

Solar Similarity Forecast: satellite-derived HelioClim-3 version 4 radiation values provided at « d+1 »



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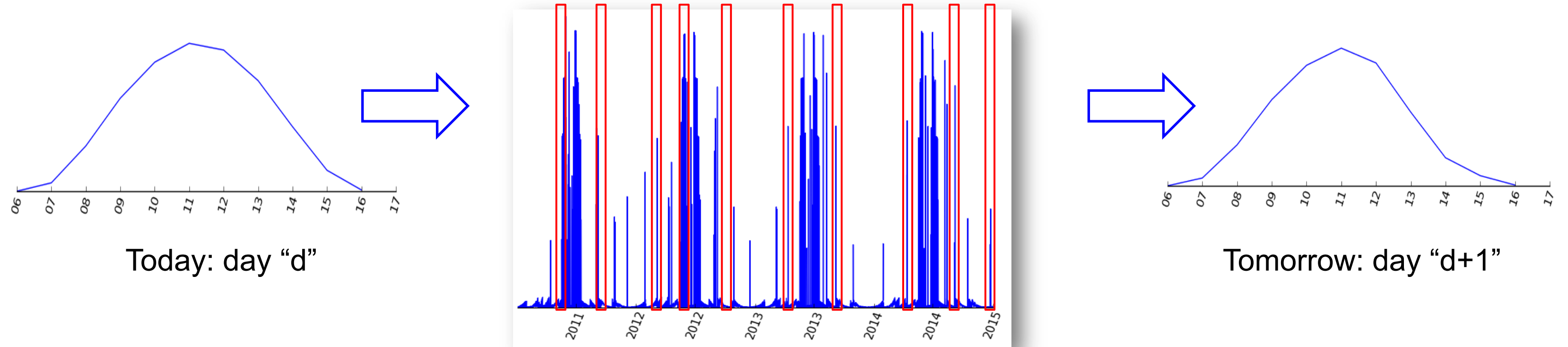
Partners



Photovoltaic plant owners are more and more urged to predict what they will produce to ensure the load balancing of the electricity network. A new solar forecast algorithm, named **Solar Forecast Similarity Method**, has been developed to predict irradiance for the next day based on a statistical analysis of the long term HelioClim-3 version 4 (HC3v4) irradiance database.

Method

- Compare today's Global Horizontal Irradiance (GHI) to the past 4 years (optimal learning period) HC3v4 irradiance database, and then:



Detect the 10 similar days in the past based on square distance → Then, average the irradiation values of the days following the 10 selected days to produce the prediction

- More information on: <http://www.soda-pro.com/soda-products/hc3-similarity-forecast>
- Use the online interface: <http://www.soda-pro.com/web-services/radiation/helioclim-3-forecast>

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Validation protocol and results

