of 4, PAC discussion)

  - Some extra input on DA and EPS

  - A technical analysis of the overlap/disjoint goals between the ALADIN and the HIRLAM strategy.

- Short-term (next year) to keep the strategic plan on track:

  - Organization of code handling (new cycles, code design)

  - **Radar DA**

  - **SURFEX (our externalized surface scheme)**

  - Actions to address the challenges in scientific collaboration.

  - User orientation: diagnostics, validation, verification.

Operational AROME radar assimilation in MF has provided improvements and shows potential for all ALADIN and HIRLAM partners
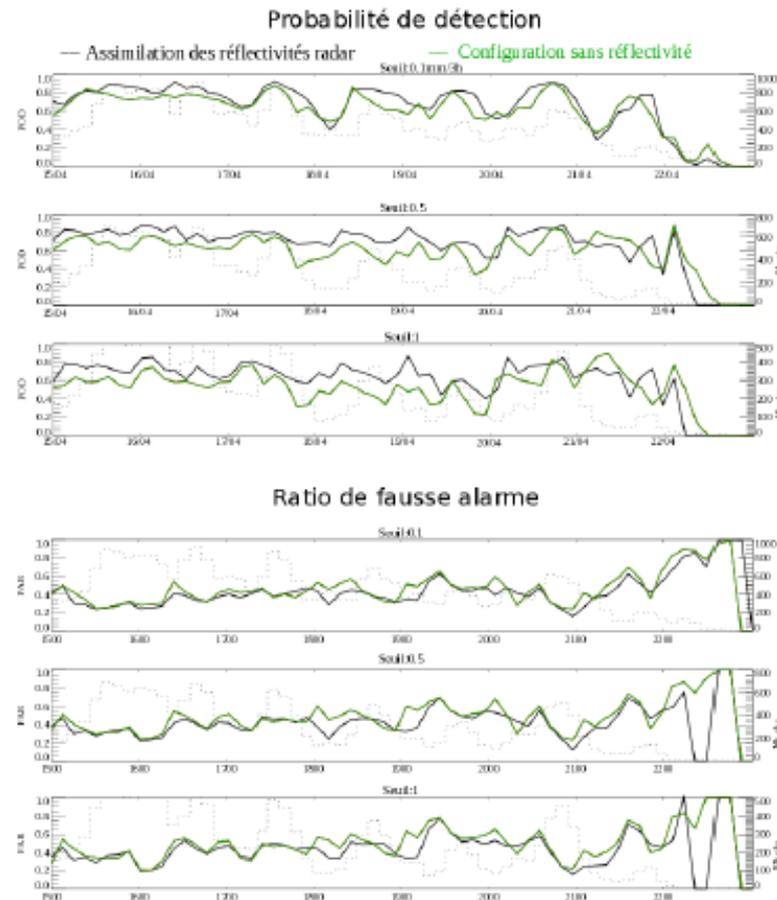

Time series of convective events

Fig. 2: Séries temporelles de scores probabilistes de cumuls de précipitations pendant les 3 premières heures d'échéance de prévisions pour les seuils 0,1mm, 0,5mm et 1 mm. Sur la période du 15 au 23 avril avril 2009, pour l'expérience sans assimilation des réflectivités radar (vert), avec l'assimilation des réflectivités radar (noir). En haut pour la probabilité de détection, et en bas, pour le ratio de fausses alarmes.

Short-term I: Plans DA (see presentations of Claude and Gergely)

- Priorities for the ALADIN consortium, next year. MF showed very convincing result on radar DA. So we will focus on:

  - Extend OPLACE to other countries ALADIN/HARMONIE countries
  - Work on software to give freedom to local data developers: local radar format (*ANY, including HDF5*) – CONRAD – M-F BUFR – Bator – ODB – screening
  - RUC, in particular the initialization
  - Get prepared for new data that is coming our way: radar, GPS, MTG, modeS (in order of priority).

- ***Bottleneck: exchange of radar data in Europe and the role of OPERA***

- More data (IASI, IARS, SSMI F18) MF's ARPEGE, see presentation of Claude.

