

Recommendation: Major Revision

My original review recommended that the authors go back, check which sensors are 3-output LWR and redo the analysis without the a & b terms in the correction for those sites that used 3-output LWR. It is very disappointing that the authors decided not to do this.

With the greater detail about what LWR timeseries were used, it is clear that all of the time series came from either PMEL or WHOI. All PMEL LWR were 3-output LWR and thus the LWR provided to the public has already been corrected for the differential heating of the case and dome at those sites. I contacted Bob Weller, lead scientist of the WHOI UOP group, and he confirmed that all UOP LWR are also 3-output LWR and thus the user SHOULD NOT apply additional corrections for differential heating to any of the longwave radiation data used in this analysis. The author's post-processing with the " a " and " b " terms in equation 9 should not be referred to as "correction". It is an "adjustment" to the data that actually introduced a bias error.

The data providers at WHOI and PMEL do not want users to do this adjustment. In order to discourage any readers and future users from doing a similar "bad practice", the authors have two good choices and one not as good choice:

Preferable choice: Explain that all LWR were corrected for differential heating by the data provider and thus the only potential correction needed is for any solar radiation leakage caused by pinholes or degradation of the dielectric coating on the PIR dome. Then reprocess the data using only the λ term in equation 9. Please provide an explanation for the choice of λ used.

Another good choice: Redo the analysis using the raw data downloaded from the UOP, GTMBA and OceanSITES dataservers. Justification for not applying equation 9 – (a) differential heating correction was already performed by data provider; and (b) the spikes in the LWR associated with the degradation of the dielectric coating on the PIR dome are not seen on all deployments. Therefore a universal application of this correction is probably not appropriate.

If the authors continue to use their post-processed data with the 3-term equation 9 adjustment, then, the authors should revise the manuscript to:

(1) Clearly state that they learned during the review of the manuscript that the data providers had already corrected all longwave radiation data for differential case and dome heating, and thus the adjustment performed by the authors was not a correction, but instead introduced a bias.

(2) Quantify this bias and include it in the error analysis. For hourly data, I estimate the clearsky LWR will have a noon-time bias of up to 5 W/m². Note that this is much larger than the reported

bias in the model fit. For this reason, I recommend that the authors...

(3) Remove all results associate with analyses of the biased daytime hourly data, e.g., Figure 3b, Fig. 4, Table 6, Figure 5, Figure 6, etc..

Obviously, I very much hope that the authors will choose to redo their analysis with either the raw data provided by the data providers or the lightly-post-processed data that includes a median or mean value of lambda if it is applied universally to all PIR, regardless of indication of solar radiation leakage.

Response:

Thank you for your detailed and constructive feedback.

In response, we have removed the application of the “a” and “b” terms in Equation 9 and reprocessed all longwave radiation (LWR) data using the raw data downloaded from the UOP, GTMBA, and OceanSITES data servers. We now apply no correction for differential heating, as this correction has already been performed by the data providers. We also revised the manuscript accordingly to clearly explain and justify this decision.

As noted in the revised manuscript (Lines 303–313):

“As pointed out by Pascal and Josey (2000), the main errors in measuring R_l are from the shortwave leakage and differential heating of the sensor. These errors (ΔR_l) in R_l observations can be corrected according to Pascal and Josey (2000). However, this correction was not applied in our study, as (a) differential heating corrections had already been performed by the data providers, and (b) the R_l spikes associated with sensor degradation were not present across all deployments, making a universal correction inappropriate. We also compared the results with and without the correction and found that the conclusions remained unchanged.”

In fact, our updated results indicate that model performance slightly improved without the “a” and “b” adjustments, reinforcing your point that these adjustments introduced a bias rather than improving data quality.

We have accordingly revised all affected figures and tables, including removal or update of results based on inappropriately adjusted daytime hourly LWR data (e.g., Figures 3b, 4, 5, 6 and Table 6).

We appreciate your emphasis on avoiding the propagation of poor practices and believe that the current version of the manuscript aligns well with both the data provider recommendations and community standards.

We thank the reviewer again for pointing out this critical issue, which has led to an improvement in both the accuracy and transparency of our analysis.