ALADIN 8th PAC meeting

6 and 7 June 2011

Brussels

6.1_COSP_report

Subject:	The report of the COSP action
Summary:	The goal of the COSP action is to facilitate a reduction of the number of needed SURFEX versions within the consortium by investigating whether all ALARO applications in the ALADIN countries can run with *one specific predetermined package* (the cy36t1 + V5_no_opt version that is currently used in the ALADIN/ARPEGE in MF double suite). At the same time, the aim is to establish the extra needs to make SURFEX operational. This is a short-term action in the first half 2011 to prepare a priority list and input for the SURFEX Steering Committee.
Action(s) required:	1. Take note 2. Endorse

A COodinated for running SURFEX by all Partners (COSP)

with specific input of the SURFEX working week, Brussels, 18-22 April 2011

involved people

T. Aspelien, J. Cedilnik, D. Degrauwe, K. Essaouini, F. Focaman, R. Hamdi, M. Jerczynski, L. Kullman, K. Sadoki, P. Samuelsson, S. Schneider, P. Termonia, F. Vana

and, with additional input from

François Bouyssel, Claude Fischer, Jean-François Mahfouf, Eric Martin, Yann Seity

Executive summary

- The goal of the COSP action is to facilitate a reduction of the number of needed SURFEX versions within the consortium by investigating whether all ALARO applications in the ALADIN countries can run with *one specific predetermined package* (the cy36t1 + V5_no_opt version that is currently used in the ALADIN/ARPEGE in MF double suite). At the same time, the aim is to establish the extra needs to make SURFEX operational. This is a short-term action in the first half 2011 to prepare a priority list and input for the SURFEX Steering Committee.
- Al, Be, Si, Tk, Pl, Hu, Mo, Au participated by carrying out tests within the frame of their operational applications. Most of this work was kicked off during the SURFEX working week in Brussels 18-22 April 2011. Additional input was provided by Cz, and the two HIRLAM countries Sweden and Norway (who were already using ALARO with SURFEX). Based upon these tests,
- we conclude, that, in general, *replacing the old ISBA scheme with SURFEX has much potential for improving our applications*. But some problems were still observed that will need attention in the near future.
- However, *not all countries are*, at the time of writing, *in a position to switch to SURFEX* (for instance Czech Republic).
- For the planning this implies (in order of priority) that,
    1. The proposed CY36T1+v5_no_opt deserves to get the proper attention during the next phasing.
    2. At least a minimum of coding rules is necessary (to allow for using the `make` tool)
    3. We need to readdress the problem of the interface and the definition of the externalization of SURFEX. There will be a flat-rate stay in Brussels in July in Brussels.
    4. The problem of the sand in Morocco needs to be scientifically investigated: does the new version of the physiographic database ECOCLIMAP2 improve the behavior?
    5. Extra research on the interpolation of T2m is advised, (and whether it can be cured, to some extent, by CANOPY).
    6. The behavior of the ALADIN/ALARO with SURFEX in mountainous regions needs to be investigated.

Background.

During the recent Aladin meetings (LTM/CSSI in Exeter, PAC in Budapest, GA in Prague), the situation of SURFEX, in terms of code evolutions, implementation and relationship between MF and the Aladin partners, has been addressed. Some detailed information is or will be available in the corresponding minutes (see on Aladin webpage). For short, the following actions have been decided:

- a short term coordination aiming at helping
- as many Aladin countries as possible to implement a quality-assured version of Surfex in their local forecast model. The Aladin PM has proposed to organize and coordinate a number of steps for achieving this.
- A long term action is about a proposal for a "Surfex governance". This action presently is on the side of MF and the proposal will be discussed at the PAC meeting on June 6-7 in Brussels

By *quality-assured* we do not mean that this version has been tested as part of an official export version, but that it was found to fit the needs of the double suite of Météo France. The goal of this effort is to extend this quality assurance equivalently to the needs of the partners.

In the sequel of this note, we give details and raise issues to be considered by all LTMs.

We stress that this short term effort will remain under the coordination and supervision of the PM, acting as principal contact person between partners and MF, so as to channel work, request and questions between partners and MF. The outcome of the whole exercise will itself be reviewed and discussed at the next PAC meeting.

Existing model versions:

You may be aware that several combinations of atmospheric and surface models exist:

- cy36t2 + V6 +opt (MF benchmark)
- cy36t1 + V5_no_opt (ALADIN/ARPEGE in MF double suite)
- cy36t1 + V5_no_opt+bf (HIRLAM)
- in parallel, preparations already are done for implementing the V6+opt version into CY37, for the next R&D cycle (CY37T1)

On top of this, there are several evolutions in SURFEX from version V5, V6 to V7. We recall that the SURFEX software is evolving along the line of its own technical preparation of releases, which is why the surface code version numbers are different from the NWP-familiar one (CyxTy). In the above list, "opt" stands for Surfex versions where recent MF developments for optimization already are included (I/O aspects for files and namelists; Open-MP). "no_opt" are versions not having this contribution.

It has been decided to carry out the tests with cy36t1 + V5_no_opt, which is the most "quality-assured" version currently considered by MF.

Specific goal

In many countries versions of ALADIN and/or ALARO are still used with the old ISBA scheme. We now need a coordinated effort to have all these versions running with the ISBA scheme that is present within SURFEX. This effort consists of two steps:

1. Make a validation of the cy36t1 + V5_no_opt (ALADIN/ARPEGE in MF double suite) and make a catalogue of the changes needed to make it acceptable for your local needs. It is important to stress here that one can not expect exact replication of your familiar ISBA results. We shall aim at equivalent results, as a guideline we take the work of Mohamed Jidane, technical reports available (2010). The needed changes will be bundled by the involved partners. The goal is to phase the *bundle* as one single package in cy37t2. The operational implementation in each country will follow later and should become available through the official export version of the future cycles.
2. Implementation through the official cycles in the future.

