

Unfortunately one of the agreed reviewers did not submit their review. In order to move the review process along, I decided in accordance with the journal's policies to provide my own review of the manuscript.

The manuscript presents a unique dataset of 1Hz solar irradiation data combined with additional context such as solar position, satellite cloud cover. The dataset may be useful to test forecast models related to solar energy production, where high frequency variation is important.

Overall, the manuscript is well written and documents the dataset. I have a number of comments that should be included before final publication.

Thank you for taking the time to review our manuscript as an editor. Please see below for our responses relating to your comments.

1. True dataset resolution: While data is recorded at 1Hz, the sensor response time is lower. This is unfortunately a technical limitation and dataset users should be aware of this. I would recommend to better highlight the response times and to add response times to the abstract. The authors should also provide a clear definition of response time (i.e. first order response with time constant of ...). Additionally, it would be good if the authors could expand somewhere in the manuscript on the impacts of the response time on measurements and potential applications.

Agreed, this should have been addressed more in-depth, and a similar point is raised by reviewer 1. Please see my response to their 2nd comment for the full reply to both your concerns regarding response time. In short, we have added a new subsection, figure, and made changes to the abstract to explain the response time and its implications better.

Expand description of data quality flagging. The data quality flagging is important and described very concisely. It might be good to expand this a bit to make it easier to understand (or to add a flow chart).

We agree on the importance of quality control and flagging of datasets. However, conciseness here does not imply it is not important, and in essence quality flagging is a straightforward process. There are either those 5 listed criteria, or the official BSRN flags from the 1 minute dataset. The resulting availability is then illustrated in figure 2, and the quality of data supported by Figure 8 (closure of $DIF + DHI = GHI$).

The final sentence of section 3.1 is reformulated to better emphasize the role and interpretation of Figure 8 here. Also, some other parts of section 3.1 have been clarified based on your and reviewer 1's comments.

Maintenance and sensor calibrations: L 115 mentions that sensor/site maintenance happens often. However are there any records on sensor calibrations, maintenance that could be added to the description?

We have specified the exact maintenance schedule now in the text, which is Monday, Wednesday, and Friday. There is no reliable record available for the whole 10 years of data, but indirectly this is mostly captured via data quality control and flags. We agree that ideally, this is interesting metadata to have available, however.

L 112: Are these gap filled data marked in the quality flags?

They are not, we now explicitly mention this. It mostly concerns sporadic seconds, and is not at all a widespread occurrence. Should gap filling result in unphysical data, the quality filter would catch those data, but this never occurs as far as we know.

L120: Specify all three components for clarity.

Done.

Figure 4 is very dense. One could think about ways to make it less so, but it makes sense to overlay the different radiation components. The legend is confusing in the sense that it is not immediately clear to where the residuals map. Also the text on the bars is difficult to read due to white on light grey. Please revise the figures.

It is very dense indeed, but also powerful once the reader/user has figured out the details. I agree with your comments, though, and have made an attempt at improving the clarity of labels and changed some colors.

One naive question about the data in figure 4 is that it appears that cloud enhanced radiation conditions ($SW_{Tot} > \text{Clear Sky}$) dominate during cloud activity. If one were to integrate insolation over time, how would this look with respect to total irradiance vs clear sky irradiance

The extremes of irradiance (cloud enhancement and shadows) will cancel out the more temporal or spatial integration/averaging is applied, and should eventually always settle below clear-sky irradiance. Perhaps this is illustrated in an extreme way by the climatology figure (9 in revised manuscript), which shows the average monthly irradiance is well below clear-sky.

Figure 5: I am not sure, I understand this correctly, but according to the text shadow is defined as $DNI < 120 \text{ W/m}^2$. Around 8 UTC there is data classified as sunshine which does seem to fit the shadow definition from the description text. It would be good if the authors could explain this.

I understand the confusion here, as the definition is for DNI, but for the figure we use the horizontal component DHI. This is so that one can visually add up DHI and diffuse to find the global irradiance, and thereby estimate individual contributions to the sum and validate the setup. Note that this is April 3, at 7 UTC, such that the solar angle is low enough for direct horizontal irradiance to be less than half the direct normal (or 'beam') irradiance.