

SURFEX Steering committee
3rd meeting: 28 March 2013
Toulouse/Brussels

Participants:

ALADIN: Rafiq Hamdi, Piet Termonia*, Daan Degrauwe*, Tayfun Daykiliç*
HIRLAM: Ekaterina Kourzeneva, Patrick Samuelsson*
Meso-NH: Jean-Pierre Chaboureau
GMGEC: Bertrand Decharme
GMAP: Jean-François Mahfouf, Ryad El Khatib*
GMME: Aaron Boone
SURFEX team: Stéphanie Faroux*, Patrick Le Moigne*, Eric Martin, Sébastien Dasprez*

(* = expert)

Summary written by Eric Martin

Meeting agenda:

- 1) News from the SURFEX team (E. Martin)
- 2) review of optimization of the code, including PREP, parallel OFFLINE, removing of global variables (presentation by Daan Degrauwe/Tayfun Dalkilic, Stéphanie Faroux, ...)
- 3) review of general activities, including status of the 2012 workplan and plans for 2013 (presentation by each member of the SURFEX SC)
- 4) discussion on the 2013 work plan and further cooperation.
- 5) next meeting, AOB

A copy of the presentations are available on the surfex-lab site :
<http://www.cnrm.meteo.fr/surfex-lab/spip.php?article55>

1) Surfex news

New versions :

The V7.2 was published in at the time of the last meeting (in March 2012). Since this date, two versions were published :

- v7.2.1 (Jan 2013), with some bug corrections and an update of SODA concerning the snow assimilation. This version has been used as input for CY39t1.
- V7.3 (Feb 2013), with technical contributions for OFFLINE (MPI/OpenMP), and numerous scientific improvements : TEB (BEM+green roofs...), CROCUS (various update and improvements), Flake and 1D ocean model (ECUME for Flake, relaxation, ...), ISBA (CC, soil properties, permafrost), ISBA-TopModel coupling, New albedo (based on covers and not PFTs), chemical fluxes (NO)

Surfex licences :

The number of Surfex licences delivered to teams outside MF and the MesoNH, ALADIN, HIRLAM consortia has increased in relation with the cooperation around the code (13 licences en 2012, and 8 for the first 3 months of 2013). The number of licences for ECOCLIMAP has also increased (10 in 2012 and 8 for the first 3 months of 2013).

MF intends to distribute some codes (including SURFEX) with an open source lesser general public licence. This new policy will give a better visibility of Surfex (Surfex already includes open source models such as Flake) for the scientific community. The preparatory work is currently being done (identification of authors of the code and rights on the libraries distributed with Surfex) and partners will be officially contacted.

Surfex Courses :

A course in English has been organized in October 2012, with 16 students from 9 countries. For 2013, the LEGOS asked for a training on ISBA-TRIP. ALADIN and HIRLAM announce that they consider the opportunity to organize a Surfex course dedicated to the use of Surfex in coupled mode (not before 2014). They will contact the Surfex team if they plan to organize such a course.

Publications :

The special issue in GMD has been quite attractive, with 5 papers published. The paper on ECOCLIMAP2 is

accepted. The paper on surfex v7.2 and a paper on TEB are under review. The special issue is permanent (a specificity of GMD).

2) review of optimization of the code

Optimization of PREP for operational NWP :

Previous ALADIN Surfex weeks identified the need to improve the efficiency of PREP for operational applications (interpolation of the surface initial conditions from one model geometry/resolution with SURFEX to another) . A dedicated work has been organized in Brussels in March 2013 (work undertaken by Tayfun Daykilic and Daan Degrauwe, see presentation). Time-consuming routines were identified and several changes were made in the code to speed up the application for NWP needs. The CPU time was drastically reduced, especially for the large domains (1500x1500), so that the transformed PREP may become usable within an operational suite. Several problems that must be addressed in the future in PREP and PGD were also identified both for memory and CPU.

