

Interactive comment on “Estimation of Liquid Water Path in Stratiform Precipitation Systems using Radar Measurements during MC3E” by Jingjing Tian et al.

Anonymous Referee #2

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The paper describes a technique for estimating the LWP in stratiform precipitation. The methodology is applied to 20 case studies collected during MC3E. The paper is generally clear and well written and targets a very important issue, the partitioning between cloud and rain liquid contents in precipitating clouds (though it finds only a partial solution to it). Some comments

- 1) It must be clear from the beginning that the methodology is only capable of computing the LWP below the bright band and that the methodology is not applicable in presence of liquid above the melting layer.
- 2) The explanation on the overestimates of LWPs by radiometers is pretty convoluted

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(at the moment it is a full page, page 17) and needs to be simplified. To better understand this bit in first place you could compute the extinction (and scattering) coefficients like in Fig.10 of your second reference. Clearly raindrops are much more efficient in extinguishing radiation than cloud droplets (but this depends on the size of the raindrops! so I do not agree with the 2/3 statement at line 382). Yes I agree the single scattering albedo also is much larger. Second you could use RT computations (e.g. Eddington or a successive order approximations where you can simplify all equations because for your purpose you can neglect polarization effects and you can assume spherical particles only) to compute the TBs for the two channels used by the radiometers to show the enhancement when r-LWP instead of c-LWP is present. Fig4 of your second reference shows an example of that for 30 degrees elevation angle (here you need to repeat the computation at nadir and for the frequencies of the radiometer). But from that figure it is clear the enhancement in case of rain: compare the TBs e.g. for c-LWP=1 kg/m² vs r-LWP=1 kg/m².

- 3) Also a key effect in enhancing brightness temperature is the presence of the melting layer (relevant literature must be cited).
- 4) I found also the discussion at line 315-324 a bit confused: I am not sure why you want to include other disdrometers located within 5 km. I would suggest to delete it.
- 5) Figure A: it would be good to see also contour lines with the values of μ .
- 6) Several typos (e.g. line 196, 292)
- 7) The names of the parameters in the Appendix are not optimal, e.g. Z_3GHz RR does not suggest a ratio. Also their units is not dB as stated in the caption of Fig.1. (dB corresponds to $10 \log_{10}$ of a UNITLESS quantity!!!); here you are defining a very specific unit (like the dBZ, you need to specify the units used for z and LWC).

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