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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

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Specific comment 1. The difference in the sampling volumes of the C-POL and MMCR radars is obviously a limiting factor. To mitigate this issue the current version of the retrievals uses interpolation of the C-POL data to the MMCR vertical resolution points. As stated in the last sentence of the paragraph which follows Eq. (5): "Since the MMCR vertical gate spacing (∼90 m) is finer than that of C-POL RHI estimates above the MMCR site (∼300 m), the linear interpolation is used to recalculate C-POL reflectivities to the MMCR vertical resolution points". Retrievals were also attempted with another mitigating approach. Namely, MMCR running 3 gate averaging, which approximately

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matches the C-POL resolution, was used. The differences of results obtained with both these approaches were well within the estimated retrieval uncertainties. In future, the use of collocated and vertically-pointing measurements at weakly and high attenuating radar frequencies, when such radars are available for ARM (sometime after 2010), will mostly remove such problems. Unfortunately, correlating the C- and Ka-band reflectivities at some lower range where atmospheric and hydrometeor attenuation is small for both wavelengths is not feasible because of the presence of attenuation of Ka-band signals by the wet radome. This attenuation can be as high as 20 dB (as seen from Fig.2) and it is generally variable in time and nearly impossible to quantify. It does not, however, influence Ka-band reflectivity reflectivity gradients which are used for retrievals.

Specific comment 2. Yes, delta R_m in eq.(8) is the uncertainty of R_m. The definition is added to the revised version of the manuscript.

Specific comment 3. The parameter SD in Fig. 3 is calculated as the standard deviation of the C-POL reflectivities observed in a given C-POL vertical profile (in a liquid hydrometer layer) relative to the mean value of reflectivity in this profile. In fact, it is a measure of the vertical variability of reflectivity in a vertical profile. This clarification is added in the revised manuscript.

Specific comment 4. I agree. This choice of the radar frequencies is what is currently available at this site and it is not perfect in terms of frequencies and in terms of a collocation. In the last paragraph of the manuscript, a more suitable choice of radar frequencies is discussed. Hopefully, ARM will have these better choices after new ARM scanning radars will be deployed (sometime during late 2010 or early 2011).

Specific comment 5. The reason here is that the exact variability of DSDs along the vertical coordinate is not generally known, while the mean rain rate (R_m) in the vertical layer of liquid hydrometeors needs to be estimated using the rain rate profile from Eq. (3). So, Eqs. (3) and (5) should be consistent.

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Technical comment about Fig. 4 Yes, of course. The axis label in Fig.4 (“rainfall rate”) is now deleted (the corrected Fig.4 is uploaded).

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

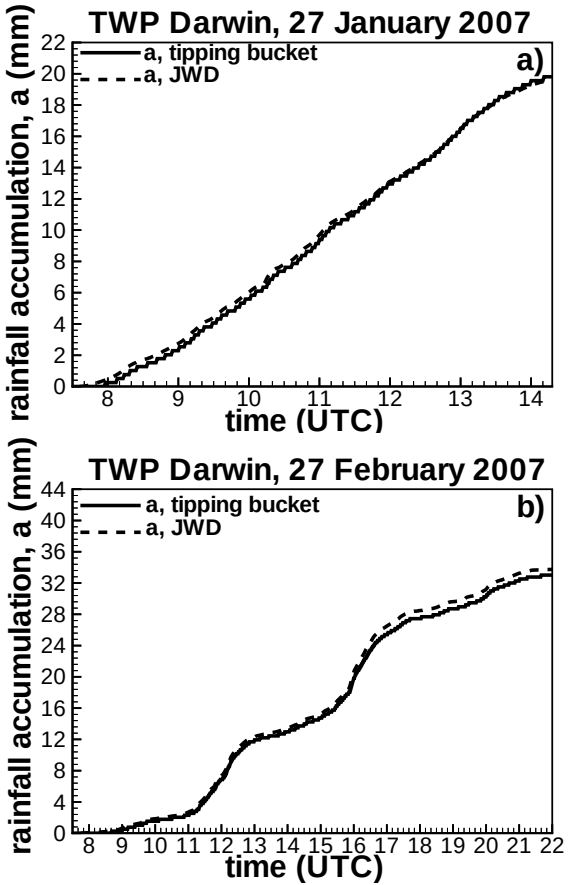

Fig. 1. corrected Figure 4. Time series of rainfall accumulation from the JWD and rain gauge at the TWP Darwin site for the events of 27 January 2007 (a) and 27 February 2007 (b).

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