- New techniques (more details from Claude talk): heterogeneous B matrix (precipitating vs. non-precipitating area's, Montmerle, Berre), Wavelets (Be), Ensemble techniques (MF, Pt, Mo), Hybrid methods (Hu, LACE)

- Discussion within HIRLAM/ALADIN: relative merits of 4Dvar with respect to hybrid 3Dvar methods (Ensemble methods, ETKF):

  - 4Dvar is expected to become important for the long scientific evolutions: the local moist balances, and the way how to handle comparable magnitude of model errors vs. observation error
  - Hybrid 3Dvar is attractive in the short term for it computational cost.

- The OOPS overhaul of the code to facilitate the organization of 4Dvar operations: study its impact and role for the LAM versions within HARMONIE.

Short-term-II: SURFEX, priorities for the next year

- Bring the (large) user communities (meso-NH, climate, NWP, academia) together: wiki, enquiries (of future plans), the creation of a SURFEX SC (first meeting last was last week).

- Increased and needed work on technical facilities (file format, change of geometries in surface data files, optimization work)

- Reanalysis/extension of the Best *et al.* (2005) interface and specifically the role of the so-called enquiry mode (which provides maximum freedom of upper-air experts and surface experts to develop their own schemes)

- Preparation for the Multi-Energy-Balance (MEB) scheme developed within the HARMONIE context, which is considered to become instrumental for addressing temperature biases in the HARMONIE system.

A word about scientific evolutions: joining **4** streams of scientific research: ALARO-1

- MT (Piriou 2007) → 3MT (Gerard *et al.* 2007) → hydrostatic ALARO-0 → NH ALARO-1 and PCMT (Piriou): **multiscale treatment of deep convection** (see talk of Neva)

- Piotrowksi *et al.* (2009) → **physics-dynamics interaction (?)** → Work of Lisa (Bengsston) on cellular automata, currently coded with ALARO-0.

- The discovery of **non-zero turbulent diffusion in the stable regimes** concluded from Quasi-normal-mode-elimination techniques of Sukoriansky *et al.* (2005): TOUCANS (see talk of Filip)

- Lilly (1968) → Betts (1973)→ Marquet (2011)'s new moist thermodynamical variable theta_1s → Marquet, Geleyn (2011) -> treat **shallow convection as part of the vertical diffusion** → TOUCANS?
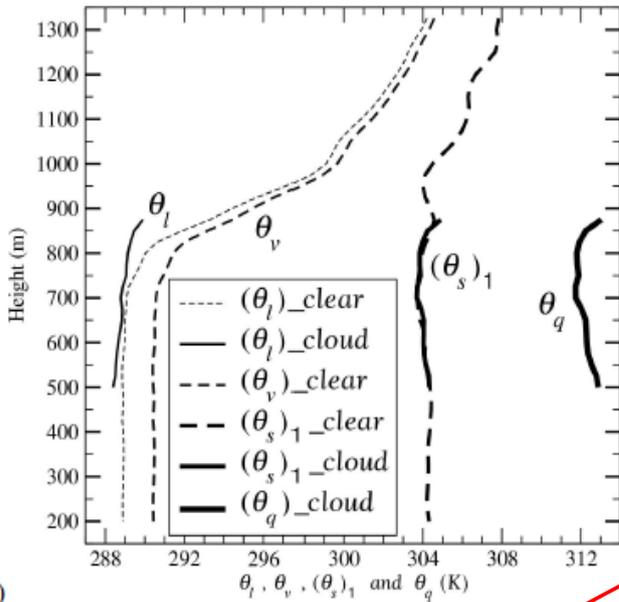
Status of deep convection (more info on the Belgian poster and Neva's presentation)

- ALARO-1 approach of kilometer scale. Aim: produce a satisfying **multi-resolution behavior of the parametrization in the range 20 km to less than 1 km**, and a convergence with the explicit treatment of convection at finer resolutions.

