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Evapotranspiration process as the result of land surface – atmosphere interaction.

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Since a few years, EUMETSAT (http://www.eumetsat.int) is developing a network of decentralized meteorological satellite data processing centers called 'Satellite Application Facilities' (SAFs). These centers have both operational and research objectives in view to develop robust products and services. The 'Land-Surface-Analysis' SAF (LSA-SAF, http://landsaf.meteo.pt/), develops algorithms for the estimation of operational land products using meteorological satellites. The SEVIRI instrument, on-board Meteosat Second Generation (MSG) satellites, is design to provide wide area coverage and is able to monitor quick changing surface variables affected by cloudiness and diurnal cycle. It has a 3 km spatial resolution at sub-satellite point and a high observation repetition rate (15 min).

RMI participates to the LSA-SAF to develop the evapotranspiration (ET) product. ET is the combined response of soil and vegetation to environmental conditions provided by the atmosphere and soil. ET cannot be observed directly and is assessed indirectly through modeling. Different approaches exist to compute ET, from simple empirical relationships to semi-empirical and more complex models. Soil-Vegetation-Atmosphere Transfer (SVAT) schemes are conceived to mimic as best as possible the interaction between atmosphere and land surface. The proposed model is based on the SVAT scheme developed at ECMWF and is adapted to accept real-time data from meteorological satellites.

In this contribution we test the capability of the algorithm to reproduce locally observed fluxes at ground measurement stations in Europe and Africa. Emphasis is put on highlighting the interaction between atmosphere and land surface. Local observations of the atmospheric variables (radiation fluxes, air temperature and humidity, wind speed, precipitation) are first compared to the input data (from LSA-SAF and ECMWF) used in the model. Resulting ET and related water and energy fluxes are then compared to observations. Special cases are selected to examine short time step of both observations and response of the model. Longer term tendency is then investigated to check model capability to reproduce correct interaction at the annual time scale.

The algorithm is running in near real time at the LSA-SAF host institute. It produces ET estimates with the SEVIRI spatial resolution each 30 minutes. Results are generated over the full MSG disk for Europe, North and South Africa and the Eastern part of South America. Validation already carried out attests of the robustness of the proposed algorithm. Nevertheless, research will be pursued during coming years, looking for additional validation sites and evolving towards an improved combination of observations and models through assimilation procedures. Successive versions of the algorithm are developed with increasing the number of remote sensing input, used as forcing fields and parameters. The algorithm involved in the operational production is updated accordingly as soon as a new model version is ready and validated.