Evaluating the spatial and temporal variations of the performance of CAMS Radiation Service and HelioClim-3 databases of surface irradiation in Germany

Mathilde Marchand, Yves-Marie Saint-Drenan, Laurent Saboret, Claire Thomas, Lucien Wald

To cite this version:
Mathilde Marchand, Yves-Marie Saint-Drenan, Laurent Saboret, Claire Thomas, Lucien Wald. Evaluating the spatial and temporal variations of the performance of CAMS Radiation Service and HelioClim-3 databases of surface irradiation in Germany. EMS Annual Meeting: European Conference for Applied Meteorology and Climatology 2019, Sep 2019, Copenhague, Denmark. 16, pp.2019 - 729, 2019. hal-02298518

HAL Id: hal-02298518
https://hal-mines-paristech.archives-ouvertes.fr/hal-02298518
Submitted on 26 Sep 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Both databases contain global horizontal radiation as well as its direct and diffuse components. Data are updated in real time and available via the SoDa website (www.soda-pro.com). CAMS-RAD version 3.2 is based on the physical Heliosat-4 method and use cloud properties from the APOLLO algorithm (DLR). HelioClim-3 version 5 (hc3v5) is based on the Heliosat-2 method (cloud index). Both methods use the Copernicus McClear service version 3 providing irradiation in cloud-free conditions calculated on the basis of CAMS aerosol data.

**In-situ measurements**
- 10 min measurements of global (GHI) and diffuse (DHI) irradiation made by pyranometers (CM11 and CM21) and SCAPP
- 26 stations; period 2010-2018 (9 years)
- Available online from the Deutscher Wetterdienst (DWD) climate data center: (ftp://opendata.dwd.de/climate_environment/CDC/)

**Quality Check, Validation - Protocol and Results**
- Discard non-plausible data using quality check procedures from EU-funded FP7 ENDORSE project.
- Compute bias, mean of absolute errors, standard deviation of errors, root mean square error, and correlation coefficient.
- A conditional validation has been conducted using three classes defined on the basis of the measured clearness index (all data, KT<0.2 for overcast skies and KT>0.7 for clear skies).

**Results and conclusion**
- Very good correlation for both CAMS and HC3v5. Both reproduce well the temporal variations of the solar radiation.
- Very small bias for all-sky class but positive bias in overcast skies and negative bias in clear skies.
- The bias are more pronounced for CAMS-RAD than for HC3v5.
- The biases observed for the two considered classes can be partly explained by the validation procedure but other possible causes are to be investigated.

---

**CAMS-RAD and HelioClim-3 in a nutshell**
From MSG: 3 km at nadir, every 15 min, Feb. 2004 onwards

- Both databases contain global horizontal radiation as well as its direct and diffuse components.
- Data are updated in real time and available via the SoDa website (www.soda-pro.com).
- CAMS-RAD version 3.2 is based on the physical Heliosat-4 method and use cloud properties from the APOLLO algorithm (DLR).
- HelioClim-3 version 5 (hc3v5) is based on the Heliosat-2 method (cloud index).
- Both methods use the Copernicus McClear service version 3 providing irradiation in cloud-free conditions calculated on the basis of CAMS aerosol data.

**In-situ measurements**
- 10 min measurements of global (GHI) and diffuse (DHI) irradiation made by pyranometers (CM11 and CM21) and SCAPP.
- 26 stations; period 2010-2018 (9 years).
- Available online from the Deutscher Wetterdienst (DWD) climate data center: (ftp://opendata.dwd.de/climate_environment/CDC/)

**Quality Check, Validation - Protocol and Results**
- Discard non-plausible data using quality check procedures from EU-funded FP7 ENDORSE project.
- Compute bias, mean of absolute errors, standard deviation of errors, root mean square error, and correlation coefficient.
- A conditional validation has been conducted using three classes defined on the basis of the measured clearness index (all data, KT<0.2 for overcast skies and KT>0.7 for clear skies).

**Results and conclusion**
- Very good correlation for both CAMS and HC3v5. Both reproduce well the temporal variations of the solar radiation.
- Very small bias for all-sky class but positive bias in overcast skies and negative bias in clear skies.
- The bias are more pronounced for CAMS-RAD than for HC3v5.
- The biases observed for the two considered classes can be partly explained by the validation procedure but other possible causes are to be investigated.

---

**Comparison of ground measurement with HC3v5 for all stations (10 min time resolution)**

**Comparison of ground measurement with CAMS-RAD for each station (10 min time resolution)**

---

**Authors**
Laurent SABORET - MARINES ParisTech
Marie MINES ParisTech
Lucien WALD - TRANSVALOR ParisTech

---

**Evaluating the spatial variations of the performance of CAMS Radiation Service and HelioClim-3 databases of surface irradiation in Germany**

---

**Partners**

---

**This image is not related to the text.**