

Comparison of HelioClim-3v5 satellite irradiation data within in-situ measurements for five states in Brazil



HelioClim-3

From MSG: 3 km at nadir, every 15 min, Feb. 2004 onwards

- All radiation components over a horizontal, fix-tilted and normal plane (tracker 2D)
- Updated in real time. Irradiation forecasts available. Duplicated servers for a robust service. Available via the SoDa website
- Version 5 of HelioClim-3 (Nov. 2014) combines the cloud index with the MACC clear sky properties service named McClear



Partners



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In-situ measurements

5 stations from the INMET network

- Hourly Global Horizontal (GHI) values



Stations	Brazilian state	Lat, lon (deg)	Time period
Aquidauana	Mato Grosso do Sul	-20.475, -55.784	2006-11-01 to 2014-12-31
Cacoal	Rondonia	-11.446, -61.434	2008-07-20 to 2014-12-31
Canela	Rio Grande do Sul	-29.369, -50.827	2008-08-27 to 2014-12-31
Cidade Gaucha	Parana	-23.359, -52.932	2008-03-11 to 2014-12-31
Curitibaanos	Santa Catarina	-27.289, -50.604	2008-02-29 to 2014-12-31

Validation protocol and results

Quality check procedure (EU-funded FP7 ENDORSE project)

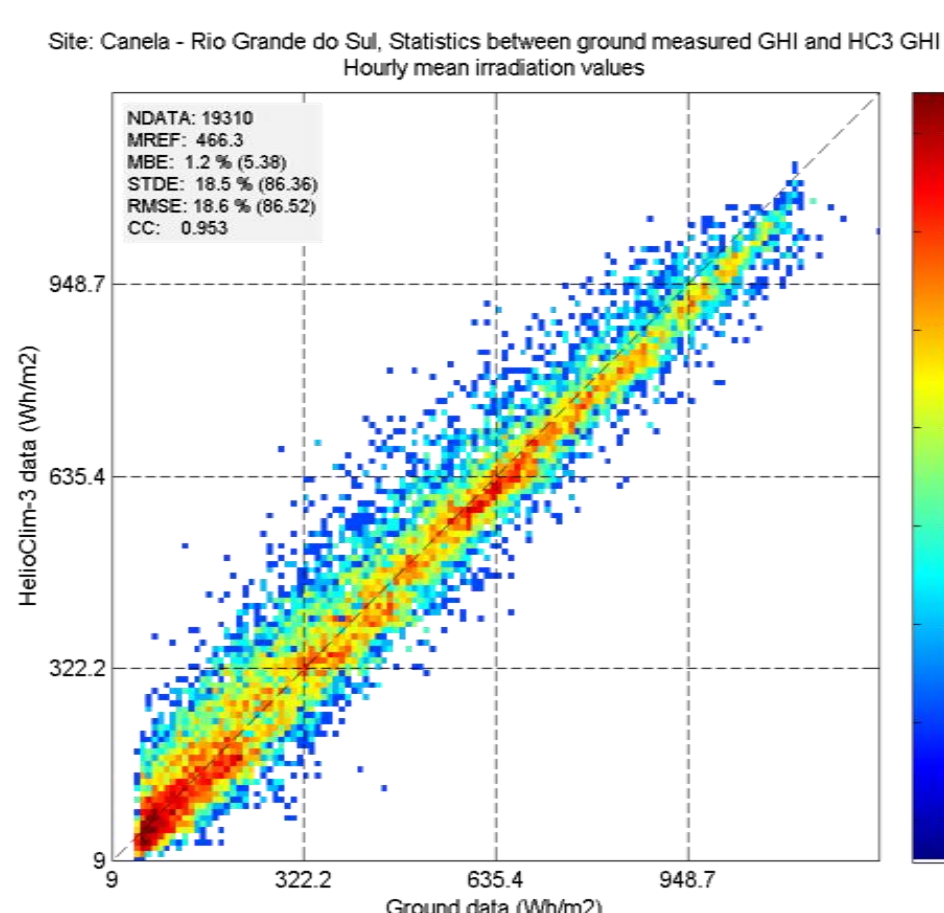
- Only keep in-situ GHI measurements above 50 W/m²
- Discard non plausible data (extremely rare and physical possible limits)
- Missing values: sum the available hours to generate partial daily values, idem for partial monthly values
- Compute: bias, Root Mean Square Error (RMSE), and correlation coefficient (CC) for each summarization.

Results for hourly values

Results for partial days

Results for partial months

Stations	Number of values	Mean - station (Wh/m ²)	Bias (Wh/m ² (rel. in %))	RMSE (Wh/m ² (rel. in %))	CC	Stations	Number of values	Mean - station (Wh/m ²)	Bias (Wh/m ² (rel. in %))	RMSE (Wh/m ² (rel. in %))	CC	Stations	Number of values	Mean - station (Wh/m ²)	Bias (Wh/m ² (rel. in %))	RMSE (Wh/m ² (rel. in %))	CC
Aquidauana	26155	501	10 (2%)	96 (19%)	0.951	Aquidauana	2496	5253	101 (2%)	410 (8%)	0.968	Aquidauana	90	146	3 (2%)	4 (3%)	0.990
Cacoal	19868	459	17 (4%)	140 (30%)	0.875	Cacoal	1933	4720	173 (4%)	587 (12%)	0.894	Cacoal	71	129	5 (4%)	8 (6%)	0.970
Canela	19310	466	5 (1%)	87 (19%)	0.953	Canela	1833	4912	57 (1%)	386 (8%)	0.977	Canela	70	129	2 (1%)	3 (2%)	0.996
Cidade Gaucha	20095	483	-5 (-1%)	78 (16%)	0.963	Cidade Gaucha	1909	5085	-49 (-1%)	305 (6%)	0.984	Cidade Gaucha	69	141	-1 (-1%)	3 (2%)	0.996
Curitibaanos	22337	444	6 (1%)	87 (20%)	0.950	Curitibaanos	2121	4678	61 (1%)	370 (8%)	0.974	Curitibaanos	76	131	2 (1%)	4 (3%)	0.994



Example of graph for the station of Canela, hourly values.

Conclusion and perspectives

- With a low bias which ranges from -1% to 4% and a good to very good RMSE for all summarizations, these preliminary results demonstrate that HelioClim-3 version 5 is a reliable irradiation resource to assess the solar potential in Brazil.
- The objective is to widen this analysis to the other 26 stations available in the INMET network.
- We also plan to carry out the same validation process on the 11 stations of the INPE network.