

Interactive comment on “CALIOP V4 Cloud Thermodynamic Phase Assignment and the Impact of Near-Nadir Viewing Angles” by Melody A. Avery et al.

Anonymous Referee #1

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In my view, this is a strong manuscript that has a topic suitable for the journal and its special issue, and presents high-quality work relevant to a large community. From my perspective, the two key contributions are (a) a detailed description of the updated algorithm for cloud phase determination in the most recent version of the operational CALIOP cloud product, and (b) an analysis of cloud phase differences that occur when we switch from analyzing the previous version of CALIOP cloud products to analyzing the newest version. The first topic is important for all researchers analyzing CALIOP cloud phase data; the second topic is important for the wide community of people who have experience with the previous version of CALIOP data. The methodology is sound, and the presentation is clear. I do have a few suggestions for minor improvements in

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wording or clarity, but none of my comments raise significant concerns.

Specific comments:

Page 3, Line 19: I suggest removing “the” from in front of “CALIOP”.

Equation (5): Is the last relationship meant to be “equal”, as opposed to “nearly equal”? If it is indeed meant to be “equal”, it would help to explain why the equality.

Page 10, Line 5: It would help to add a sentence on explaining why the positive correlation for water clouds (I guess multiple scattering?) and why the negative correlation for ice clouds (perhaps due to larger backscatter being associated with a larger fraction of HOI, which have a smaller depolarization than ROI?). Of course, readers could always look up the cited reference for more information, but adding a sentence could make it more convenient and ensure that all readers understand the physical concept behind this spatial coherence test (which plays a significant role in the manuscript).

Page 10, Lines 26-28: I suggest clarifying whether it’s the color scale that would be adjusted and mentioning that this adjustment is not shown in the figure. Most importantly, though, I recommend mentioning the appropriate correlation coefficient value in the text, or including it into the figure. This would help because, just looking at the current figure panels, it is not clear that the correlation is indeed positive in the water sector.

Page 20, Line 9: The words “the view” seem to be missing in front of “from the west”.

Page 26, Lines 3 and 4 of the caption for Figure 16: It would help to explain what is meant by “granule”. Just a few words saying that it’s a roughly half-orbit extending from one terminator to the next could be sufficient. This word (and maybe the data selection used for Fig. 16) should also be explained in Section 5.2 (Line 4 of Page 28) for the sake of readers who jump to the conclusions right after reading the abstract, without going through the detailed text first.

Page 26, Lines 20-21: It could be interesting to include some thoughts on whether the increase in unknown phase is likely caused by the presence of unidentified HOI

(or perhaps by surface reflection?). The same applies to the increase in cloud volume (Page 28, Line 3), which is only 5% for 3° view angle, but is 9% for 0.3° view angle.

Page 27, Line 20: The section number 5.1 is missing from in front of the section title.

Page 27, Lines 27-30: I suggest adding something along the lines of “The impact of” at the beginning of this sentence, if I am right in assuming that it is not the crystals themselves that we try to eliminate (by excluding clouds with HOI from the CALIOP products), but we try to minimize their impact on the retrieved cloud properties. Also, it would help to delete, replace, or explain the word “more”, as I was not sure about “more than what”? Finally, for the sake of clarity, I suggest replacing “they also occur as” in Line 29 by something like “this is a fairly minor issue, as HOI affect”.

Page 28, Line 30: I suggest adding “is” in front of “composed”.

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