Atmos. Meas. Tech. Discuss., 5, C456–C459, 2012
www.atmos-meas-tech-discuss.net/5/C456/2012/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Observations of tropical rain with a polarimetric X-band radar: first results from the CHUVA campaign" *by* M. Schneebeli et al.

Anonymous Referee #2

Received and published: 30 March 2012

General Comment

This paper focuses on attenuation correction at X-band, mainly using the Ensemble Kalman Filter (EKF) method, which is the object of a paper currently in print on JTECH. I agree with reviewer #1 that the title is not appropriate for the content of the manuscript. The main focus of the paper is indeed the process of attenuation correction (path and wet radome induced) and not the polarimetric observations during the CHUVA campaign. For example, despite the title, from the results presented it looks that the data actually considered, although not clearly stated in the text, come from a single day (April 12 2011). If the paper aims at focusing on a measurement campaign more details are needed, e.g. how many events were recorded during the campaign? Which events are considered for this study and how was the selection performed? A mete-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

orological description of the considered events (including microphysics based on the available instrumentation) should also be included to set the environmental conditions. Anyway, given the actual content of the manuscript, I suggest that the title could be changed (relating to attenuation correction at X-band) and the manuscript accordingly re-shaped. This option would certainly require less effort than try to adapt the content to the current title. Most of the material already fits the purpose and only smaller portions of the manuscript will need a major revision. If this way is pursued I recommend in particular to improve the part about the radome attenuation correction (section 7.1):

-) Radome attenuation in excess of 15-20 dB for several hours looks really a lot. With this respect a description of the rain event (e.g. a simple time series of the rainfall rate from the laser disdrometer) will be extremely valuable. Although the disdrometer is not co-located with the radar, this will provide some numbers about the precipitation event: range of R, temporal variability,..

-) In the paper it is reported a daily average temperature of 27C and the simulations are also performed at similar temperatures (300K). Attenuation through a water medium is a function of both frequency and temperature, with attenuation decreasing with temperature. Attenuation by a wet radome is no exception (see e.g. Kurri et al., 2008 JTECH). This means that the attenuation values shown in the manuscript could be even worst at lower environmental temperatures. I suggest to check the air temperature for that particular day (not the monthly average) and compare the range of estimated wet radome attenuation with other results in the literature (e.g. Effenberger, J. A., R. R. Strickland and E. B. Joy, 1986: The effects of rain on a radome's performance).

-) It is important to provide an independent indication of the radar calibration (dry radome), see specific comments below

-) Address the possible influence of the wet radome on Zdr measurements

Finally, when giving statistical results (like the quantiles, p.1734, line 22 or the statistical indicators in Table 4) it is important to report the sample size, e.g. how many offset

AMTD

5, C456–C459, 2012

estimates are used to calculate the reported quantiles? More specific comments are listed below.

Specific comments

1. P.1724, around line 18: I don't understand the bin averaging procedure. If you take equal number of data in non equally-spaced bins, you end up weighting more the low rain rates data, just as if you work on the non-averaged data. You should probably consider equal-sized bins instead to reduce the bias on high rain rates.

2. p. 1726: The parameters in eq. 9-16 are apparently derived from modeling (fig. 5) using the same dataset considered for validation. If this is the case, it should be stated clearly and the consequences for the significance of the validation itself have to be considered.

3. In general offset (bias) on reflectivity has units "dB", not "dBZ" (e.g. fig. 3).

4. Fig. 5 should be moved after fig. 2 (it is recalled at p. 1726 and refers to the T-matrix model simulations in section 4). Section 5 may be dropped, a reference to Testud et al., (2000) should be enough.

5. Fig. 6b: to which azimuth this figure refers to? From 6a) it looks the offset is on average negative (around -0.3 dB), but from 6b) it looks near 0dB or slightly positive. If the data are the same (average over time/plot vs. azimuth, average over azimuth/plot vs. time) there must be something wrong.

6. p. 1730, line 7: "the raw power measurements were not stored, hence a threshold on the signal power could not be applied". You may however trace back the SNR from the reflectivity, range and radar constant, to apply a threshold on the SNR instead of the reflectivity.

7. Fig. 8b, caption: ". . .in the foregoing section.". Replace with: ".. in section 7.1.".

8. P. 1732, line 15: the assumption that the reflectivity at the first range gate between

AMTD

5, C456–C459, 2012

45 and 135deg is constant appears rather crude. What is the range of the first valid range bin? Tropical rain is considered, what is the spatial variability of reflectivity? Does it justify the assumption?

9. Fig. 9): in order to apply eq. 22, since R is not available, the authors use the offset corrected reflectivity to calculate R and then L (the wet radome loss). But doing so a correlation between the variables in fig. 9a) is introduced. In fact the EKF offset is compared with the loss from eq. 22, after having applied the same EKF offset to calculate R! In addition, how to explain the EKF offset values between 10-20 dB, compared to the eq. 22 offset below 2dB ? Using eq. 8 and 22, this means the EKF estimates offset > 10 dB when the offset corrected reflectivity above the radar is < 20 dBZ, which typically means no or very light rain. Looking at fig. 9b), where the offset remains roughly above 10 dB for 5 hours in a row, I have the suspect that a radar miscalibration may influence these results. Authors actually try to drive away this suspect reporting an estimate of the dry radome offset form the lowest quantiles of the distribution. This is a pure (and questionable) statistical inference, when there are certainly better ways to asses the radar calibration (dry radome). One such way would imply selecting the periods of no rain on the radar, e.g. by analyzing the low elevation radar reflectivity spatial patterns (not only the nearest gate value) and then present some statistics on the EKF offset estimates for this data subset. For the same subset of data, the radar reflectivity could be compared with the disdrometer retrieved reflectivity.

10. P. 1734, line 15: replace “fond” with “found”.

11. P. 1735: “These streaks indicate that the radome offset correction in that specific direction was determined with low accuracy which causes inconsistencies in the Zh and Zdr field from one direction to the other.” Is there a radome correction for Zdr also? Section 7.1 is only about reflectivity correction.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 1717, 2012.