

## ***Interactive comment on “Local short-term variability in solar irradiance” by Gerald M. Lohmann et al.***

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In my opinion, this paper is of excellent quality. Data and methods are clearly exposed, including several engaging ideas. Data analysis is exhaustive, and the results are shown with a collection of superb figures. I think this paper will be an important contribution to the solar radiation variability subject, both for its methods, results, and discussion, and for the quality of the paper itself.

However, there are some issues that could be clarified or improved:

- The authors underline the time resolution and the spatial density of the data. However, the duration of the data is very short (4 months and 1 month, respectively) compared with papers previously published. Moreover, the time series only

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cover a certain period of the year (spring and autumn). These characteristics may limit the conclusions inferred from the time series.

- Measurements correspond to global irradiation on the horizontal plane (GHI). However, PV plants produce power with solar irradiance on a inclined plane. It must be noted that, at least on a daily basis, the variability of the effective irradiation incident on inclined planes has been reported to be higher than the variability of irradiation on the horizontal plane:
  - Suri, M., Huld, T., Dunlop, E.D., Albuissou, M., Lefevre, M., Wald, L., 2007. Uncertainties in photovoltaic electricity yield prediction from fluctuation of solar radiation. In: 22nd European Photovoltaic Solar Energy Conference.
  - Perpignan, O., 2009. Statistical analysis of the performance and simulation of a two-axis tracking PV system. *Solar Energy* 83 (11), 2074–2085.
- In order to remove trends in GHI variability, the authors compute the clear sky index from the GHI measurements. The problem with this index is that the subsequent results are model dependent. In fact, there is not a unique clear sky index because there are several clear sky models to choose. Moreover, most of the models require the use of aerosol measurements or estimations, or assumptions regarding the atmospheric conditions. Therefore, the clear sky model imposes additional uncertainties that were not present in the original data.
- The paper includes a good bibliographic review in the introduction section. However, afterwards the results of the paper are not related to the reviewed papers, and the analysis does not put the results in the context of that review. For example, the figures 4, 5, 6, and 8 show similarities with the figures published in some papers included in the bibliographic review, but there is almost no comments about it.

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- Equation 6 uses a simple increment to compute the fluctuations of  $k^*$ . This approach could be improved as discussed (for example) in Gallego, Cristóbal, Alexandre Costa, Álvaro Cuerva, Lars Landberg, Beatrice Greaves, and Jonathan Collins. 2013. “A Wavelet-Based Approach for Large Wind Power Ramp Characterisation.” *Wind Energy* 16 (2): 257–78.
- The paper will be greatly improved if the authors could publish both the measurements data and the R code, following the recommendations on Reproducible Research: “When publishing computational results, including statistical analyses and simulation, provide links to the source-code (or script) version and the data used to generate the results to the extent that hosting space permits.” The Yale Law School Roundtable on Data and Code Sharing. 2010. “Reproducible Research.” *Computing in Science & Engineering* 12 (5). Los Alamitos, CA, USA: IEEE Computer Society: 8–13.

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