Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2019-160-RC2, 2019

Atmospheric Measurement Techniques Discussions

Interactive comment on "Characterization of Shallow Oceanic Precipitation using Profiling and Scanning Radar Observations at the Eastern North Atlantic ARM Observatory" *by* Katia Lamer et al.

Anonymous Referee #2

Received and published: 27 June 2019

The paper by Lamer et al. entitled "Characterization of Shallow Oceanic Precipitation using Profiling and Scanning Radar Observations at the Eastern North Atlantic ARM Observatory" documents the precipitation retrievals from the 2nd generation radars at the ARM ENA site including KAZR2, KaSACR2 and XSAPR2. This paper describes the procedures for the radar post-processing procedures and provides some suggestions for different radars. And then it introduces a radar reflectivity-based precipitation retrieval technique using adaptive (in both time and height) parameters for scanning radars. After proposing that XSAPR2 is more suitable for characterizing the light precipitation over a large domain compared with KaSACR2, this paper demonstrates a gridded domain precipitation rate data reconstructed from XSAPR2 retrievals. Lastly,

the paper estimates the representativeness of zenith radar (KAZR2) observations and concludes that "the zenith radar observations cannot produce objective domain precipitation estimate and that forward-simulators should be used to guide high temporal-resolution model evaluation studies." The paper provides a valuable summary of radar observations and descriptive reference for ARM data users interested in the ENA precipitation retrievals, which has never been done before to my knowledge. However, the paper could benefit from some clarification and some parts need further development before publication in AMT. General comments: 1. I think the conclusion about the KaSACR2 precipitation rate would be more convincing if the paper shows some statistical analysis for a longer time period in addition to the theoretical sensitivity curve (Figure 9c) and one snapshot (Figure 7). Some further statistics would also help us better understand the bias of the KaSACR2 precipitation rate for marine boundary layer cloud regime. 2. It is not clear to me what time period, what weather conditions, and how many data samples are included in the analyses of Section 7. 3. This paper uses the XSAPR2 precipitation rate over a domain of 40 km radius around the site at 1° elevation and the KAZR2 precipitation rate at 200m above the surface to estimate the representativeness of zenith radar retrieved precipitation rate (Section 7). We know that the altitude of the XSAPR2 measurement increases with distance away from the radar (Figure 9a); and the XSAPR2 precipitation rate includes both horizontal and vertical variability (Figure 8), especially the vertical variability of the precipitation rate is pretty large in marine boundary layer cloud regime (e.g. Figure 5a). Therefore, this comparison is not just temporal vs. horizontal precipitation variability. I was not sure how to explain the convergence of these precipitation estimates at 12h and longer time scales shown in Figure 10. The paper demonstrates a gridded domain precipitation rate produce reconstructed from the XSAPR2 measurement in section 6 (Figure 9b). I wonder why this paper doesn't use the gridded data to estimate the representativeness of zenith radar retrieved precipitation rate. Also, I'd suggest the authors calculate the correlation coefficient between these two precipitation estimates, which provides more information about the relationship between these two precipitation estimates.

Specific comments: 1. I've noticed some typos scattered throughout the manuscript, so I'd recommend a close readthrough before resubmission. 2. Line 59: This sentence (and a few other sentences) should be separated into two sentences. 3. Line 95: "retrieved" –> "retrieve" 4. Line 101: "The ENA" –> "ENA" or "The ENA observatory" 5. Line 324-325: This sentence seems unnecessary to me. 6. Line 353: "In additional to" –> "In addition to" 7. Line 424: The referred figure jumps from Fig. 6 to Fig. 9. 8. Line 433-437: The Figure number is wrong (I guess it should be Figure 7). 9. Line 620: "were showed to" –> "were shown to" 10. Figure 4. The red lines in (b) have not been defined in the caption. 11. Figure 5. Can you add the main wind direction on (c) and (d)? It may help us better understand the results from the zenith radar and the scanning radar. 12. Figure 6(c). I'm not sure why the solid line (median) is away from the higher frequency of occurrence range (the orange color a = 1.5e2) between z = 0.8km and z = 1.2 km. 13. Figure 7. "The upper panel" –> "The bottom panel" 14. Figure 10. The x axis of the subpanels and the caption "precipitation rate estimated in 0.5 mm hr-1 bins between -8 and 0.5 mm hr-1": I don't understand why there are negative precipitation rates in the results. 15. The paper argues that "forward-simulators should be used to guide high temporal-resolution model evaluation studies" without providing any information about forward-simulators. I would suggest the authors to briefly describe what forward-simulators are and cite a few relevant references.

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