The discussion showed that this work is very promising and that the modifications should be introduced as soon as possible in the official versions. However, the compatibility of the modifications with all the scientific options must be checked first, following discussions with Stéphanie Faroux, Patrick Le Moigne and Bertrand Decharme).

The Surfex SC thanks ALADIN for this work that will benefit to all Surfex users. The next step will be to send the modified code to the Surfex team for final check (in particular compatibility with other Surfex options), then to introduce these modifications as a bugfix of the V7.3. E. Martin ask the help of Tayfun Daykilic and Daan Degrauwe to finalize this action with Stéphanie Faroux in the coming months. This request in terms of manpower has been agreed by the ALADIN Programme Manager (Piet Termonia).

Parallel OFFLINE :

Stéphanie Faroux developed a parallel version of OFFLINE using MPI and OpenMP during summer and autumn 2012 with the help of CTI and GMAP. The main modifications were done in the driver and in the I/O routines. This new version has been tested on various computing platforms (PC, PC cluster, tori, prefix, ECMWF). The modifications are introduced in the V7.3 version.

Removing of global variables in Surfex :

This transformation of the code is necessary to reduce the maintenance of the OpenMP configuration and treat the parallelisation in the same way as the atmospheric physics. The suppression of global variables is also mandatory for the OOPS project (rewriting of the ARPEGE/IFS/ALADIN code using object oriented features). The CNRM has contracted with the CERFACS for this action. The original plans were to have a first version of the transformed code at the end of 2012, then to test the new version under various configurations in 2013. The transformation will be done using automatic scripts. This action was delayed in 2012. It is still hoped to finish at the end of 2013, but due to the delay, the precise strategy to import the modifications into the official version of the code is still not clear. It will be decided when we will have a reasonable estimate of the availability of the transformed code.

3) review of general activities

MesoNH :

The emission of NO by the soil has been introduced in V7.2. The next version MesoNH (that should be released in May 2013) will use the V7.3.

GMGEC :

In 2012, extensive improvements and validations of ISBA were undertaken (ISBA-Ags, ISBA-CC, ISBA-DF). The number of PFTs was increased to 19 in order to couple ISBA to the LPJ-guess ecosystem model. An interactive coupling between the aquifers of TRIP and the ISBA root zone was developed. Plans for 2013 are to complete the tests of ISBA (in particular ISBA-DF-ES-MEB), to introduce GELATO1D, couple Surfex to LPJ and to change the coupling with TRIP (use of OASIS).

Patrick Samuelsson note that the TRIP team in Japan now recommends another model. Bertrand Decharme answers that the CNRM version of TRIP has been deeply recoded and improved and is far from the original model. He recommends the use of this CNRM "TRIP" model instead. Concerning LPJ, the current plans are to import the LPJ routing in Surfex rather than a "real" coupling. Patrick Samuelsson reports that a workshop will be probably organized in June concerning the coupling of climate models and LPJ. Expert(s) from CNRM (Christine Delire) are welcome (Patrick and Christine had a discussion on that subject).

GMAP :

SURFEX is currently used in AROME and ALADIN overseas (CY37T1_op1+SurfexV6+). The current experimental suite is based on CY38T1_op1+Surfexv7.2 (operational in June 2013), with several new

features : HWSO data for ALADIN, FA files (without compression at this stage), OI_main called from CANARI. ECOCLIMAP2 could not be introduced (negative impact). CY39T1 is prepared with SurfexV7.2.1. GMAP points out some technical aspects that must be solved in the future, to benefit from the use of Surfex in NWP, some of these are blocking, especially for ARPEGE : PREP (the work by ALADIN may solve partly these problems), PGD, suppression of global variables (see point 2), reproducibility between versions (a print of the main physical options in the listing will help to verify this point). There is a need to move from GTOPO30 to another global orography database (e.g. GMTED2010), as GTOPO30 has some deficiency in the Antilles. Concerning lakes, GMAP plans to use first the lake climatology, then Flake for NWP. GMAP ask that any new version of SURFEX should be tested with the "NWP options" with Meso-NH and evaluated in terms of surface forecast scores (quantitative measures) in order to confirm the ascending compatibility of this new version. The move to ISBA-DF will require to address issue of data assimilation. Finally, a reflexion must be undertaken for the creation of orographic parameters (mean and subgrid values) at model resolution since currently two programmes are used (PDG and E923 to handle spectral orography) with a number of inconsistencies.

