



## **Variability and trends of surface solar radiation in Europe based on CM SAF satellite data records**

Jörg Trentmann (1), Uwe Pfeifroth (1), Arturo Sanchez-Lorenzo (2), Manon Urbain (3), and Nicolas Clerbaux (3)  
(1) Deutscher Wetterdienst (DWD), Offenbach, Germany (joerg.trentmann@dwd.de), (2) Pyrenean Institute of Ecology (IPE), Spanish National Research Council (CSIC), Zaragoza, Spain, (3) Royal Meteorological Institute of Belgium, Brussels, Belgium

The EUMETSAT Satellite Application Facility on Climate Monitoring (CM SAF) generates satellite-based high-quality climate data records, with a focus on the global energy and water cycle. Here, the latest releases of the CM SAF's data records of surface solar radiation, Surface Solar Radiation Data Set - Heliosat (SARAH), and CM SAF cLOUDs, Albedo and Radiation dataset from AVHRR data (CLARA), are analyzed and validated with reference to ground-based measurements, e.g., provided by the Baseline Surface Radiation Network (BSRN), the World Radiation Data Center (WRDC) and the Global Energy Balance Archive (GEBA).

Focus is given to the trends and the variability of the surface irradiance in Europe as derived from the surface and the satellite-based data records. Both data sources show an overall increase (i.e. brightening) after the 1980s, and indicate substantial decadal variability with periods of reduced increase (or even a decrease) and periods with a comparable high increase. Also the increase shows a pronounced spatial pattern, which is also found to be consistent between the two data sources.

The good correspondence between the satellite-based data records and the surface measurements highlight the potential of the satellite data to represent the variability and changes in the surface irradiance and document the dominant role of clouds over aerosol to explain its variations. Reasons for remaining differences between the satellite- and the surface-based data records (e.g., in Southern Europe) will be discussed.

To test the consistency of the CM SAF solar radiation data records we also assess the decadal variability of the solar reflected radiation at the top-of-the atmosphere (TOA) from the CM SAF climate data record based on the MVIRI / SEVIRI measurements from 1983 to 2015. This data record complements the SARAH data record in its temporal and spatial coverage; fewer and different assumptions are used in the retrieval to generate the TOA reflected solar radiation, which is closer related to the satellite observation than the surface solar radiation. Consistent patterns in the temporal trends of these two data records enhance the confidence in the satellite data.