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Copernicus Atmosphere Monitoring Service

The Copernicus Atmosphere Monitoring Service (CAMS) Radiation Service in a nutshell

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The Copernicus Atmosphere Monitoring Service (CAMS)

All-Sky Radiation Service in a nutshell

The atmosphere service of Copernicus combines state-of-the-art atmospheric modelling on aerosols with Earth observation data to provide information services covering European air quality, global atmospheric composition, climate, and UV and solar energy. The CAMS Radiation Service provides a fast parameterisation of the radiative transfer in the atmosphere (Fig. 1) and couples cloud-free sky parameters as aerosols, water vapour, and ozone with satellite-based cloud information (Fig. 2).

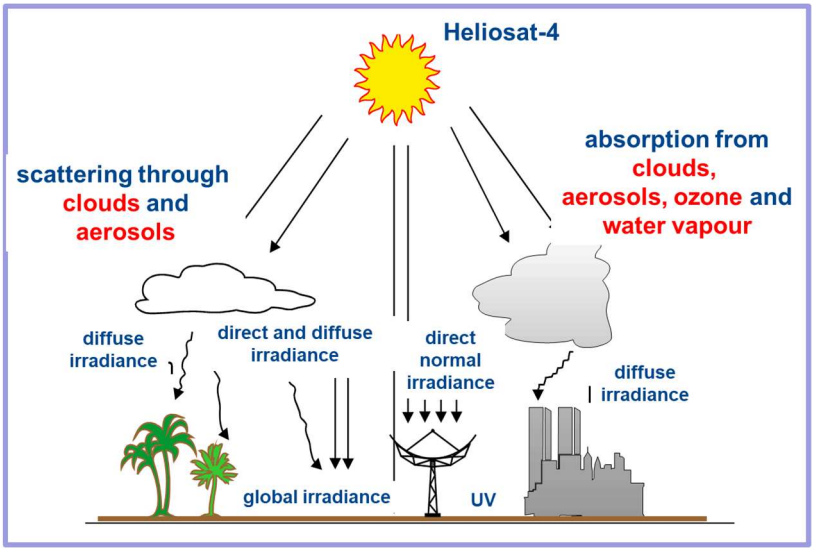

Figure 1: Principle of radiative transfer which is the basis of the CAMS Radiation Service

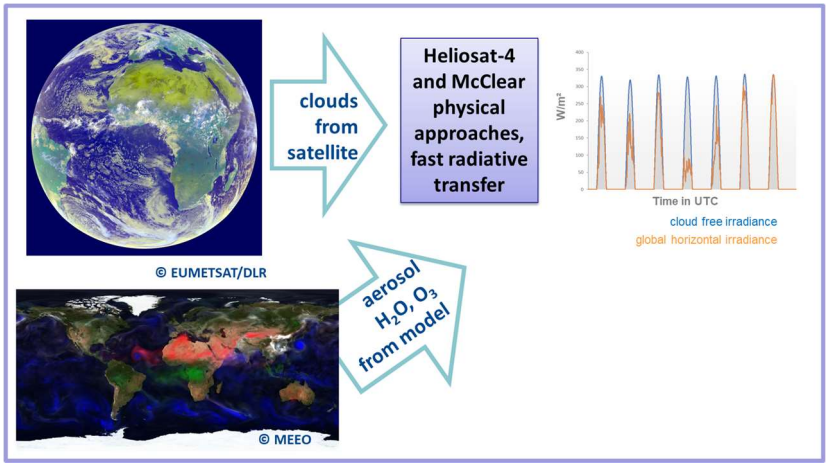

Figure 2: Combination of satellite-based cloud information with model based aerosol, water vapour and ozone information to derive time series of solar radiation at the surface in cloudy and cloud-free conditions

Within the radiation service, existing historical and daily updated databases HelioClim-3 and SOLEMI for monitoring incoming surface solar irradiance are further developed. The CAMS Radiation Service is jointly provided by DLR, Armines, and Transvalor. The Monitoring Atmospheric

Composition and Climate (MACC) project series have been prepared for the service provision, which is now operational as part of the Copernicus programme. Data are made available via the Copernicus Data Store (ADS).

