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LSA-SAF evapotranspiration products based on MSG/SEVIRI: improvement opportunities from moderate spatial resolution satellites sensors for vegetation (SPOT-VGT, MODIS, PROBA-V)

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The Satellite Application Facility on Land Surface Analysis (LSA-SAF) proposes a panel of land surface related products derived from the EUMETSAT satellites, MSG (Meteosat Second Generation) and EPS/METOP, and produced in near-real time over Europe, Africa and part of South America. With LSA-SAF products, key surface variables are observed, and allows to characterizing the main processes governing land atmosphere processes. Land evapotranspiration (ET) is one of the variables monitored within LSA-SAF. ET at a spatial resolution of approximately 3 km at the sub-satellite point above the equator is derived in near-real time, every 30 minutes, using a simplified land surface model, forced by LSA-SAF radiation products derived from MSG/SEVIRI data. Given that spatial resolution, some smaller scale processes cannot be resolved, though their contribution may affect the total MSG pixel area ET estimates. Besides, information with an increased resolution is expected to have a positive impact on the total accuracy of the modeled ET. A variety of new remote sensing products derived from EO data at a higher spatial resolution are now publicly available. This is an opportunity to assess the improvement that moderate spatial resolution (250 m to 1 km) satellites sensors for surface and vegetation characterization could offer to the evapotranspiration monitoring at the MSG/SEVIRI scale in the context of LSA-SAF.

On the basis of a global analysis and on test cases, we show the usefulness of EO data acquired from moderate resolution satellites sensors (SPOT-VGT, MODIS/Terra&Aqua, MERIS) towards the improvement of the LSA-SAF ET products derived from MSG/SEVIRI. In particular, 4 different variables/indices (land cover map, LAI, surface albedo, open water bodies detection) are assessed regarding the LSA-SAF ET products: 1) the investigated processes at small scales unresolved by the geostationary satellite, e.g. open water bodies dynamics, are better taken into account in the final ET estimates, 2) an increased spatial resolution of the land cover map used is shown to reduce the uncertainty of evapotranspiration due to geolocation errors, 3) LAI and surface albedo from moderate resolution sensors are shown to give complementary information to MSG derived products in heterogeneous zones.

In the present contribution, we briefly describe the LSA-SAF ET products, review the various products derived from moderate resolution satellites sensors that are of interest for the LSA-SAF ET, and assess their respective impact on several test cases. At last, we give a general conclusion about the complementarity of such data to the MSG derived products, also in the perspective of EUMETSAT Meteosat Third Generation satellites and draw some perspectives towards the forthcoming launch of the SPOT-VGT successor, PROBA-V from the enhanced spatial resolution point of view.