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Satellite-based climate data record of the surface solar radiation

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The incoming surface solar radiation has been defined as an essential climate variable by GCOS. Long term monitoring of this part of the earth's energy budget is required to gain insights on the state and variability of the climate system. In addition, climate data sets of surface solar radiation have received increased attention over the recent years as an important source of information for solar energy assessments, for crop modeling, and for the validation of climate and weather models.

The EUMETSAT Satellite Application Facility on Climate Monitoring (CM SAF) is deriving climate data records (CDRs) from geostationary and polar-orbiting satellite instruments. Within the CM SAF these CDRs are accompanied by operational data at a short time latency to be used for climate monitoring. All data from the CM SAF are freely available via www.cmsaf.eu.

Here we present the regional climate data records of surface solar radiation from the CM SAF. The SARAH-2 climate data record (Surface Solar Radiation Dataset – Heliosat, doi: 10.5676/EUM_SAF_CM/SARAH/V002) is based on observations from the series of Meteosat satellites. SARAH-2 provides high resolution data (temporal and spatial) of the surface solar radiation (global and direct) and the sunshine duration from 1983 to 2017 for the full view of the Meteosat satellite (i.e, Europe, Africa, parts of South America, and the Atlantic ocean). The high stability of this data record allows the assessment of the spatial and temporal variability and trends in Europe (Pfeifroth et al., 2018). This Thematic Climate Data Record (TCDR) is accompanied by a consistent Interim Climate Data Record (ICDR) that is provided with a latency of 5 days to allow operational climate monitoring.

The distinction between cloud coverage and snow-covered surfaces is still a challenge for satellite retrievals, especially for the historic satellite instruments with limited spectral channels. A new method, called 'HelSnow', to separate between snow and clouds based on the efficient detection of moving objects, has been developed and applied to the Meteosat satellite data. As part of this method, a daily snow mask covering 1989 to 2015 has been generated and validated against surface measurements. The improved quality of the satellite-derived surface radiation under snow-covered conditions, which will form the basis for the next release of the SARAH data record planned for 2021, will be presented.

Pfeifroth, U., A. Sanchez-Lorenzo, V. Manara, J. Trentmann, and R. Hollmann (2018), Trends and Variability of Surface Solar Radiation in Europe based on Surface- and Satellite-based Data Records, Journal of Geophysical Research: Atmospheres, 123, 1735-1754, doi:10.1002/2017JD027418.