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Comment on acp-2022-794

Anonymous Referee #1

Referee comment on "Parameterization of downward long-wave radiation based on long-term baseline surface radiation measurements in China" by Junli Yang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-794-RC1>, 2023

Review on "Parameterization of downward longwave radiation based on long-term baseline surface radiation measurements in China" by Junli Yang, Jianglin Hu, Qiyang Chen and Weijun Quan

General comments:

This study investigates different empirical parameterizations of the surface downward longwave radiation regarding the adequacy for their use in China. In addition, the authors develop a new empirical parameterization and perform a comprehensive evaluation using data from 7 stations from the Chinese Baseline Surface Radiation Network. The authors conclude that the parameterizations and associated coefficients they derive are suitable for the determination of downward longwave radiation over China. The paper is well written, fairly straightforward and clearly structured. The applied methods are sound.

My main reservation with this study is the relatively limited applicability of its results, being only of use for the determination of downward longwave radiation in China. To make the paper more attractive for readers outside China and to increase its impact in the community, information on the applicability of these parameterizations outside China would be valuable. For example, the Baseline Surface Radiation Network (BSRN, www.bsrn.awi.de) with numerous worldwide distributed high quality radiation stations would provide a framework to test and calibrate these parameterizations under more diverse geographical and climatological conditions. This would then allow to investigate the more general applicability of the parameterizations and make it more interesting for the worldwide readership of ACP. While such a broader analysis might be challenging to achieve within the limited time of a revision phase, I would find it at least useful if the authors could add a discussion of the potential and limitations of these parameterizations

for their use outside of China, in order to provide guidance to readers interested to apply them for the determination of downward longwave radiation in other parts of the world.

While I think the English is overall adequate, there are still numerous minor issues as indicated in the technical comments. As I certainly not have caught all of them, I encourage the authors to doublecheck the manuscript in this respect, ideally with the help of a native English speaker.

I recommend the acceptance of the manuscript after revisions as outlined above and below.

Specific comments:

L69ff In addition to the climate zones, it would also be interesting to know if the stations are located in an urban, industrial or rural setting. This can give some indications to what extent the measurements could be influenced by local anthropogenic pollution sources.

Table1: it would be worthwhile to include in this table also the measurement period for each site.

L103: are there also collocated upper air soundings (radiosondes) available at some of the stations? BSRN recommends the high quality radiation stations to include upper air soundings for the interpretation of the measured fluxes and testing of models.

L130: I think the structure and formulation of the Brunt model and the Weng model should be explicitly described here or in the method section.

L131: It would be good to describe precisely how the clear sky hourly data were identified as being clear sky.

L142ff: ok here come the formulations of the different parameterizations which I expected earlier on (comment L130). Maybe this part could be described in the method section in a paragraph describing the different parameterizations used in this study together with their formulas.

L150: by eye it is hard to recognize much difference between the 2 models (red and black curve) for the dry conditions ($e \leq 17.5$ hPa), thus hard to fully appreciate the improved performance of the Wang model for dry conditions.

L185ff: it is not clear to me how the structure of the parameterizations has been established. Why do they have precisely this form and not e.g. another one?

L194ff: I understand the independent clear-sky dataset is independent in the temporal sense, i.e. the data stem from another period (from 2018 onward rather than before 2018), however still from the same stations. Two questions here: 1.) why not all 7 stations have been used, but only 4? 2.) Is there a chance to do a validation also at independent stations (not only independent times)? Basically one could use the entire worldwide BSRN dataset for this (see general comments). This would have the advantage that one could also get an idea on the performance of these parameterizations in other parts of the world under different climate regimes.

L202ff: similar comment as above, why only 3 stations are used here for a validation and not all seven? Again also an evaluation with (spatially) independent stations would be interesting, ideally even outside China.

L207: Why should more samples necessarily help to reduce the MBEs?

L239ff/Figure 5: I assume this validation uses hourly values? And uses measurements from all 7 stations? This should be mentioned in the text or the figure caption.

Technical comments:

L29: add "e.g.," in front of the references, as there are many other and also earlier papers dealing with DLR.

L31: same comment, add "e.g.," in front of the references, as there are many other application papers of DLR. There are several other places in the manuscript where an "e.g.," in front of the references would be appropriate, as other papers could equally well be cited. The authors may check on this throughout the manuscript

L40: hereinafter refer to > hereafter referred to as

L44: the presence of cloudS

L59: in terms of > based on

L63: to estimation of > for the estimation of

L90: influencing > influences

L106: strictly quality controlled > strict quality controls

L140: hereinafter refer to > hereafter referred to as

L155: to have basis in physics > to be based on physics

L166: Circles represent data pairs > Circles represent hourly data pairs

L170: are in consistent > are consistent (inconsistent has the opposite meaning!)

L217: can overestimate > overestimates

L241 & L250: and that > and the one

L252 & L253 & L254 & L255: could underestimate > tend to underestimate

L269: three parameterization models> all three parameterization models

L278: improve accuracy > improve the accuracy

L279: this sentence sounds awkward and needs reformulation

L280: to establish > to be established

L286: whereas > however

L289: station > stations