

4th SURFEX SG Meeting

Aaron Boone
Representative from GMME/CNRM-GAME

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SURFEX SG Meeting, March 19, 2014



Current Uses and Ongoing Developments

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1) Hydrological Processes

- Regional Scale Hydrological application SIM over France : upgrades
- Mesoscale Hydrology for flash flood prediction

2) Soil-Vegetation processes (ISBA)

- Test of ISBA-DIF in coupled mode in the Meso-NH model.
- Progress of the Multi-Energy-Balance (MEB) ISBA option
- Improved vegetation radiative transfer (RT) option
- ECOCLIMAP

3) Lakes (FLAKE improvements)

4) Urban processes (TEB: new urban hydrology work)

5) Benchmarking and offline surface analysis

- Offline Benchmarking multi-site platform
- Fine scale runs (5.5 km) over Europe
- LDAS



1) Hydrological Processes

Hydrological application SIM over France

- Testing of ISBA-DIF was continued in offline mode in the framework of the Safran-Isba-Modcou (SIM) chain.
- Evaluation → using discharge (~400 gauges) and soil T (10 to 100 cm at ~150 to 400 stations)
- Added elevation tiles in mountainous regions
- Currently using GTOPO30 → soon SRTM 90m
- Currently using soils from French Agro Agency → soon HWSD
- Soon use either Jarvis (default) or Ags options
- Hydrological reservoirs for each mesh accounting for small aquifers and transfer in the soil
- Transfer the code to the operational service (Direction de la Climatologie: Climate Direction) → eventually replace the old SIM chain.

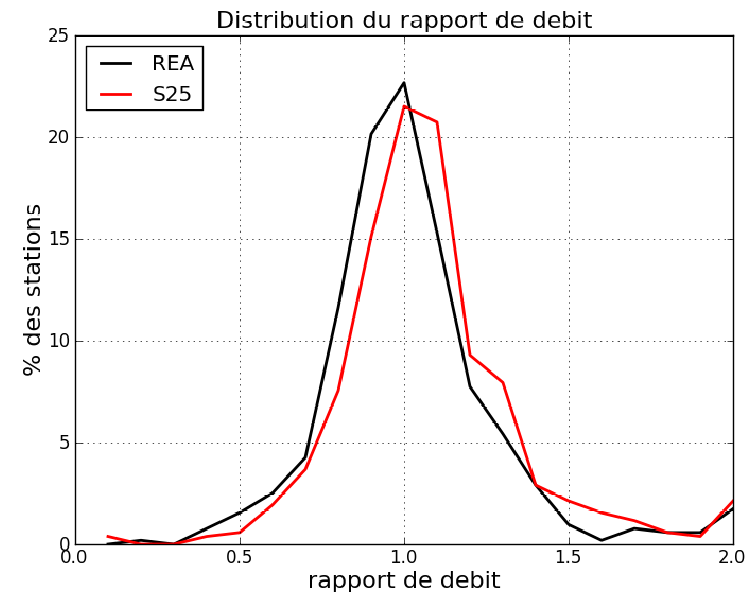
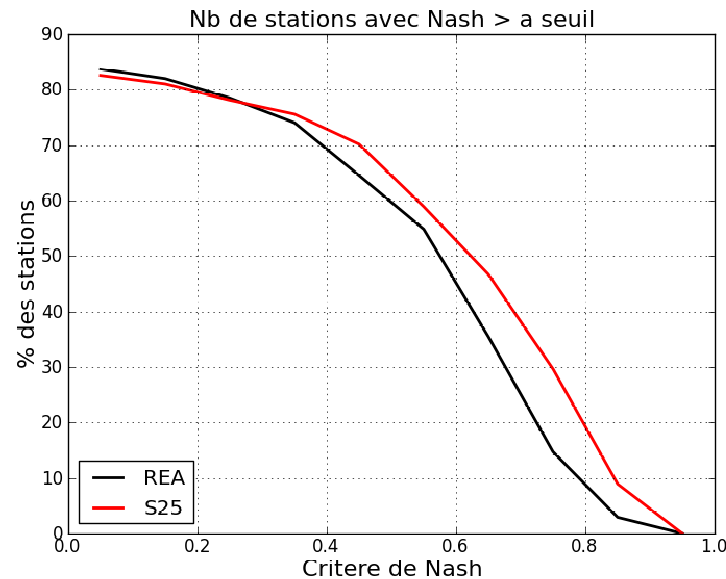
Hydrology for flash flood prediction : TOPODYN option (ISBA-TOPmodel approach)

