

The number of lines in the comments corresponds to the revised manuscript after the first-round revision. The number of lines in the responses (in red) corresponds to the revised manuscript with changes noted for the second-round revision.

Reviewer 1:

The authors have addressed all the critical items I had pointed out, particularly I thank them for showing the comparison of the simulation with the new ones performed with the latest version of LBLRTM code v12.16. From my point of view the manuscript can be published as is.

Thank you for your insightful comments towards our manuscript! Your suggestions have been invaluable in helping us refine and strengthen our paper.

Reviewer 2:

I thank the authors for their thoughtful consideration of my comments on the first draft of their paper. I find it much improved, and would recommend that it be published after the authors consider these few minor comments:

We are grateful for your valuable comments and suggestions regarding our manuscript. They have significantly contributed to the enhancement of our work.

1) Line 223: the surface contribution is also has a reflected term; i.e., $\text{surface_contribution} = (\text{downwelling radiance}) * (1 - \text{emissivity}) + (\text{emission from surface})$. Using the lowest altitude observation as they are includes this, so only the text needs a slight tweak

Thank you for pointing this out! We have revised the manuscript in Lines 212-215.

2) Line 395: only AERI channels that dominated by either water vapor, carbon dioxide, or both are used in the analysis

Here, we have included only the channels that are dominated by either water vapor or carbon dioxide. We have revised the corresponding descriptions in the manuscript, specifically at Lines 357-359, Lines 377-378, and Line 392.

3) Line 425 (and this is absolutely critical to me): “Three field campaigns, during which a single radiosonde was launched, were conducted...”. This is a good study, but its biggest weakness is the very small number of true comparisons that were done (3).

We acknowledge and agree with you that the limited number of field campaigns is a significant limitation of our study. Our belief in the authenticity of the phenomena described in the manuscript arises from the consistent radiative closure features observed across all three campaigns.

To address this limitation within the manuscript, we have incorporated the following two sentences at Lines 414-417:

“It is essential to acknowledge that the sampling size for this study was limited to three field campaigns. Despite the observed consistency in the radiative closure characteristics of AERI and HiSRAMS across these campaigns, further research involving additional field campaigns is necessary to comprehensively evaluate the radiative accuracy of these two instruments.”