

SSC4 March 2014 GMME Report

GMME/MOSAYC

Hydrological application SIM over France (with GMGEC)

In 2013, the testing of ISBA-DIF was continued in offline mode in the framework of the Safran-Isba-Modcou (SIM) chain. ISBA-DIF was tested using discharge (~400 gauges) and temperature measurements from 10 cm to 100 cm (~150 to 400 stations depending of the level). Cooperation with B. Decharme (see Decharme et al., 2013). The work on SIM was then completed by adding elevations tiles in mountainous regions, and hydrological reservoirs for each mesh accounting for small aquifers and transfers in the soil. The sub-grid drainage option in SURFEX is no more used. In 2014, the plans are to transfer the code to the operational service (Direction de la Climatologie: Climate Direction), to build an experimental chain in order to replace the old SIM chain.

Test of ISBA-DIF in coupled mode in the Meso-NH model.

The data from the CarboEurope regional experiment are used to test ISBA-DF and compare it to the classical force restore version. The preliminary results at 8 km show a slight warm bias when compared to the observations and the force-restore version. This result is preliminary, and further tests concerning the impact of the initialization (at present, both versions are initialized from the ECMWF model). Further developments are needed in SURFEX to allow the grid nesting functionality of Meso-NH to run with ISBA-DF. In 2014, the plans are to continue the test of ISBA-DF at high resolution (2,1,0.5 km).

Fine scale runs (5.5 km) over Europe

In the framework of the EURO4M project SURFEX has been forced from 2007 to 2010 by the MESCAN (collaboration with SMHI) analysis over Europe (1,000,000 grid points). The project is now finished. The follow on project UERRA will produce 50 year of data at the same resolution.

Work on Flake (with GMGEC) :

Separation of rivers and lakes/reservoirs: new ECOCLIMAP_2 and new LAKE_DEPTH maps

- Some estuaries changed from « WATER » to « SEA »

- Reservoir depth set to 10m

- Minimum depth of 1m for big lakes

- Aral treated as a lake of 10m depth

- Lake depth inverse averaging

Model changes:

- Maximum density of snow set to 300kg/m³ instead of 400kg/m³ previously

- Bug in the energy balance equation (missing emissivity)

- Snow albedo computed as $0.4a_{min} + 0.6a_{max}$

- Consistency between ISBA and FLake parameters

- Consistency of radiative properties at time t+1 (necessary in climate models)

- New diagnostics: accumulated variables, snow SWE, etc.

- Time splitting if TSTEP > 300s

- Add a skin temperature computation

Perspectives:

- Allow time varying snow albedo

- Interface to a more detailed snow scheme like Crocus

- Rewrite part of FLake to treat arrays instead of real variables: will allow new diagnostics, improve the readability of the code

GMME/MOANA

Development of the Multi-Energy-Balance (MEB) ISBA option (with HIRLAM)

MEB work is being done mainly under the auspices of a collaborative effort between SMHI and CNRM via HIRLAM. In 2013, the working version of MEB was merged into SURFEX 7.2 within a development branch. Work to phase MEB into the official SURFEX 8 release began in 2013 (P. Samuelsson, SMHI, and A. Boone). This version of MEB will be available using a limited set of options in the first release of v8. During 2014, remaining options will be added as they are tested and evaluated : the first version of MEB will be available with ISBA-DIF, and using the 3-L explicit snow scheme. Work to add CROCUS, the new TR code (radiative transfer) and Ags are the next priorities. A thesis student (A. Napoly) at CNRM began work on MEB evaluation in October, 2013 in offline mode at the local scale. The student will also contribute to improvements and further development, along with testing in different configurations. In addition, in offline mode at CNRM within the ALMIP2 and AMETHYST projects, and it will be tested within the GSWP3 project (in collaboration with CNRM-GMGEC).

GMME/VEGEO

Improved vegetation radiative transfer

In 2013, the new vegetation canopy radiative transfer option (TR : Carrer et al. 2013) was implemented in SURFEX 7. Discussions are underway to possibly implement TR within CTESSEL (at ECMWF : they would use the methodology but recode in a manner consistent with their routines). This new TR scheme is especially adapted for improved radiative transfer within the Ags scheme option (for photosynthesis), however, it can also be used with other ISBA options.

ECOCLIMAP

ECOCLIMAP albedos were updated using a 10 year time series of MODIS data (Carrer et al. 2014). The new albedos are most different over West Africa and forest regions (such as in Siberia), and such changes are anticipated to have an impact in fully coupled mode. This new modification also permits the possibility of including inter-annual albedo variability (during the same time period spanning the MODIS data). Finally, an investigation into the future evolution of the next generation of ECOCLIMAP (2020 and beyond) based on user needs was initiated.

Offline Benchmarking

An effort has also been initiated to provide developers with a standard offline benchmarking platform based on the Fluxnet dataset. This platform currently includes over 100 surface flux stations with approximately 4 years covered per station (N. Laania, D. Carrer, R. Seferian).

Additional developments

Also of note, VARASSIM will be implemented in v8, and LDAS-France is being recoded in preparation for use in LDAS-Monde (Global LDAS).

GMME/TURBAU

Urban processes

In 2013, a new version of TEB-Hydro was developed in collaboration between CNRM-GAME and IFSTTAR (with K. Chancibault), and it is currently under evaluation (before being implemented in to the official SURFEX release). This version uses ISBA-DIF for exposed urban soils, the ground beneath buildings and roads and in gardens. It also incorporates runoff from roads and the subsequent transfer to an underground urban routing network.

The inclusion of solar panels on building is also under development.

GMME/MICADO

Hydrology for flash flood prediction

Several new developments and improvements have been made for the ISBA-TOPmodel option. Starting with SURFEX v8, it will be possible to activate the TOPODYN approach for lateral distribution of soil water using ISBA-DIF, in addition to the current default ISBA-3L. It will also be possible to consider several patches instead of only one (was is the current default). Finally, the creation of masks for correspondence between a DTM (DEM ?) for the catchment description and the SURFEX grid is possible for 'IGN' projections (in addition of 'CONF PROJ' and 'LATLON REG').