Software correction of angular misalignments of tilted reference solar cells using clear-sky satellite open data

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To cite this version:

Thibaut Barbier, Philippe Blanc, Yves-Marie Saint-Drenan. Software correction of angular misalignments of tilted reference solar cells using clear-sky satellite open data. EU PVSEC 2019, Sep 2019, Marseille, France. hal-02291413

HAL Id: hal-02291413
https://hal-mines-paristech.archives-ouvertes.fr/hal-02291413
Submitted on 18 Sep 2019
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EUPVSEC 2019 Conference 09 - 13 sept 2019

Context and objectives
- In-situ measurements for photovoltaic systems are very sensitive to angular misalignments:
  - They increase errors in solar resource estimation or nowcasting [1]
  - They reduce the accuracy of cloud tracking algorithms (e.g. in [2])
- Angular misalignment can occur e.g. during the installation or the operation, notably due to temperature gradients, wind efforts, birds, etc.
- We propose a method for estimating the angular misalignment of tilted reference solar cells or pyranometer using output of the clear-sky irradiance model McClear, a free Copernicus Atmospheric Monitoring Service.

Description of the method

Case study
- Seven reference cells at different angles from the sensors of the Opti-SkyControl (35°, 20°, 10°, 0°, 10°, 20°, 35° tilted in N/S axis)
- GTI measured at 1 min time step in a site located in the South West of France, over the year 2017
- Optimal angle correction found in the 6 first months (9 clear sky days)
- RMSE test in the 6 following months (8 clear sky days)

Results
- Bias (-7.6 W/m²) and RMSE (-5.1 W/m²) improved, all sensor included, in the 6 following months after angle correction

Conclusions and perspectives
- We propose a robust and efficient algorithm to correct a posteriori angle misalignment of pyranometric sensors
- Angular correction improves satellite-based estimation of GTI for the 6 following months for clear sky days
- Next possible step: dynamic correction to detect misalignment variations

Références