

Interactive comment on “Combining visible and infrared radiometry and lidar data to test ice clouds optical properties” by A. Bozzo et al.

Anonymous Referee #3

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General comments: This paper shows comparisons of modeled radiances in the visible and near infrared region against measured radiances from MODIS Airborne Simulator (MAS), Scanning High-resolution Interferometer Sounder, (S-HIS), and Cloud Physics Lidar, (CPL). In general the paper is well written and highlights potential inconsistencies in the ice crystal phase function models between the SW and NIR spectrum. It is not obvious however, that the purpose of the paper is to ‘test’ ice cloud optical properties, in fact the paper is organized more as an evaluation of the forward modeling methodology (LBLMS).

The juxtaposition between the MAS cloudy case and the MODIS cloudy case is a little confusing. I think there needs to be a better explanation of the purpose of section 4.3 in both the introduction and in section 4.3.

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Explain why the that particular field experiment data were chosen, why not use data from an experiment where cloud in-situ data were available? Same thing for the MODIS case, why not choose a granule where more coincident data sets were available, for that matter why not use a MODIS Aqua granule and collocated CALIPSO/CloudSat data to get accurate cloud heights and water phase.

There should be more discussion on the parameters of the particle size distribution used in the specific simulations.

Specific comments: Section 4.1: It be nice to see the impact on the simulations if the CPL extinction data were used to infer the vertical distribution of IWC. There are certainly going to be differences in the IR radiances for an inhomogeneous vertical distribution of cloud extinction. Does the RT-RET retrieval use the CPL cloud optical depth or the extinction profile?

Page 7226, sentence starting on line 15. Why not use the best ‘assumed atmospheric temperature profile’, the reasoning hear seems weak.

Page 7237, sentence starting on line 13. This is a false statement, the lidar retrieval of optical depth depends on the value of the phase function at 180 degrees (the backscatter phase function). No where is it stated in the text if the lidar retrievals are assuming a default backscatter phase function, or are using a measured value.

Figure 2. Not really useful.

Figures 3 and 4. Don’t include the data from 1848 cm⁻¹, it only draws a reader to focus on it. Just leave the statement in the text that the channel was excluded.

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