



## Validation and climate analysis of satellite-based and reanalysis data records of surface solar radiation

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The solar radiation reaching the Earth's surface determines our climate and is therefore important to be monitored as consistent and complete as possible. Even though surface reference measurements of surface solar radiation are available (e.g. from the Baseline Surface Radiation Network (BSRN)), their density remains low and large areas, like the oceans, remain poorly covered. To fill the gaps, satellite-based data records (like those from the EUMET-SAT Climate Monitoring Satellite Application Facility (CM SAF), ESA Climate Change Initiative (ESA-CCI) and CERES EBAF) or model-based reanalysis data records (like ERA-5 and MERRA-2) can be used. They deliver surface solar radiation data with global coverage, which is needed to understand its distribution and variability from the regional to the global scale.

The quality of satellite-based and reanalysis data sets is variable and partly unknown, but should be assessed in order to avoid its deficient usage. Here we present a validation and analysis of surface solar radiation given by satellite-based and reanalysis data records on the global scale with reference to a data base of hundreds of surface measurements over land and ocean, collected from different sources (incl. BSRN, GEBA, WRDC, and buoy networks). A closer look to the variability and trends of surface solar radiation in Europe will be also presented.

Beside a global view on surface solar radiation and variability, this study will bring new insights about the quality and uncertainty of available state-of-the-art satellite-based and reanalysis data records for climate studies, and helps to potentially improve future releases of such data records.