15-years of LSA-SAF/Eumetsat satellite-derived albedo products: method for retrieval validation, and recent advances using neural networks during spectral integration

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Using two sets of Eumetsat satellite sensors (geostationary MSG with SEVIRI sensor, polar orbiting Metop/EPS with AVHRR sensors), the Land Surface Analysis (LSA-SAF) team provides to the community several remote sensing products related to the land surface properties (http://lsa-saf.eumetsat.int/). The long-term continuity and consistency of these products is ensured from 2004 to at least 2022 thanks to the Eumetsat funding. In this contribution, we are focus on the various albedo products, presenting their properties, algorithms (from the L1 Top-Of-Atmosphere reflectance data to the L3 albedo), and validation results.

The main albedo retrieval algorithm is based on three steps. First, atmospheric correction is performed using a Smac approximation of a 6S off-line model. Second, the surface interaction is modeled by a kernel-based BRDF (Ross-thick-Li-sparse kernels), with an additional Kalman filter. Third, angular and spectral integrations are performed to compute spectral albedos (white-sky and black-sky) and broadband albedos (visible and NIR and total-shortwave).Validation results show a good match when comparing albedos with other sensors (MODIS) or with in-situ measurements. And performances are here analyzed in details with regards to the user requirements.

Finally we discuss the potential added value of using machine learning techniques in the scope of the launch of the next generation of European satellites which will provide observations in more spectral bands (as for instance MTG/FCI which characteristics are close to HIMAWARI 8/9: 5 visible bands and 3 NIR bands). In the third step of the albedo algorithm (spectral integration), non-convolutional neural networks seem to offer a promising way forward.

Keywords: brdf, albedo, satellite, remote sensing, neural network, machine learning

