



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

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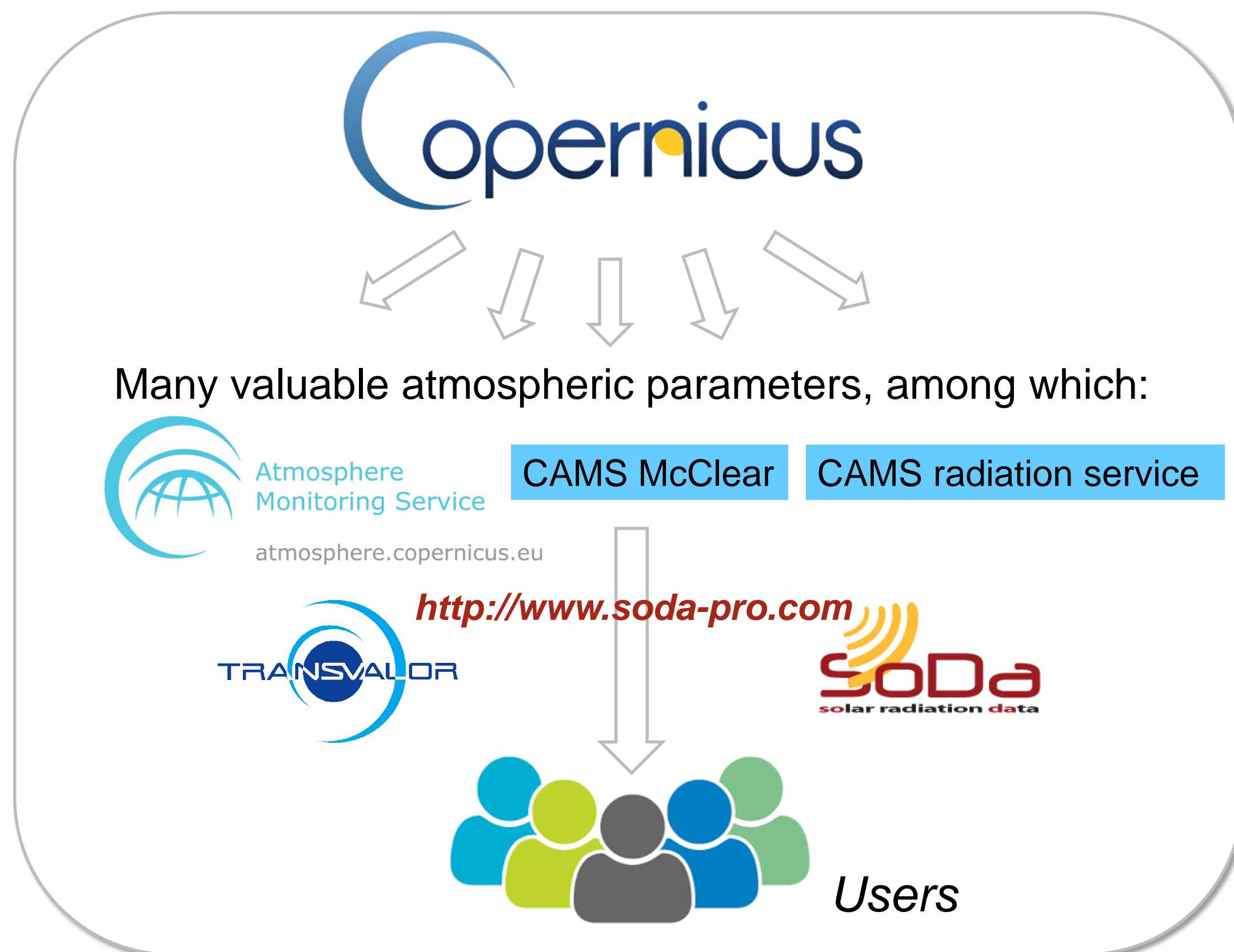
HelioClim-4, a successful and sustainable business service based on CAMS radiation service

ICEM 2017, 27-29 June 2017, Bari, Italy

4th INTERNATIONAL
CONFERENCE
ENERGY & METEOROLOGY

Challenges in weather, climate and
water services for energy

Partners



HelioClim-3 version5

an example of successful take-up of a Copernicus service by the SoDa team

CAMS McClear



Combined with

HelioClim-3 (HC3)



