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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The variability of tropical ice cloud properties as a function of the large-scale context from ground-based radar-lidar observations over Darwin, Australia" *by* A. Protat et al.

Anonymous Referee #2

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General Comments:

This is a comprehensive study of ice clouds observed using ground-based radar and lidar observations from the Atmospheric Radiation Measurement Program at Darwin, AU. The properties of these clouds in different meteorological regimes are examined using a huge data set comprising four years of data. This study will be of considerable use for evaluating general circulation models in the Darwin area and I recommend that

the article is accepted for publication in nearly its current form.

Specific Comments:

1. In Abstract, remove mention of terminal fallspeeds. 2. 20071, line 20. Better understanding of microphysical processes and in-situ observations are also key. An example is ice concentrations. Shattering on the inlets of probes has resulted in overestimates of ice concentrations and extinction estimates. A second example is to better understand ice nucleation pathways. 3. 20073, lines 15-16. My most major comment is that this study has required the use of lidar data. Anytime cloud optical depths are higher than about 3, corresponding to somewhat thin and high ice cloud, the observations are not included in the analysis. This skews the observations to a certain yet relatively unknown subset of the ice clouds in the area. This point needs to be emphatically emphasized in the abstract and elsewhere. 4. 20076, lines 24-25. This is not really ice cloud occurrence. See comment 3. 5. 20078, line 5. Not true cloud top heights, only when lidar and radar both detect cloud? 6. 20081, line 5. Unless you can demonstrate this it should be taken out. 7. 20082, lines 1-2. It is not easy to believe this level of accuracy. 8. 20083, line 2. This is not a plausible explanation as aggregation is inhibited by both small particles and temperature at these heights. A plausible explanation is sublimation although the IWCs increase downward so this is not a likely explanation either. Could it be a retrieval artifact. Could it be where lidar alone and lidar/radar together detect cloud?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20069, 2010.

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