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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Synergetic use of millimeter and centimeter wavelength radars for retrievals of cloud and rainfall parameters" *by* S. Y. Matrosov

Anonymous Referee #2

Received and published: 8 March 2010

The paper presents an approach for deriving cloud and rain properties from the combination of a cm-band precipitation radar and a mm-band cloud radar. The combination of the two instruments allows retrieval of cloud liquid water path during stratiform precipitation events. Overall, the paper is well-organized and clearly written and presents interesting new results. I recommend acceptance, with consideration of the general comments below.

Comments:

1) The author mentions that an important objective of the ARM program is a comprehensive characterization of hydrometeors in the vertical atmosphere column. This is

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true, but another important objective is characterization of the vertical column at all times. One of the strengths of the ARM sites, of course, is that the remote sensors operate continuously and provide a long time series of measurements which enable statistical studies as well as case studies. Since this paper is presenting the retrieval, understandably only 2 case studies are discussed. However, it would be useful to the reader for the author to briefly discuss how this retrieval could be applied to the longer dataset. Would it be possible to automate the criteria for identifying stratiform precipitation cases? Once a case is identified, are the steps of the retrieval fairly automatic or is manual intervention required to produce good results?

2) I was a little confused by the discussion of Eqs 3-5 on p. 952. It is stated that parameters a and b are established for each observational case and that R_JWD and Zec(h0) are used to calculate the shift (delta-Z) to "calibrate" the radar. At this point in the paper it is not clear on what time-scale either of these equations are applied (although later an example of the regression to retrieve a and b is shown). It would be useful to say explicitly at this point that parameters a and b are calculated from a regression on all the data for the case. I am also not clear on the time-scale at which the delta-Z is calculated – is it for each profile or as an average over all the profiles in the case? If the former, how much does the delta-Z vary from profile to profile?

3) Section 3.1, it is stated that a "conservative" value of the melting layer bottom height is chosen. This means that the CLWP may be somewhat underestimated. Is this believed to be insignificant due to the large values of CLWP?

4) Section 3.2, states that the IWC-Zec relationship was "obtained with in situ microphysical data set used for deriving mm-wavelength IWC-Ze relationships for high reflectivity ice clouds". This statement is a little confusing as here you are using a cm-wavelength IWC-Ze relationship. Perhaps you could change the sentence to "previously used for deriving" just so it is more clear that you are using a different IWC-Z relationship here.

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5) Although retrieval uncertainties are nicely presented, no mention is made of other datasets for comparison/validation of the retrieval results (or the lack thereof). Are there any datasets (satellite?) that could be used to compare to these retrievals?

Technical comments:

1) Abstract, line 22, please change “estimate” to “estimation”

2) P. 949, line 15, please change “correspondingly” to “respectively”

3) P. 953, line 8, Reflectivities is spelled incorrectly

4) P 954, line 1-2, please change “in tropics” to “in the tropics”

5) P. 954, line 19, please remove “the” from “is its the most robust mode”

6) P. 956, line 6, Incorrect figure reference, should be Figure 5.

7) P. 960, line 12, change “radiozonde” to “radiosonde”

8) P.960, line 17, please change “due water” to “due to water”

9) P. 961, line 9, change “Another reason of” to “Another reason for"

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 947, 2010.