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

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1. The Copernicus Programme and its Atmosphere Monitoring Service (CAMS)

Copernicus, previously known as GMES (Global Monitoring for Environment and Security), is the European Programme for the establishment of a European capacity for Earth Observation [1] with respect to land, marine, and atmosphere monitoring, emergency management, security, and climate change. The atmosphere service of Copernicus combines state-of-the-art atmospheric modeling on aerosols with Earth observation data to provide information services covering European air quality, global atmospheric composition, climate, and UV and solar energy [2]. Besides the radiation service, it provides information on – among others – ultra-violet radiation and aerosol concentration on a global scale.

2. The CAMS Radiation Service

Within the radiation service, existing historical databases HelioClim-3 and SOLEMI for monitoring incoming surface solar irradiance have been further developed. The new service is jointly provided by DLR, Armines, and Transvalor. The Monitoring Atmospheric Composition and Climate (MACC) project series has been preparing for the service provision, which is now operational as part of the Copernicus programme. Data are made available both via the Copernicus portal and the SODA portal [3]. A User's Guide [4] has been created during the MACC project and will be updated on a yearly basis. The scientific algorithm is described in [5] and [6].

The radiation service consists of an all-sky radiation time series service taking satellite-based cloud parameters into account and a clear-sky radiation time series service for cloud-free skies. Quality of the service is ensured by regular input quality control, regular quarterly benchmarking against ground stations, and regular monitoring of the consistency in order to detect possible trends.

Following the Copernicus data policy, all data is provided free for any use after a registration giving a name and email address. It is not allowed to sell the data directly without modification, but data may be used for any purpose and value-added data may be part of any commercial usage.

Details of the all-sky radiation service are:

- Period of record: Feb 2004–present, updates are made continuously, data is provided with up to 2 days delay
- Temporal resolution: 1-minute, 15-minute, hour, day, month
- Spatial coverage: Europe/Africa/Middle East/Eastern part of South America/Atlantic Ocean.
- Spatial resolution: Spatial resolution is the original pixel of the Meteosat Second Generation image (approx. 3 km at satellite nadir and 5 km at mid-latitude).
- Data elements and sources: Global, direct, diffuse, and direct at normal incidence irradiances; global, direct, diffuse and direct normal irradiances in cloud free conditions; verbose mode with all atmospheric input parameters used for clouds, aerosols, ozone, water vapor and the surface reflective properties.

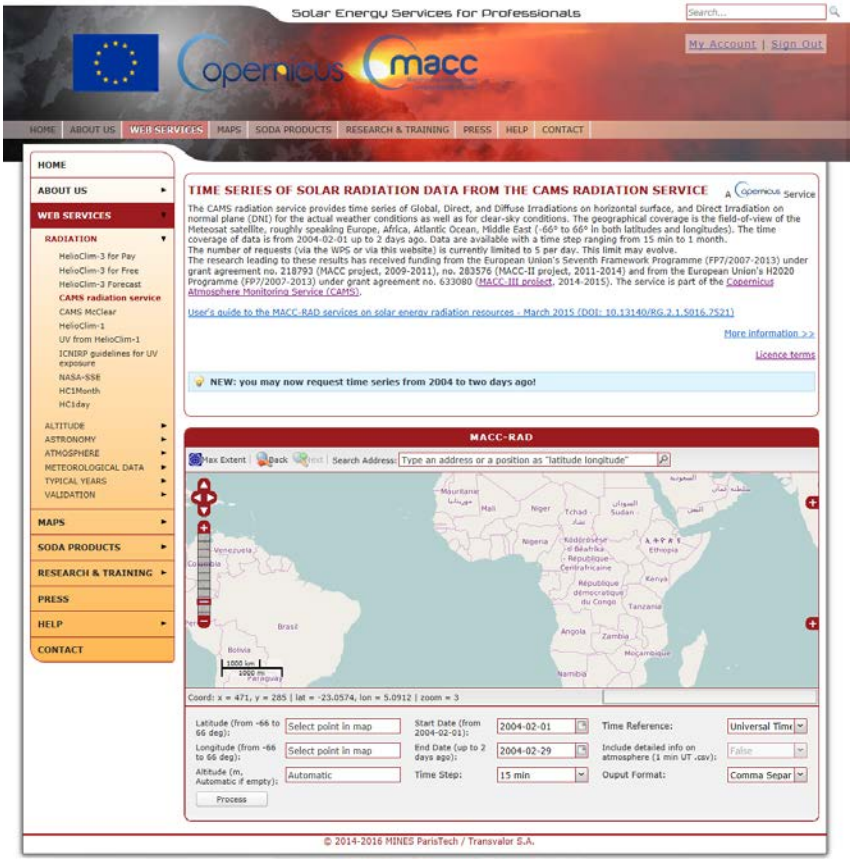

Fig. 1: Web interface of the CAMS radiation service

The fast clear-sky model called Copernicus McClear implements a fully physical modeling replacing empirical relations or simpler models used before. It exploits the recent results on aerosol properties and total column content in water vapor and ozone produced by the Copernicus service. Details of the clear-sky radiation service are the same as the all-sky service, but the spatial coverage is global and any point of interest can be interpolated. Data elements provided are clear sky (i.e. cloud free) global, direct, diffuse and direct at normal incidence irradiances, and a verbose mode with all atmospheric input parameters used for clouds, aerosols, ozone, water vapor and the surface reflective properties.

The paper will summarize the new service capabilities and illustrate quality control and validation results.

References

[1] Copernicus website, http://www.copernicus.eu/

[2] Copernicus Atmosphere Monitoring Service (CAMS) website, http://atmosphere.copernicus.eu/

[3] Copernicus portal http://atmosphere.copernicus.eu/ and the SODA portal http://www.soda-pro.com/web-services/radiation/cams-radiation-service.

[4] User's Guide, available at https://atmosphere.copernicus.eu/sites/default/files/repository/MACCIII_RAD_DEL_D57.5_final_0.pdf

[5] Lefèvre M., A. Oumbe, P. Blanc, B. Espinar, B. Gschwind, Z. Qu, L. Wald, M. Schroedter-Homscheidt, C. Hoyer-Klick, A. Arola, A. Benedetti, J. W. Kaiser, and J.-J. Morcrette, "McClear: a new model estimating downwelling solar radiation at ground level in clear-sky conditions", Atmos. Meas. Tech., 6, 2403-2418, 2013, doi:10.5194/amt-6-2403-2013.

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