So we do not aim at operational use of SURFEX in the first half of 2011. The aim is to make a local quality-assurance to the standards that it would also fit your double suite and a phasing effort.

Boundary conditions

We should avoid doing "wasted" work. There will be a guarantee (subject to technical limitations, see below) that the work will be considered for phasing if we stick to following agreements:

- There will be a phasing of cy37t1 in March/April and there is a plan to have a second phasing in June for implementing a CY37T2 containing the V7 version of SURFEX. During the quality assurance exercise by partners, code modifications might be necessary. The target is to have these contributions enter cy37t2.
- Since phasings are subject to severe time constraints, the above target demands some degree of discipline: we need to have the contributions **no later than the end of May**. Should this deadline be passed, then specific discussions and decision-making about the optimal strategy for introduction into the official releases would need to take place. It is important to anticipate delays so we can coordinate the prioritizations. Hence communication will be crucial, see below!
- It is important to succeed! So we should be realistic in our ambition.
- We need to start from one single common version in order to avoid conflicting code evolutions. It is decided to work on the cy36+V5_no_opt. Thus, for this COSP exercise, we will not be concerned with optimizations. As is explained above, optimizations will be available in the official NWP releases with CY37T1. It should be avoided that the communication between experts multiplies. Therefore the communication will go through myself (PM). I will be the point of contact with MF.
- In the coming months, there will be ongoing development of work on V7 of SURFEX. In order to avoid conflicting evolutions, there should be a follow-up both of the evolutions in MF and in the action by the partners. So all partners should be active in staying in contact with me, and the same holds for the MF experts.

Specific outcome to be expected of the COSP action

- preparation phase: the notes about the information given to the LTMs, and their feedback to the PM
- completion of work and reporting about Aladin model versions (old Aladin, Alaro, Arome, etc) tested and validated with SURFEX. By the end of May (**A *precise date will be settled later***) we should provide **the bundle** of the modifs ready to be phased in cy37t2/Surfex V7.
- specific reporting to PAC (for June 6-7)

Encountered technical problems (as input for the SURFEX SC and for future planning)

- During the working week in Brussels there was a discussion about the interpolation of T to 2m: Geleyn's scheme vs. Paulsson (AROME SBL scheme and is planned in MF). This week all tests were carried out with Geleyn's scheme.
- Preprocessing does not work for surfex with more than one processor.
- There were crashes on the machine `socrates` in Brussels within the routine ACTQSAT, but surprisingly it seemed to work when changing the number of cpu's. This could point to a parallellization problem of the code (SURFEX?). We also found crashes with ALADIN with the Lopez scheme and ALARO, but in the same tests in Hu this problem was not there. There was no time not try to diagnose the problem this week. Perhaps it has already been seen before and solved (HIRLAM?).
- We were not able create lfi files with 927 from same domain to the same domain. There was a crash in mod_soil (floating point error). This is not a direct obstacle for the applications, but may point to a problem in the code.
- There were compilation problems on the Turkish computer. Exactly the same setup did, however, work on the machine in Brussels called `socrates`. Similar crashes had been observed before (with applications without SURFEX), so a compilation was going to be tested with -O1 instead of -O2.

Model performance (synthesis)

In general we found neutral performance to improvements, except for the following cases:

- In Austria the model is coupled to the IFS and the rescaling method to cope with the incompatibility between the TESSEL scheme and SURFEX cannot be used. The technical way to deal with this, is to have cold start with a coupling to the ARPEGE surface fields and then use a surface data assimilation cycle.
- During the working week in Brussels, the switch to SURFEX degraded the PBL scores. However, this degradation was not noticed in the model fields. Moreover, this problem was somehow alleviated by using the CANOPY scheme. This points to a problem in the interpolation to 2m and 10m rather than a problem of SURFEX. This is further investigated.
- The performance of ALADIN over Morocco in the desert degraded seriously when switching on SURFEX. This problem was alleviated by using CANOPY (there is currently an E-mail exchange between K. Essaouini, F. Bouyssel and R. Hamdi on this subject).
- In general we found a deterioration of the ALARO scores over mountainous regions. This was observed in the Moroccan application and in Poland.
- Specific input was provided by F. Vana:
    1. The Cd/Ch variable turned out to be not initialized in the model. This was discovered after SURFEX working week by Filip Vana. Filip also provided his solution for this initialization and tests we carried out in Brussels with this fix. Surprisingly, this turned out to have almost no impact on the model scores (which makes it even more hard to be detected).
    2. It turned out that the snow information was not passed from SURFEX to the atmospheric part of ALARO. This has been identified by running SURFEX in ALARO in the HIRLAM countries, but the information was not passed to the ALADIN participants of the SURFEX working week.
    3. It is a tedious work to find the dependencies for compiling the model with the tool `make`. The Czech colleagues rely on `make` for quick (re)compilations for their developments.

This problem can be (relatively) easily solved, by sticking to coding rules, in particular that the name of the FORTRAN file has to be the same as the FORTRAN routine.

Input for the (next) phasing

- The developments of HIRLAM (in principle this was already planned for cy37t1 or cy37t2).
- The bugfixes proposed by F. Vana.