- Starting with SURFEX v8, it will be possible to activate the TOPODYN approach for lateral distribution of soil water using ISBA-DIF (current default ISBA-3L)
- Consider several patches
- Creation of masks for correspondence between a DEM for the catchment and SURFEX grid → possible for 'IGN' projections (in addition to 'CONF PROJ' and 'LATLON REG').



1) Hydrological Processes

Improvement of hydrological scores :



Black : operational version, red : new version

Next step will be to transfer the new chain based on SURFEX to operational services

2) Soil-Vegetation Processes

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

- CarboEurope regional experiment data are used to test ISBA-DF and compare it to the classical force restore version
- Further SURFEX developments needed 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).

Improved vegetation radiative transfer

- Vegetation canopy radiative transfer option (TR : Carrer et al. 2013) in SURFEX v7 → improved photosynthesis, remote sensing applications
- Possibly implement TR within CTESSEL (at ECMWF)

ECOCLIMAP

- Updated using a 10 year time series of MODIS data (Carrer et al. 2014)
- Permits the possibility of including inter-annual albedo variability
- Investigation into the future evolution of the next generation of ECOCLIMAP (2020 and beyond) based on user needs was initiated.

2) Soil-Vegetation Processes

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Development of the Multi-Energy-Balance (MEB) ISBA option (with SMHI within 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 v8 release began in 2013 (collab. With SMHI)
- Time splitting used for energy budget : permits use of low canopy heat capacity (more realistic T_v , fluxes), still fully implicit coupling with atmosphere
- Version 1 of MEB in SURFEX-v8 will be available with ISBA-DIF, and using the 3-L explicit snow scheme
- Perspectives: Work to add CROCUS, the new TR code (radiative transfer) and Ags are the priorities for 2014+
- Offline 0-D mode at CNRM within the ALMIP2 and AMETHYST projects (thesis student) and Siberian snow cover (Brun et al., 2013) , and it will be tested within the GSWP3 project (2D offline), impact on global hydrology, fluxes, snowpack...



3) Lakes (FLake testing, developments)

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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



4) Urban sfc Processes (TEB developments) GMME

TEB-Hydro

- In 2013, a new version of TEB-Hydro was developed in collaboration between CNRM-GAME and IFSTTAR (not available yet in official branch/release)
- Runoff from roads and the subsequent transfer to an underground urban routing network.
- ISBA-DIF for exposed urban soils, the ground beneath buildings and roads and in gardens



5) Offline Benchmarking & Sfc re-analysis

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Offline Benchmarking

- Based on Fluxnet dataset → platform currently includes over 100 surface flux stations with approximately 4 years covered per station

Surface Offline Re-Analysis

- VARASSIM (EKF) will be implemented in SURFEX v8
- LDAS-France is being recoded in preparation for use in LDAS-Monde (Global LDAS).

Fine scale runs (5.5 km) over Europe

- Within 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 years of data at the same resolution.

Global Offline

- ISBA (SUREFEX v8) will participate in the GEWEX-supported Global Soil Wetness Project 3 (GSWP3) in 2014-2015. Forcings at 0.5 degree & 3h
- Exp1: Long term retrospective runs: 1901-2008.
- Exp3: Super Ensemble: 1979-present
- Exp2: Multiple GCMs and Scenarios (2000-2100)
- ISBA-DIF, TRIP, ISBA-ES, Tiles...also test MEB



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