HelioClim-3 version 5 (HC3v5)

<http://www.soda-pro.com>

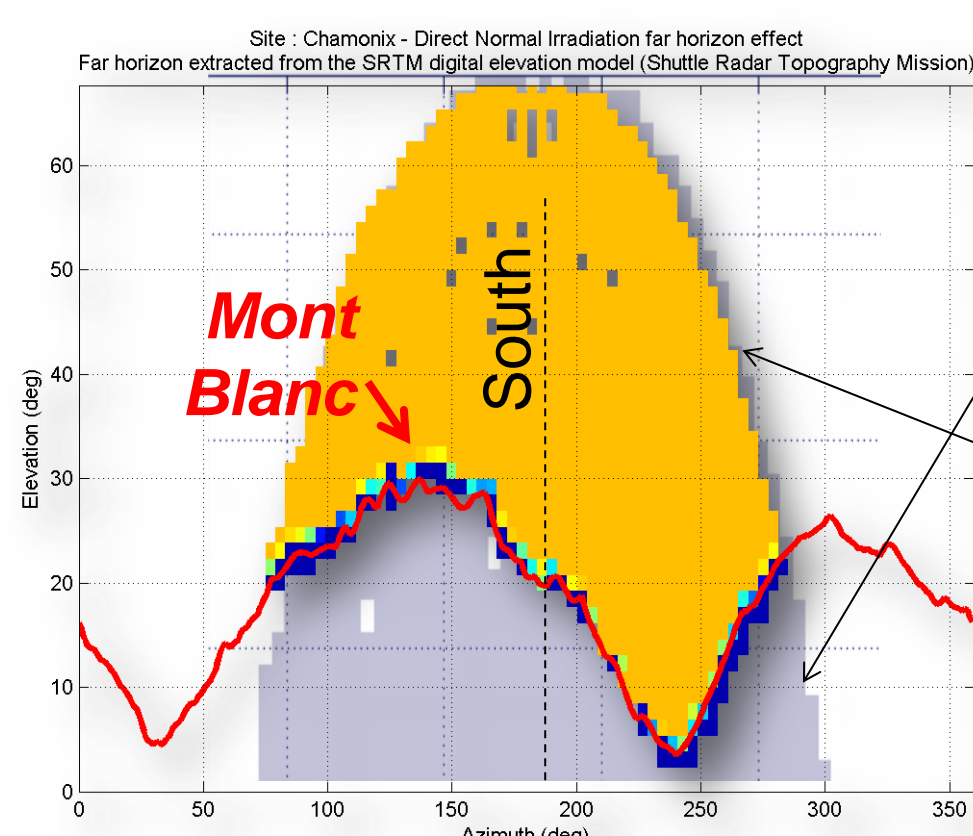
Outperforms all previous versions

More than 60 annual
subscriptions (for pay)

