HelioClim-4, or how to build a successful and sustainable business service based on CAMS radiation service
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HelioClim-4, a successful and sustainable business service based on CAMS radiation service

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HelioClim-3 version 5
an example of successful take-up of a Copernicus service by the SoDa team

Combined with

HelioClim-3 (HC3)

Outperforms all previous versions

More than 60 annual subscriptions (for pay)

More than 1400 requests per week in 2017

HelioClim-4 (HC4) = CAMS radiation enhanced with several value-added post-processing layers

Horizon

- CAMS radiation components are horizon free data (gray + yellow values).
- HC4 proposes an option to take into account (yellow values + a fraction of gray values) the shadowing effect due to the far horizon computed from SRTM

Evaluation of the performance

18 stations (hourly data) => 4 groups (A, B, C, D):
- 17 non-shadowed pyranometers (pyr.) measuring Global Tilted Irradiation (GTI) 25° South => evaluate the performance of fix-tilted data in HC4
- 1 pyr. measuring GHI with a discriminant horizon => horizon

Statistical results (bias in %, Standard Deviation STD in %, Root Mean Square Error RMSE in % and Correlation Coefficient CC) are provided for both HC4 CASE 1 and CASE 2, and for HC3v5

Conclusions
- HC4 is fairly close to HC3v5 in most cases
- HC4 Case 1 returns better results than Case 2: the use of an empirical algorithm should be avoided
- Improvement when horizon is taken into account

Perspectives
- Reliable precursor of service
- Further development: e.g. modulate HC4 value with the height of the selected point inside a Meteosat pixel

Data on every plane orientation

- CAMS radiation service: all components on horizontal plane + Direct Normal Irradiation.
- HC4: all the irradiation components in all plane orientations: fox tilted, 2D Sun tracking, 1D Sun tracking (North-South or East-West axis), tilt or azimuth tracking
- Two models tested to compute fix-tilted components:
  - CASE 1: Exploit all CAMS radiation components (GHI and BHI)
  - CASE 2: Exploit only GHI, and use an empirical model (Ruiz-Arias et al.) to compute BHI prior transfer on the tilted plane

<table>
<thead>
<tr>
<th>Groups of stations</th>
<th>CASE 1</th>
<th>CASE 2</th>
<th>HC3 V5</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Bias (%)</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>RMSE (%)</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>0.963</td>
<td>0.963</td>
</tr>
<tr>
<td>C</td>
<td>Bias (%)</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>RMSE (%)</td>
<td>21%</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>0.958</td>
<td>0.960</td>
</tr>
<tr>
<td>D</td>
<td>Bias (%)</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>RMSE (%)</td>
<td>18%</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>0.971</td>
<td>0.969</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group of stations</th>
<th>GHI CAMS radiation (without horizon)</th>
<th>GHI HC4 (with horizon)</th>
<th>HC3 V5 without horizon</th>
<th>HC3 V5 with horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Bias (%)</td>
<td>8%</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>RMSE (%)</td>
<td>25%</td>
<td>21%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>0.950</td>
<td>0.953</td>
<td>0.957</td>
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