Summary of the discussions on the SURFEX ALADIN-HIRLAM plan for 2007-2008,
As concerns the model part (Monday and Tuesday meetings)
(12 December 2006)
(With some elements from the Wednesday discussions)

The discussion focussed on the general strategy toward an HIRLAM/ALADIN convergence on surface modelling, for both scientific and technical aspects. The SURFEX code is currently under testing in 3D within the ALADIN model (and already used in the AROME and Méso-NH models).

The ALADIN consortium will continue to test SURFEX, in order to use it in operational mode. The HIRLAM strategy is to use SURFEX in its mesoscale model version as well, and include the relevant processes of the current HIRLAM surface code in SURFEX. The externalization of the surface scheme of the current synoptic model is also an objective, but has a lower priority.

The discussion combined both scientific aspects (comparison of the physics in each surface scheme), and a crucial more technical aspect concerning the consistency between the atmospheric and surface modules (data flows, respective role of the surface and the atmosphere for some processes involving both).

1) Scientific aspects of the collaboration and exchanges of code.

The various strengths of each group on modelling aspects have been identified:

- The input from ALADIN is TEB, mixed layer ocean, new soil discretization (ISBA-DF), carbon cycle and fluxes, chemical (aerosol) modules, ECOCLIMAP.
- The input from HIRLAM is sea-ice, snow on ice, snow and forest interaction, lake model FLAKE

The strategy concerning the implementation of the snow and forest scheme in SURFEX is not obvious, as the HIRLAM and ALADIN surface code, although originally based on the same code diverged (soil treatment, snow and canopy at least). The tests in the HIRLAM model showed an improvement of the 2m scores, while ALADIN also is concerned with the additional parameters that would be required by the inclusion of a separate forest canopy temperature. It is not clear if the *patch option* available in SURFEX can be sufficient to describe snow/forest surfaces. The ongoing SNOWMIP2 intercomparison (http://users.aber.ac.uk/rie/snowmip2.html) is recognized as a good starting point to evaluate the available models. For HIRLAM, a realistic treatment of the snow forest interaction is very important. HIRLAM will continue its work on the validation of its snow and forest scheme. A working group needs to be created to evaluate the amount of work needed for the implementation of this scheme in SURFEX, as changes of the code are probably important.

HIRLAM proposes that ALADIN ports the existing FLAKE model into SURFEX, together with the physiographic part (due to possible inconsistencies with ECOCLIMAP). It is suggested that this task could be done in the framework of a thesis, or a post doc (visiting scientist position) at CNRM. HIRLAM will concentrate on the assimilation aspects.

2) Consistency between atmospheric and surface modules

The principles of the surface externalization are described in the Best et al. (2004) paper (SURFEX follows this paper). However, it appears that this paper remains relatively general. The discussion identified a number of points where we need to define a long term strategy for surface / atmosphere interactions. This includes the standardization of a dataflow between the surface and the atmosphere, even if some of the variables to be exchanged are not used at a first stage.
This is necessary to avoid a situation where problems would be solved step by step with "quick and dirty temporary solutions" which would then remain as permanent.

Subjects raised :

- Antifibrillation. Now an ad hoc solution is used for ALADIN, but it is possible to improve the situation.
- Implicite treatment of the interaction between (canopy + air temperature) and atmosphere
- orography (raised also during the talks). Orography is used in both surface and atmosphere. The question of having a different orography in surface and atmosphere should be studied in details, but is probably unavoidable as the gravity wave drag parametrization better requires the finer surface-type orography (to keep its fluxes consistent with other surface fluxes on the last model level), while all other model parts (for instance bottom boundary terms in the dynamics) require a filtered orography for numerical stability reasons. Other points are sloping radiation (including shadowing effects) or 2m observations operators.

It is proposed to create two working groups :

1) *A working group on data flow between surface and atmosphere.*
The group will examine the need of data exchanges on aspects not treated in the Best paper (antifibrillation, canopy+air temperature, parametrisations related to orography, …). This working group will propose a strategy for the exchange of variables between surface and atmosphere. Physiography and assimilation should also examined (for assimilation, a good liaison with a third working group for data assimilation specifications is needed). This WG1 should start beginning of January 2007, with the goal to have a finalized draft to be presented at the common workshop in Oslo (week of 22-24 April 2007).

2) *A working group on the physical consistency*
The working group will review all processes and parametrisations which can potentially lead to mismatches between their representation (formulation or input physiographic data) in the atmospheric and surface parts. It should consider the present situation and the mid-term planned developments. Post-processing needs should be tackled as well as a good liaison with the data assimilation working group (which will itself handle the comparison and possible discrepancies of the observation operators). A particular attention should be paid on orography (see above) The group should propose a way to avoid or correct these inconsistencies. This WG2 should start early 2007, keep in touch with WG1 (above) and WG3 (data assimilation aspects), and produce its finalized draft by end of 2007.

Finally (as an additional remark caught up from the Wednesday discussions), the former WG on scientific convergence and surface scheme inter-comparison should complete a final version of its own "convergence paper" as soon as possible, and send that to the new WGs as input. This first WG should then be dissolved.