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Use of satellite remote sensing in the ISBA land surface model of Meteo-France, from the regional to the global scale

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Land surface modelling aims at representing the terrestrial carbon cycle and the surface hydrology. Earth observation data permit to map the model's parameters and to constrain the model. In particular, remotely sensed observations at various wavelengths may be assimilated into the land surface model. At Meteo-France, the use of Earth observation data over land is developed in the framework of the SURFEX modelling platform, for research and pre-operational applications. SURFEX includes a representation of the soil-plant system (ISBA), of urban surfaces (TEB) and lakes (FLAKE). SURFEX now includes a land data assimilation system able to assimilate remotely sensed soil moisture and/or LAI estimates. In SURFEX, the land parameter map is provided by ECOCLIMAP, and by ECOCLIMAP2, an upgraded/updated version of ECOCLIMAP over Europe and Africa. The downwelling radiation and the surface albedo produced by the EUMETSAT LSA-SAF permit to constrain the model. Surface soil moisture and LAI may be assimilated into the model in order to correct its « trajectory ». Land surface temperature and freeze/thaw products permit to verify the simulations. Finally, historical reprocessed time series of Earth observation data are now available (AVHRR, active or passive microwave products) and may help produce or verify climatic reanalyses. An example of comparison between anomalies of soil moisture products and anomalies simulated by ISBA is given for the 2003 heat wave over France.
The use of Earth observation data for land applications will grow in the framework of GMES (Global Monitoring for Environment and Security) and of the EUMETSAT's SAF. Meanwhile, it is essential to develop and maintain validation sites for a satellite / model / in-situ cross-validation. The vegetation/land component of GMES (http://www.land.eu) is called "Land Monitoring Core service" (LMCS). The GEOLAND2 project (2008-2012), co-funded by the European Commission, is a demonstrator of the evolution of the LMCS, including the consolidation of prototype services and the test of their operational capacity.