GMAP report a bug on ascending compatibility for PGD and PREP. A detailed report should be send to Stéphanie Faroux for analysis.

GMGEC used GMTED2010 for hydrology and will report to the Surfex team on the possibility to get these data and make them available to the Surfex users.

ALADIN agrees with GMAP on the technical issues, the need for the reflexion for orography and the needs of ascending compatibility and points the need of a coordination for the transition from an ARPEGE without Surfex to an ARPEGE with Surfex.

ALADIN

ALADIN worked on 3 main topics during the working week organized in september 2012 :

- 1) Optimization of PREP : see point 2.
- 2) Test of local and national application : the use of Surfex is mostly positive, with some degradation that are underestigation (strong winds for the Poland case, coastal stations for Morocco). A paper is in preparation.
- 3) Interface between ALARO and SURFEX (TOUCANS) : there is a need to treat turbulence in a consistent way between atmosphere and surface. A first solution was tested in December (use the neutral average drag coefficient from Surfex). A second solution has been implemented (introduction of the TOUCANS stability functions) but it remains to be tested, and there is an incompatibility with CANOPY.

In parallel, the work on EKF for ALARO was pursued in offline and coupled mode

HIRLAM

Data assimilation : HIRLAM contributed to SODA and plan to give support for SODA in the long term. Tests of various structure functions are currently being done within CANARI in the framework of the EURO4M project. Assimilation of snow depth and snow extent are under study with various datasets. The plans for the introduction of a simple sea ice model into Surfex are to adapt the routine SOIL_HEATDIF to ice conditions.

The lake climatology was recently improved (new forcing, albedo, numerical scheme, snow on ice) and will be implemented in Surfex and tested within HARMONIE. The lake data assimilation has been further developed and tested, plans are to include it in Surfex. TEB is currently tested over Helsinki. New physiographic fields were tested with the identification of a number of problem (Aster orography at high latitudes, HWSO over Sweden and Norway exhibiting too low spatial variability). Finally, a reflexion is being conducted on the implementation of interaction between tiles.

Concerning the problem with the soil texture over Norway and Sweden, Patrick Samuelsson will contact both the FAO (contact on the FAO web page) and the local institutions (in order to speed up a revision of the database). In order to facilitate the introduction of a simple sea-ice model, HIRLAM wants to have access to the GELATO svn branch in order to avoid duplications of work for the coupling of Surfex and the sea-ice model. The GMGEC developments are not yet in svn, but the present working code can be made available. A coordination is needed with developments undertaken at GMGEC regarding the inclusion of GELATO in SURFEX. Patrick Le Moigne will be the CNRM contact point of HIRLAM for this action.

GMME

The Flake model was tested in coupled mode in the Thaumex experiment and in offline mode at global scale. The TEB Building energy model and vegetated roofs are introduced in Surfex. The coding of ISBA-MEB was continued, in cooperation with HIRLAM. GMME contributed to the validation of ISBA-DF over France and Siberia. A coupling between ISBA and TOP-MODEL (for flash flood simulations) has been validated and introduced into Surfex. A benchmarking framework for the validation of ISBA versions has been built. Jean-François Mahfouf asked how it could be used to evaluate the consistency between SURFEX V(n) and

SURFEX V(n+1). Finally, a new albedo, based on MODIS data has been introduced in ECOCLIMAP.

CEN (presented by E. Martin)

Interactions with met.no regarding avalanche warning activities. Project in development phase, with numerous interactions.

Requests from AEMET (Spanish met office) regarding avalanche warning activities : the contact is established, work should start soon.