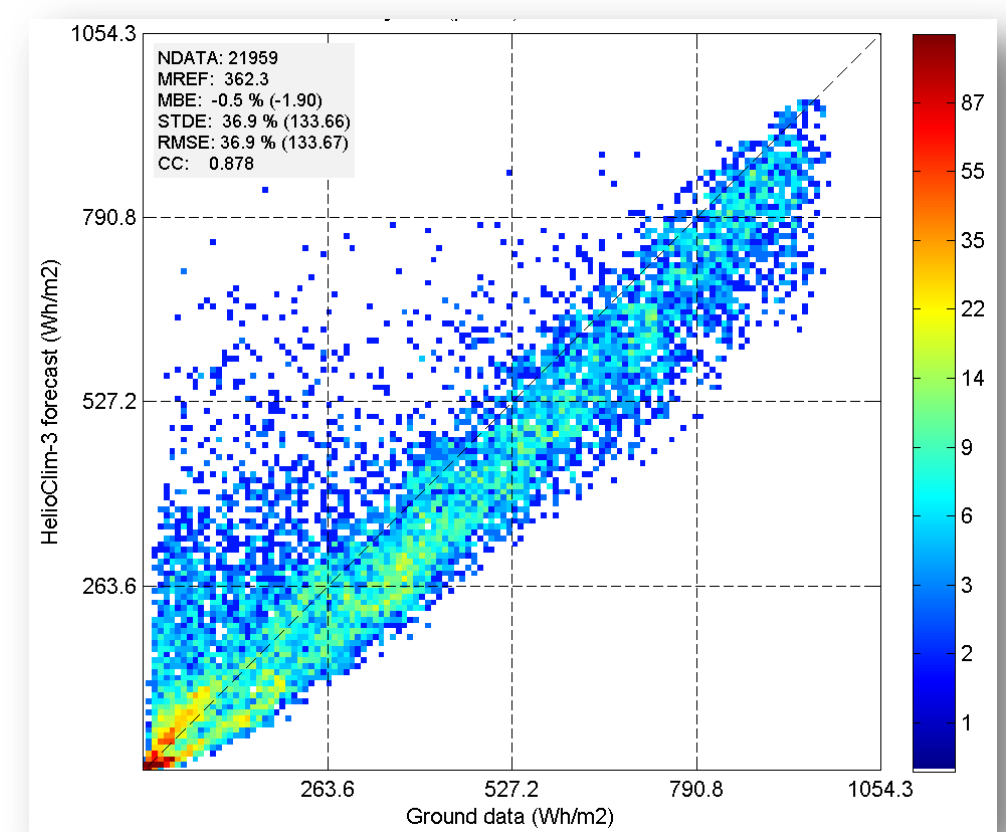
Validation protocol

- Comparison of the Similarity forecast GHI values against the measurements of Baseline Solar Radiation Network (BSRN) stations
- Compute: bias, Root Mean Square Error (RMSE), and correlation coefficient (CC) for each summarization: 15 min, 1h (see table below), 1 day, 1 month

BSRN data quality check

- Remove night and non plausible data
- Missing values: sum the available 15 min data to generate partial hourly, daily and monthly values
- 14 BSRN stations in the HC3v4 coverage, but only 9 stations with at least 4 years of data available

Ex. of 2-D histogram
BSRN station of Carpentras, 1 hour
summarization



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1 HOUR COMPARISON RESULTS	Number of values	Mean - BSRN - (Wh/m ²)	Bias HC3v4 (Wh/m ²) (relative in %)	Bias Forecast (Wh/m ²) (relative in %)	RMSE HC3v4 (Wh/m ²) (relative in %)	RMSE Forecast (Wh/m ²) (relative in %)	Correl. coeff. HC3v4	Correl. coeff. Forecast
Toravere	18095	221.9	-6.0 (-2.7%)	-3.3 (-1.5%)	60.3 (27.2%)	126.5 (57.0%)	0.958	0.800
Cabauw	22886	249.6	-9.0 (-3.6%)	-10.8 (-4.3%)	56.7 (22.7%)	126.9 (50.8%)	0.968	0.821
Palaiseau	19680	285.1	9.3 (3.3%)	6.6 (2.3%)	51.4 (18.0%)	134.1 (47.1%)	0.978	0.830
Payerne	10167	306.7	-24.3 (-7.9%)	-31.6 (-10.3%)	67.3 (22.0%)	144.3 (47.1%)	0.970	0.839
Carpentras	21959	362.3	3.5 (1.0%)	-1.9 (-0.5%)	47.2 (13.0%)	133.7 (36.9%)	0.986	0.878
Sede Boqer	14417	505.6	-35.3 (-7.0%)	-39.0 (-7.7%)	69.2 (13.7%)	98.0 (19.4%)	0.982	0.957
Tamanrasset	20996	479.2	0.7 (0.1%)	0.4 (0.1%)	71.7 (15.0%)	120.6 (25.2%)	0.974	0.926
Brasilia	9428	417.1	16.4 (3.9%)	24.2 (5.8%)	110.4 (26.5%)	154.2 (37.0%)	0.933	0.860
Sao Martinho da Serra	11567	396.3	-5.8 (-1.5%)	-13.0 (-3.3%)	73.3 (18.5%)	190.6 (48.1%)	0.971	0.787

Conclusion and perspectives

- The bias of the forecast is close to the HC3v4 bias
- RMSE can be up to 57% in cloudy areas, but correlation coefficients are almost always above 0.8
- This method performs better in slowly varying weather areas; in cloudy areas, numerical weather predictions at "d+1" will be used to constrain the choice of the nearest days in the HC3v4 database

