

HelioClim, overview

Summary

The HelioClim surface solar radiation (SSR) databases, HelioClim1 and HelioClim3, are based on SSR estimation from Meteosat Second Generation images. This satellite-based method used to estimate the SSR is named HelioSat-2 and was proposed and developed by the Center for Energy and Processes (MINES ParisTech / ARMINES). The HelioClim databases are commercialized by Transvalor and are available, with other solar related web-services, at www.soda-is.com.

Protagonists

The Center for Energy and Processes (www-cep.cma.fr) is a joint research laboratory of the French school of engineers MINES ParisTech (www.mines-paristech.eu) and ARMINES (www.armines.net). ARMINES is a “non-lucrative” association meant to be a framework for school of engineers for research activities directed to the industry.

Transvalor S.A. is a commercial company, created by ARMINES, to transfer and value into the industry the research results of the different school of engineers involved in ARMINES.

Methodology

Satellite-based methods for surface solar radiation (SSR) estimation such as the well known HelioSat method ([2], [1]) represent an operational alternative to interpolation approaches based on meteorological ground stations, as it enables a better spatial and temporal coverage.

Since February 2004, the Heliosat-2 algorithm [3] applied to Meteosat Second Generation (MSG) SEVIRI images has been used to update, on a daily basis, the solar resource database HelioClim-3. This database covers Europe, Africa, the Mediterranean Basin, the Atlantic Ocean and part of the Indian Ocean with a spatial resolution of approximately 5 km (see figure) and a temporal resolution up to 15 minutes. The MSG data are received from Eumetsat and processed in near real time, overnight.

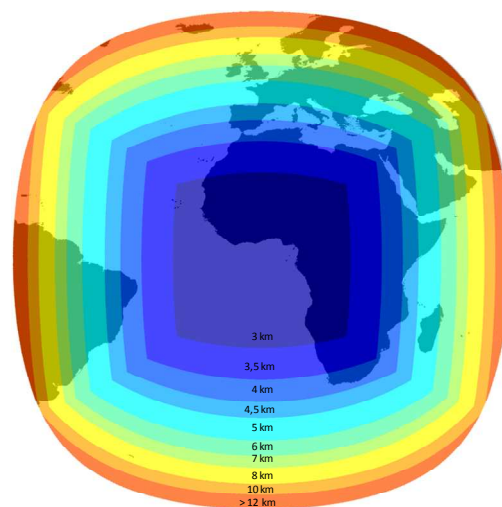


Figure: Spatial coverage and resolution of HelioClim-3 solar resource database.

There are two independent acquisition and processing chains for the HelioClim-3 database: one in Mines ParisTech, and one in Transvalor S.A., in Sophia-Antipolis. In brief, the process of these two chains begins by the merging of these two images into a synthetic image normalized according to the sensor and the sun elevation. As this image is located in the visible part of the spectra, the idea of the HelioSat-2 method is the following: the whiter the pixel, the cloudier. The method calculates the proportion of cloud contained in each MSG pixel compared to the same pixel value in clear sky conditions, in order to deduce the irradiation value at ground level.

The HelioSat-2 method is described in the following publications:

[1] Beyer H. G., Costanzo C., Heinemann D., Modifications of the Heliosat procedure for irradiance estimates from satellite images. *Solar Energy* 56(3); 207(1996).

[2] Cano D., Monget J., Albuissou M., Guillard H., Regas N., and Wald L., A method for the determination of the global solar radiation from meteorological satellite data. *Solar Energy* 37; 31(1986).

[3] Rigollier C., Lefèvre M., Wald L., 2004. The method Heliosat-2 for deriving shortwave solar radiation data from satellite images. *Solar Energy*, 77(2), 159-169.

Accuracy and uncertainties

We have built a html page on the SoDa website with the uncertainty result of a benchmarking. The hourly horizontal radiation values of the HC3 database were benchmarked using 29 ground stations:

http://www.soda-is.com/eng/helioclim/helioclim3_uncertainty_eng.html