Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-2-AC1, 2016

Atmospheric Chemistry and Physics Discussions

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

Gerald M. Lohmann et al.

gerald.lohmann@uni-oldenburg.de

Received and published: 20 April 2016

Thank you very much for reviewing our manuscript. We appreciate the positive feedback and feel that the detailed comments have helped us to improve the quality of the paper.

Below, each comment is quoted in italics and followed by its respective author response. A corresponding revised version of the manuscript is attached to this response as a supplement. It has been prepared by means of latexdiff and highlights all differences between the original and revised versions of the paper. All page and line numbers quoted below refer to this supplement file.

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

We have included corresponding caveats in sections 2.1 and 7 (Measurement campaigns and Conclusions) on page 3 (lines 30–31), and page 20 (lines 10–11), respectively.

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., Albuisson, M., Lefevre, M., Wald, L., 2007. Uncertainties in photovoltaic electricity yield prediction from fluctuation of solar radiation. In: 22nd European Photovoltaic Solar Energy Conference.*
- *Perpinan, O., 2009. Statistical analysis of the performance and simulation of a two-axis tracking PV system. Solar Energy 83 (11), 2074–2085.*

We have added both references and included a corresponding statement in section 6 (Discussion) on page 18 (lines 27–29).

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.

We have extended the corresponding paragraph in section 2.2 (Clearsky index) on page 5 (lines 5–8) accordingly.

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.

We have added comparative comments and cross references to the anaylses of our figures 5, 6, and 8 in sections 4 and 5 on pages 11 and 12 (lines 10–11 and 1–2), page 14 (lines 4–12), and page 18 (lines 9–16). As for figure 4, we don't see immediate similarities with the cited literature. Our figure characterizes the spatial autocorrelation structures of short clearsky index time series for different values of their mean and spread, while the reviewed papers focus on the direct analysis of k^*-increment properties.

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.*

We shall consider this suggestion for future analyses and have consequently mentioned it as an outlook in section 7 (Conclusions) on page 21 (lines 6–7).

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.

We understand the idea behind this comment and would of course like to contribute to the reproducibility of our results. However, we feel that the availability of the source code is less important for this purpose than the availability of the irradiance dataset. The procedures of our analyses are described in great detail in the text, and the methods are comparatively straight forward to apply (basically, it's just a great many additions, subtractions, multiplications and divisions; combined with different conditionings). Thus, we consider the current work reproducible without the original source code, but will consider preparing the code of future analyses in a more open manner. As for the data, we have added an unnumbered section "Data availability" before the acknowledgements on page 21 (lines 8–10), containing a reference to the appropriate project website, from which the HD(CP)^2 data portal is by now accessible.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/acp-2016-2/acp-2016-2-AC1-supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-2, 2016.