More than 1400 requests per
week day in 2017

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

Horizon

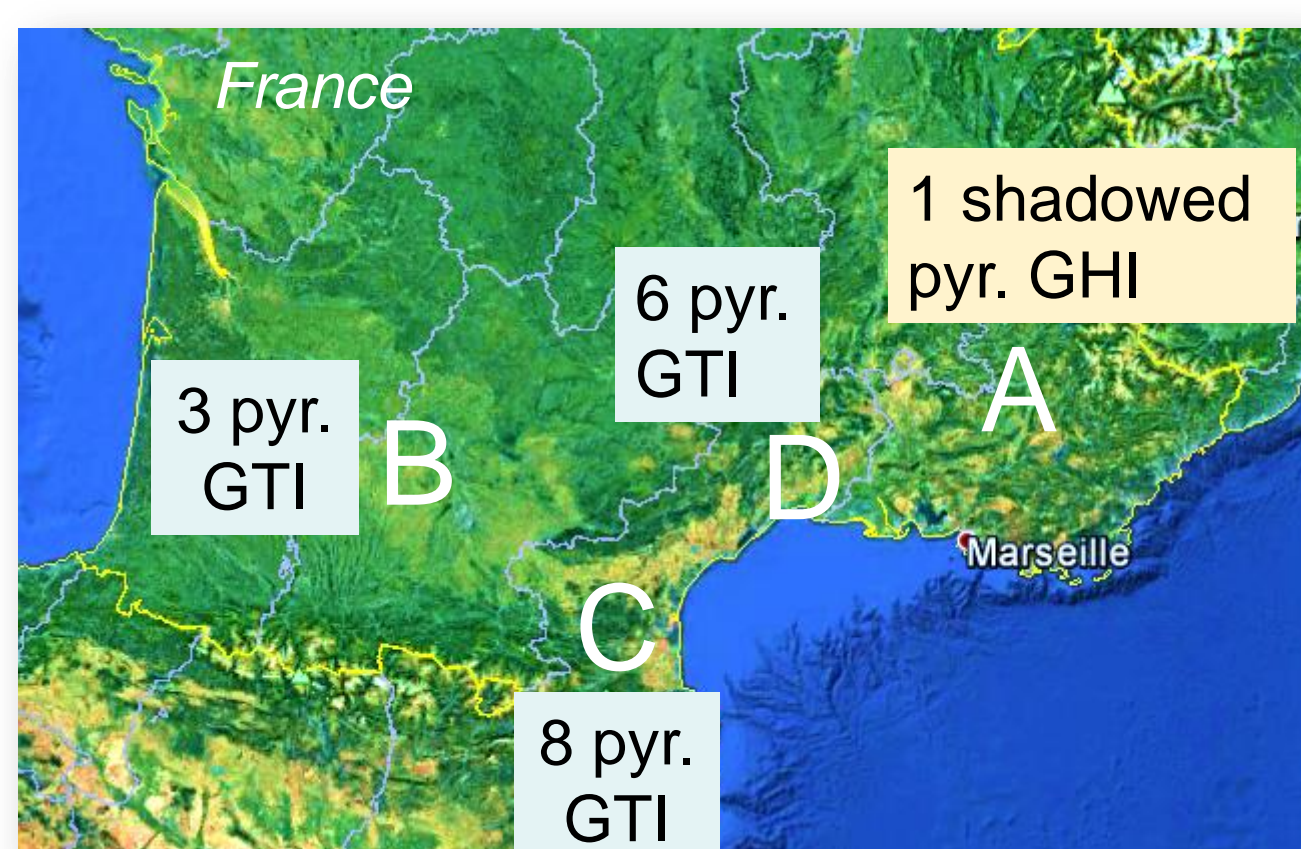


- CAMS radiation components are horizon free data (gray + yellow values).
- HC4 proposes an option to take into account (yellow values + a fraction of gray values) the shadowing effect due to the far horizon computed from SRTM

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: fixed 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

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

| Hourly GTI values Groups of stations | | CASE 1 HC4 | CASE 2 HC4 | HC3 V5 |
|---|----------|---------------|---------------|--------|
| B | Bias (%) | 5% | 9% | 4% |
| | STD (%) | 23% | 23% | 18% |
| | RMSE (%) | 23% | 25% | 18% |
| | CC | 0.963 | 0.963 | 0.978 |
| C | Bias (%) | 4% | 6% | 5% |
| | STD (%) | 21% | 20% | 16% |
| | RMSE (%) | 21% | 21% | 17% |
| | CC | 0.958 | 0.960 | 0.975 |
| D | Bias (%) | 6% | 9% | 4% |
| | STD (%) | 18% | 19% | 16% |
| | RMSE (%) | 19% | 21% | 17% |
| | CC | 0.971 | 0.969 | 0.976 |

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

| Hourly GHI values Group of stations | | GHI CAMS radiation (without horizon) | GHI HC4 (with horizon) | HC3 V5 without horizon | HC3 V5 with horizon |
|--|----------|--|---------------------------|---------------------------|------------------------|
| A | Bias (%) | 8% | 7% | 3% | 2% |
| | STD (%) | 25% | 24% | 23% | 23% |
| | RMSE (%) | 26% | 26% | 23% | 23% |
| | CC | 0.950 | 0.953 | 0.957 | 0.958 |

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

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