ALARO-1 working days

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Synthetic Report and Plan

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Background and scope

Several types of research are currently being carried within the context of the ALARO model: the development of TOUCANS, work on ACRANEB, recent development to one the successor of 3MT, finalization of the physics-dynamics interface and work on the microphysics. Related to this, the 3MT scheme has been coded in such a way that it can be run with ARPEGE, leading to interesting and relevant conclusions. These different actions have been carried out by different experts and even in different places. The upshot of this is a lot of new science and it is fair to say that, if these development can be assembled, it will lead to a significant upgrade of the ALARO physics, allowing to identify a next version, which will be called ALARO-1. For this reason, it was decided to organize these ALARO-1 working days, to put the experts together.

It was stated during the meeting that one of the key issues in the assembly of ALARO-0 was the stepwise approach where all the pieces were integrated and validated one after the other, allowed for a fall-back to previous step if the validation did not produce satisfactory results. Such an approach is to be preferred, but needs the identification of the different steps and can benefit from as much anticipation as possible, hence the need of the current meeting.

Each of the experts had to opportunity to present their work, and then to aim and make a rather concrete road map for a merger and set up of a work plan that will enter the ALADIN-HIRLAM gliding plan.

In this report we only identify the points of attention. More details can be found on the presentations, which can be found on line.

Points of attention

- Currently in the design of the 3MT scheme, a first validation on the globe shows that there is little sensitivity to the details of the protection of the condensates and to the split between the stratiform and the convective part. In contrast, a stronger sensitivity was found to the details of the sedimentation. See presentation of Radmila.
- Its turns out that ALARO-0 behaves very well over the globe. In retrospect this comes as a surprise, but a very nice one. However this poses questions with respect to the assembly of ALARO-1; ALARO-0 was integrated all at the same time. If we had followed a stepwise approach, integrating the different components one by one, and tuning the intermediate steps, one might wonder whether the same surprisingly good behavior would have been obtained.
- A recurrent problem is the problem of biases in the T2m temperatures in stable cases. These biases are of different types; sometimes they are positive sometimes negative. It was proposed to test the adaptations of Laszlo Kullman in the different national applications. This should be coordinated. From the tuning exercise of going from 9 km to 4 km AND increasing the vertical resolution at the same time is dangerous. In fact, now we have to identify a baseline

configuration of ALARO-0. It was stated this can be related to the work of Roger Randriamampianina (reference version and namelist generation tool) for installing the HIRLAM scripting system where a verification package will be included that is used to validate the cycles for meteorological performance. Both tuning for stable cases (which could be seen as a variation from the baseline) and the baseline should be coordinated.

- Excellent work has been carried out on radiation, on the ACRANEB scheme, although there remains an open question about the pragmatic use of the so-called e-type absorption of water vapour. Nevertheless, this shows that we have an expert in our community on the spectral part of the radiation and, related to the feature of ACRANEB, to hopefully still compute gaseous thermal optical depths in one single spectral band.[1]

- The work on TOUCANS made lot's of progress to treat Shallow Convection Parametrisation (SCP) through modification of Richardson number and with consistent computation of cloudiness. Even if the latter one was not entirely settled yet it.

- From Luc Gerard's work we can identify two orthogonal developments. There are two conclusions:
  1. The work on the unsaturated downdrafts can be seen as an extra extension for the 3MT scheme and is put under a switch.
  2. The developments of CSU have the same basis as 3MT, so while it is consider as a new scheme it respects the hypotheses of the 3MT scheme.

  We could take an approach in two steps: first implement the unsaturated downdraft and then later consider CSU.

Work plan

We identify three work packages:

1. **Wrapping up ALARO-0 (calendar: this year)**
   - Establish a Baseline version of ALARO-0 with recent retuning related to a change in resolution in the vertical and in the horizontal, as presented by Radmila.
   - Address the problem of the Biases in the ALARO applications: setup coordinated "tuning" of the screen-level diagnostics based Laszlo's work.
2. **Integration of ALARO-1** (should enter the HIRLAM-ALADIN gliding plan + LACE plan! CSSI/HMG/Neva)
   - Science to be finished, see presentations during the ALARO-1 working days.
   - Two stages
     1. toucans plus radiation plus unsaturated downdraft (when radiation becomes ready),
     2. then rest; i.e. CSU, TOUCANS evolution, prognostic graupel, thermodynamic adjustment, unified cloud treatment in radiation, shallow convection, thermodynamic adjustment and 3MT.
        The remains the question of the structuration of the stepwise assembly.
   - Target resolution: . The validation will be in the range 5km to 2 km. We will forget about 10 km (this will be the standard ALARO-0 configuration). Remark: linked to the workpackage of the tests and this is also linked to the plans for the HARMONIE convection permitting EPS, where half of the members will be ALARO!

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[1] Post meeting note: this original open question has been addressed later, contrary to some pessimistic conclusions expressed during and after the meeting, there is now sufficient progress to be confident about the chosen approach by Jan Masek.

3. **Tranversal work**
   - Test interface in AROME: M. Szucs supervised by Daan Degrauwe.
   - APLPAR/APL_AROME (we need to work out the plan, difficulty coordination with MF/HIRLAM) (CSSI/HMG?), three main blocks as a starting point:
     - Radiation
     - SURFEX (define the interface for TOUCANS) to be discussed during the SURFEX WW.
     - CBR/TOUCANS
   - maintain 3MT in ARPEGE as a validation tool,
   - Make experiments in stable PBL conditions see WP1, and be present in HIRLAM meeting (3-5/12): revisit of the work of L. Kullmann before this meeting.
   - Validation: establish the methodology, setup of testbeds (cfr. PhD of Michiel Vanginderachter?).
     - Address the problem of the cycles validation (link with HIRLAM cfr. Work of Xiau + Laura!) and make the link with the proposals of Roger Randriamampianina in Hu.
     - Cases: GABLES4 (cfr. Talk of Laura Rontu), Sodankyla, KNMI testbed (Cabauw)
     - RK scheme: aspects linked to the physics-time-step organisation's changes owing to TOUCANS arrival