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Atmospheric Measurement Techniques Discussions

Interactive comment on "Estimating Solar Irradiance Using Sky Imagers" *by* Soumyabrata Dev et al.

Anonymous Referee #2

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Summary:

This paper presents a method to quantify the solar irradiance by using an all-sky imager with a fish eye lens. This uses data sampled in Singapore, with variations in cloudy scenes, and is aimed at better prediction of photovoltaic energy production. This paper describes a model by which a sky image's individual pixels, from compressed jpg, are used to related to a The paper is mostly well written, and concise, bordering on too short. The approach is interesting, and the applications may be wide ranging for energy forecasting. That said, the model is not well described, with major issues concerning the non-linearity and the normalization factor, that seems to make the model results look better than actuality. Model here is also a bit of a stretch as it is simply an empirical fit of the measured values. The actual evaluation of the model requires a normalization

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factor based on the difference to what is considered truth, the irradiance pyranometer measurements. There are some instances of colloquial use of English language, while most of the citations are not well formatted. The large use of footnotes also seems to be distracting to the content.

The benchmarking technique against other models seems to be lacking most of the state-of-the-art techniques that can easily be found through literature review. Techniques described by Chu et al., 2015, Baharin et al., 2016 for all sky imagers, or satellite-based methods such as the start from Mueller et al., 2004. There are likely many more methods, but just to name a few not reference in this manuscript.

Because of the questions on the model assumptions, and its evaluation against dated models, this manuscript does not seem to meet the criteria for publication unless there is significant rework. The simplistic approach does seem to have merit, but it may be overstated.

General Comments:

1. The abstract details 'accurate' but a root mean square deviation of 178 W/mˆ2 is hardly accurate. The other 'state of the art' methods should be described or at least mentioned.

2. Throughout the manuscript, the citations are not in the AMT style. They are often mostly added to end of sentences without proper brackets.

3. The use of random points in the modelling of the solar irradiance is not well described. Why not use the entire image, and subsetting by using a cloud mask?

4. The irradiance definition is not commonplace for atmospheric research: "The first step in estimating irradiance from the luminance is thus to cosine weight it according to its direction of flow" (p. 7 line 22-23). It should be cosine weighted per regards to the normal of a horizontal plane.

5. Footnotes should be either incorporated directly into the text, or as citations. Many

caveats and omissions are found in the footnotes that should be more explicitly presented.

6. Since much of the manuscript relies on comparing to pyranometer measurements, a more in-depth description of such instrument should be included.

7. The discussion of the non-linearity seems to be rather lacking of analytical analysis.

8. The normalization factor depends on having both irradiance and all sky imaging – this seems to be hiding the discrepancies of the model. Leaves the reader doubting the results from figure 4 and 5.

Specific Comments:

9. P.2 lines 3 – 13, missing multiple citations for MODIS products, GEOSS, Ouarda et al. citation is oddly written. SEVIRI acronym not defined.

10. P.2 line 23, What are “hot belts” ? This regional language use should be amended for a more understood English sentence.

11. P.6, footnote could be inserted into text, also there is no reference to “SMPTE recommended Partice 177 “

12. P. 7, footnote should be a full citation and inserted within text.

References:

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S., Dumortier, D., Kuhlemann, R., Olseth, J. A., Piernavieja, G., Reise, C., Wald, L. and Heinemann, D.: Rethinking satellite-based solar irradiance modelling: The SOLIS clear-sky module, Remote Sens. Environ., 91(2), 160–174, doi:https://doi.org/10.1016/j.rse.2004.02.009, 2004.

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