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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Cloud thermodynamic phase inferred from merged POLDER and MODIS data" *by* J. Riedi et al.

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This is an interesting work on improving current cloud phase retrievals by merging independent algorithms currently applied to MODIS optical and infrared channels and POLDER polarized radiance. The end result will be cloud phase discrimination and a confidence level based on the performance of the merged algorithms. This quantification should benefit a number of applications, as stated in the text.

There are two concerns that I have and that I would like to see addressed:

1. The way in which the confidence level is quantified is not described at all. For example, 14113.15 "... low confidence value (about 70) ..." is presumably not what the authors intended by establishing this index. If it is to be useful the user must know how

it is defined. How are the individual methods weighted to get to the final number? For each pixel, what are the products? Does the number 0-200 indicate liquid...ice and a confidence value? Or is there only the number 0-200?

2. Potentially more troublesome is the definitions of mixed phase. Perhaps I misunderstood but the conclusion of mixed phase seems to follow when the different algorithms give different results. That should really be low confidence for any phase. How about high confidence for a mixed phase cloud? Have the authors simulated mixed phase signals in their algorithms? Many users would be very interested in a high confidence for a mixed phase signal. Granted, this is not likely very simple. At the very least a distinction should be made. This leads back to item 1) that the quantification of confidence level should be clearly defined.

The following are minor comments. In general the paper would benefit from a thorough editing.

14105.3-5: "Cloud thermodynamic phase is an important indicator used by forecasters to determine hazardous road conditions." Is there a reference for this? Seems like phase is not sufficient; must have knowledge of temperature structure below cloud base. A reference to aircraft icing conditions may be appropriate here.

14108.1-3: Change word order: "...which is less sensitive to multiple scattering effects than the total radiance, L."

14108.10-14: The polarization technique of phase determination is not well explained, although it is certainly true that it is well known to those who know it well.

14108.17-20: Already said in 14107.21-22.

141109. 14 "droplet size does not increase too much" and l. 23 "size become too large" imply that changing particle size impacts retrieval when in fact it is meant that when drops are not too large (too small for crystals) that the retrievals work. Please give some quantitative thresholds.

ACPD

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14111.1: Presumably "issues" means problems? State as such.

14112.12: explain "poor observation geometries".

14115.8: quantify the "given threshold".

14115.17: "Not that the reverse isn't ..." This is at least a double negative and may be more! Very confusing sentence.

14116.25: Spherically equivalent volumes for ice crystals? This is a poor representation of ice crystal scattering. Please refer to the work on P. Yang. These are used for MODIS ice cloud retrievals. Or am I misinterpreting this statement?

14120.14-15: Isn't "confident mixed" = 100, just like "low confidence liquid and ice"? Explain how this is different, and which additional parameter (extra confidence parameter?) is used to make this distinction.

14123.20: This confidence index is not introduced in the text - explain.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14103, 2007.