- New updraft scheme: currently in test with academic setup in the 3D non-hydrostatic model. It includes new features to **master** today's problems in deep convection (convergence to resolved solution, and the problem of the triggering)

  - Perturbation approach (Complementary Updraft approach), with respect to what is resolved, with a CAPE closure for the steady state.

  - resolution-dependent triggering (starting from the updraft source layer, to allow a better control of the triggering),

- ***The integration of this development with TOUCANS*** (including the 3D turbulence at 1km) as well as the study of the model behaviour with respect to horizontal diffusion should be helped by the new academic test bench (Weisman-Klemp tests).

P. Marquet and J.-F. Geleyn: SC by a turbulence description, a step forward based on Marquet's moist entropy potential temperature (?)
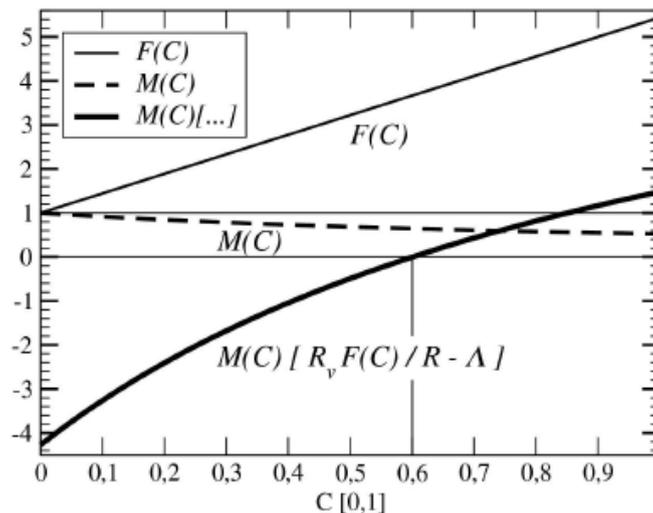

$$N^2(C) = g\, M(C) \left(\frac{\partial \ln(\theta_s)_1}{\partial z} \right)_e - g \left(\frac{T}{T_v} \right)_E \left(\frac{\partial q_t}{\partial z} \right)_e$$
$$+ g\, M(C) \left(\frac{R_v}{R} F(C) - \Lambda \right)_E \left(\frac{\partial q_t}{\partial z} \right)_e . \qquad (52)$$

C=0

C=1

Unsaturated moist air

$$N^2_{ns} = g \left(\frac{\partial \ln(\theta_s)_1}{\partial z} \right)_e - g \left(\frac{T}{T_v} \right)_E \left(\frac{\partial q_v}{\partial z} \right)_e$$
$$+ g \left(\frac{R_v}{R} - \Lambda \right)_E \left(\frac{\partial q_v}{\partial z} \right)_e . \qquad (48)$$

Saturated moist air

$$N^2_m = g \frac{D_{1v}}{D_2} \left(\frac{\partial \ln(\theta_s)_1}{\partial z} \right)_e - g \left(\frac{T}{T_v} \right)_E \left(\frac{\partial q_t}{\partial z} \right)_e$$
$$+ g \frac{D_{1v}}{D_2} \left(\frac{L_v}{c_{pd} T} - \Lambda \right)_E \left(\frac{\partial q_t}{\partial z} \right)_e , \qquad (39)$$

10 October 2011

Dynamics

- Work on VFE (see presentation J. Simarro), and some work on LBC's related to spectral nature of the model.

- The way forward, after Brač-HR:

  - Medium-term: extend the purely Fourier nature by a more Generalized Galerkin structure to evaluate the "fitness" of our code for flows over steep slopes in a scientifically clean manner.

  - The evolution of the HPC machines:

    – Literature overview study of other dynamical cores (other than our 2TL spectral SI SL) is planned.

    – Test our core (in adiabatic mode) in intercomparison tests: ***are the other consortia be interested in this?***

SRNWP points

- Radar data exchange.

- Joint efforts on testing our cores on European HPC infrastructures

The ALADIN consortium