- Period of record: Feb 2004–present, data is provided with up to 2 days delay
- Temporal resolution: 1 min, 15 min, 1 h, day, month
- Spatial coverage: Europe/Africa/Middle East/Eastern part of South America/Atlantic Ocean
- Spatial resolution: Interpolated to the point of interest
- Data elements and sources: Global, direct, diffuse, and direct at normal incidence irradiation; global, direct, diffuse and direct normal irradiation in cloud free conditions; verbose mode with all atmospheric input parameters used for clouds, aerosols, ozone, water vapour, and the surface reflective properties.
  For cloudy atmospheres, the direct components (also known as beam components) include both non-scattered and scattered radiation within the field-of-view of a pyrheliometer.
- Data quality control and assessment: Input quality control, regular quarterly benchmarking against ground stations, regular monitoring the consistency and detecting possible trends.
- Availability:
  Copernicus Atmosphere Data Store https://ads.atmosphere.copernicus.eu
- Updates: Continuous.
- Data policy: Following the Copernicus data policy – free for any use.
- Documentation:
  Dataset information at https://ads.atmosphere.copernicus.eu/cdsapp#!/dataset/cams-solar-radiation-timeseries?tab=overview

  User‘s Guide at https://atmosphere.copernicus.eu/supplementary-products
  Quarterly validation reports at https://atmosphere.copernicus.eu/supplementary-services
- Scientific references:
  APOLLO_NG/Heliosat-4: Schroedter-Homscheidt et al., Surface solar irradiation retrieval from MSG/SEVIRI based on APOLLO Next Generation and HELIOSAT-4 methods, Meteorol. Z./Contrib. Atm. Sci., DOI10.1127/metz/2022/1131

  Heliosat-4 method: Qu, Z., Oumbe, A., Blanc, P., Espinar, B., Gesell, G., Gschwind, B., Klüser, L., Lefèvre, M., Saboret, L., Schroedter-Homscheidt, M., and Wald L.: Fast radiative transfer parameterisation for assessing the surface solar irradiance: The Heliosat-4 method, *Meteorol. Z.*, 26, 33-57, doi: 10.1127/metz/2016/0781, 2017

The Copernicus Atmosphere Monitoring Service (CAMS) Clear Sky Radiation Service in a nutshell

The fast clear-sky model called Copernicus McClear implements a fully physical modelling replacing empirical relations or simpler models used before. It exploits the recent results on aerosol

properties and total column content in water vapour and ozone produced by the Copernicus service. It provides irradiances that would be observed in cloud-free conditions. Data are made available via the Copernicus Atmospheric Data Store (ADS).

- Period of record: 2004–present, data is provided with up to 2 days delay
- Temporal resolution: 1 min, 15 min, 1 h, day, month
- Spatial coverage: Global
- Spatial resolution: Interpolated to the point of interest
- Data elements and sources: clear sky (i.e. cloud free) global, direct, diffuse and direct at normal incidence irradiances; verbose mode with all atmospheric input parameters used for clouds, aerosols, ozone, water vapour and the surface reflective properties.
- Data quality control and assessment: Input quality control, regular benchmarking against ground stations, regular monitoring of consistency and detecting possible trends
- Availability:
  Copernicus Atmosphere Data Store https://ads.atmosphere.copernicus.eu
  Expert mode access with all input data is also available via http://www.soda-pro.com/web-services/radiation/cams-mcclear
- Updates: Continuous.
- Data policy: Following the Copernicus data policy – free for any use.
- Documentation:
  Dataset information at https://ads.atmosphere.copernicus.eu/cdsapp#!/dataset/cams-solar-radiation-timeseries?tab=overview
  User's Guide at https://atmosphere.copernicus.eu/supplementary-products
  Quarterly validation reports at https://atmosphere.copernicus.eu/supplementary-services
- Scientific references:
  McClear V2: Lefèvre, M., Oumbe, A., Blanc, P., Espinar, B., Gschwind, B., Qu, Z., Wald, L., Schroedter-Homscheidt, M., Hoyer-Klick, C., Arola, A., Benedetti, A., Kaiser, J., W., and Morcrette, J.-J.: McClear: a new model estimating downwelling solar radiation at ground level in clear-sky conditions, *Atmos. Meas. Tech.*, 6, 2403–2418, doi: 10.5194/amt-6-2403-2013, 2013.

  McClear V3: Gschwind, B., Wald L., Blanc, P., Lefèvre, M., Schroedter-Homscheidt, M., Arola, A., 2019. Improving the McClear model estimating the downwelling solar radiation at ground level in cloud free conditions – McClear-V3., Meteorol. Z./Contrib. Atm. Sci., 28, 2, 147-163, doi:10.1127/metz/2019/0946.

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