Actual collaborations with : NASA/Goddard (Greenland melt ponds and subsurface aquifers), LGGE Grenoble (snow modeling for microwave applications, coupling with the microwave emission model DMRTML), Univ. Edinburgh (R. Essery ; SEKF data assimilation in Crocus for snow depth, SWE and microwave brightness temperature)

4) Discussion on the 2013 work plan and further cooperation

The Surfex committee decides to introduce as soon as possible the improvements made by ALADIN to PREP in the official code. It is also decided to release the V8 in 2014 (Spring/Summer) in order to have enough time to validate the scientific improvements, in particular ISBA-MEB and other important models such as the sea-ice models and a proper coupling with TOUCANS.

5) Next meeting

The next meeting is scheduled in March 2014. Following a suggestion of Jean-François Mahfouf, every member will be asked to distribute before the meeting a short summary of important points to discuss in order to improve the efficiency of the discussions during the meeting.

2013 Workplan for SURFEX :

GMAP :

- Validation of CY39T1 and Surfex V7.2.1.
- Changes in operational soil analysis (OI_main called from CANARI)
- Use of FA files instead of LFI
- work on using the FA files for SURFEX
- Use of HWSD for ALADIN

GMGEC :

Preparation of the next version of the coupled model CNRM-CM6 :

- Improvement of transpiration over tropical forests
- coupling with dynamic vegetation
- test of ISBA-ES-DF-MEB in global mode (offline and coupled)
- test of new MODIS albedo
- introduction of GELATO1D
- use of OASIS for coupling Surfex and TRIP

GMME :

ISBA :

- Development of ISBA-MEB (with HIRLAM)
- specific soil column for snow
- validation of new versions of ISBA-A-gs (Benchmarking)
- removing obsolete versions of ISBA-A-gs
- validation of ISBA in the framework of the Safran-Isba-Modcou chain over France

TEB :

- Street trees (2013)

CEN :

Development of CROCUS :

- new formulation of snow metamorphism
- new formulation of albedo and extinction
- development of data assimilation

MesoNH :

- release of the new version of MesoNH with the V7.3

ALADIN

• Integrating SURFEX in a wide range of national applications: performance within operational weather prediction models. Hamdi et al., GMD 2013, in preparation

• Continue the work of the interface with TOUCANS: a stay is planned in Prague this year.

- Continuing the evaluation of the STAEKF with data from the Cabauw tower.

• Introducing the STAEKF within the SODA system and test it with 3-D VAR ALARO.

• A scientific paper about the coupling 3DVAR + EKF for ALADIN is in preparation (PhD of Annelies).

HIRLAM

- Continuation with some option in parallelization with SODA
- Continuation of anisotropy in CANARI experiments
- Testing MEB in SURFEX7.3
- Assimilation of Snow Extent data (NESDIS or ...), further investigation of GLOBSNOW SWE obs, EKF for SWE
- Implementation of simple ice model (and later a more detailed sea-ice model : HIGHTSI) => is it yet another sea-ice model ??
- Implementation of improved lake climatology into SURFEX, more tests with FLake in SURFEX and in HARMONIE
- Using of satellite lake obs: quality control of satellite data, new structure functions, etc. Implement EKF for lakes into SURFEX
- Testing of TEB
- Implementation of high resolution orography in SURFEX, radiation over sloping surfaces, implementation of new version of lake database into SURFEX, continuation of lake database (Southern hemisphere), evaluation of GLOBCOVER data
- Feasibility study: interactions between tiles
- Evaluation of EKF vs OI-MAIN, assimilation of ASCAT soil moisture data

SURFEX Team

- Scalability test on the new MF supercomputer for OFFLINE
- Finalization of the optimized version of PREP with ALADIN and introduction in the official version as a bugfix.
- Further work on improvement of PREP and PGD.
- Work on the removing of global variable with CERFACS and introduction in the official Surfex code.
- Introduction of a print of the scientific options activated in the code
- Make available GMTED2010 to the surfex users