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The new CAMS Radiation Service v4.5 – method improvements with a special focus on solar energy user needs

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The Copernicus Atmosphere Monitoring Service (CAMS) provides open data access to solar irradiances through its CAMS Radiation Service (CRS). Data is accessible via both the CAMS Atmospheric Data Store and user-specific Python libraries as the PV-LIB.

Observations from the MSG meteorological satellites are combined with modelled aerosols, water vapor, and ozone from the CAMS Integrated Forecasting System. Irradiance time series in 1 min, 15 min, hourly and daily temporal resolution are produced 'on-the-fly' on user request - using the most recent method and input datasets at the desired location inside the domain of the MSG satellite view. In addition to the standard access as time series, a gridded dataset in 0.1° and 15 min for the years 2004-2022 is available for land surfaces of Europe and Africa.

CRS v4.5 was released in 2022 and uses APOLLO_NG for deriving cloud information based on a probabilistic cloud detection. Its usage in Heliosat-4 follows a detection approach that is highly optimized for solar energy needs. The method is operationally applied for Europe, Africa and the Middle East, but has also been tested for Asia/Australia, and North and South America.

The derivation of the radiation at the earth's surface was extended by a parameterization of circumsolar radiation and provides a more accurate validation of the direct radiation with pyrheliometers. Besides concentrating solar power technologies, accurate direct radiation is needed to provide direct/diffuse ratios e.g. for tilted irradiances at solar module planes.

CRS v4.5 switched to CAMS reanalysis as input. This allows improved accuracy for all years 2004 – 2020 compared to the usage of the CAMS IFS in its various versions over time. This accuracy gain is larger for years before 2020 with their older CAMS IFS versions used in the CRS before v4.5.

The bias correction methods used so far have compensated for offsetting errors due to aerosols and clouds, obscuring the opportunity for improvement in both the cloud and aerosol algorithms. Various method improvements have now eliminated the need for operational bias correction in the CRS.

Typical improvement from CRS v3.2 to CRS v4.0 (new cloud scheme, bias correction active) to CRS v4.5 (new clouds, new CAMS reanalysis, no bias correction active) will be discussed in the presentation. Most recent evaluations done for Himawari-8 Field of View will be added.

Furthermore, the operational CAMS integrated forecast system (IFS) provides radiation forecasts in hourly resolution for up to 5 days. These forecasts are evaluated against ground based observations of radiation and compared against the spatially higher resolved ECMWF HRES forecasts.