

Manuscript egosphere-2023-1665 – Replies to Reviewer #2 Second Report with Revisions

The authors correctly addressed the major comments I had, giving greater depth and significance to their work.

The reviewer's comments were indeed very helpful toward improving this paper, and we thank the reviewer for the thoughtful review.

I appreciated that they included a discussion of the comparison with the ARM ground-based instruments, showing some disparity with the phase observed by MODIS. However, to my knowledge, the VAP THERMOCLDPHASE products use the HSRL instrument in addition to other observations (KAZR, MWR), which makes it possible to identify the phase of layers beyond the altitude where the lidar signal is extinguished. The authors should, therefore, revise the section starting with "This inevitably results from the HSRL's upward-looking view" (Page 10, Line 254).

This section has been clarified. The point is not that THERMOCLDPHASE would not detect the phase of higher cloud layers beyond the lidar attenuation, but rather that the majority of these clouds precipitate ice below the cloud base, which is entirely missed by the satellite passive imager (MODIS).

Interestingly, this additional analysis also shows a general underestimation of clear-sky cases with TSI, most marked for Regime 3 (about 10 %). Can the authors comment on this difference?

This section now mentions a known tendency for TSI to sometimes underestimate clear sky fraction due to forward scattering contamination near the position of the direct solar beam.

Few minor comments and typos:

Page 8, Line 197: A space is missing after ERA5.

This has been corrected.

Page 9, Line 226: Should be "reanalyses".

This has been corrected.

Page 16, Figure 9: The figure may be easier to read using a log scale.

The figure now uses a log scale.

Page 20, Line 457: In the PDF version I reviewed, the sentence starting with "considered here, the fact ..." appears two times.

This has been corrected.

