

Interactive comment on “Calibration of the 2007–2017 record of ARM Cloud Radar Observations using CloudSat” by Pavlos Kollias et al.

Anonymous Referee #1

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Review of the article titled “Calibration of the 2007-2017 record of ARM cloud radar observations using CloudSat” by Kollias and coauthors for publication in AMT. The authors have compared the reflectivity from vertically pointing Doppler cloud radars at the ARM sites to the reflectivity from radar onboard polar orbiting satellite. The goal of this study is to characterize the performance of the ground-based radars, as the spaceborne radar is well-calibrated. They find significant calibration offset for the ground-based radars throughout the 10-year period, and inherent inconsistencies between the different modes of them. The technique is already well-established and used here in a relatively straightforward manner. The article is overall okay, but needs several small tweaks in writing. Due the number of small corrections listed below, I recommend this

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article for major revisions.

Major Suggestions:

1) As the authors have already made CFAD of all the ARM radars, it will be relatively straightforward for them to calculate the minimum detectable signal (MDS) for them. You can just pick up the bottom 5% of reflectivity at 1 km, and make its average. This will greatly assist the scientific user community, as it is unclear how sensitive are the ARM radars and if their sensitivity has changed through years. You already have the data for calculating this and hence will be a worthy and useful effort. If you do this, then you can add this as another column in Table 1. Thanks.

2) Please add one more column to Table 1 and report the average and standard deviation of the calibration offset for each radar. This table will be very useful for users who'd like to use your calibration offsets in their research. Please add the different modes of KAZR and MMCR in the rows. I understand that this will be an average through many years, but still worthy of reporting. Thanks.

3) The article ends abruptly and you only provide a brief summary without discussing the implications of your results. It will be good if you can devote one paragraph each on the following two things i) the impact of calibration offset on the regular data products produced by the ARM program. I did a quick search and the radar reflectivity is used for doing microphysical retrievals like MicroBase and cloud drop concentrations. Please discuss how a calibration offset might affect these data-products. ii) The lead author has significant expertise in retrieving vertical air motion and microphysical properties from ground-based radars. A quick search made me realize that scientists have also used radar reflectivity in those studies in addition to using mean Doppler. It will be good if you can elaborate on how your results will impact the results previous studies by you and from Giangrande, Verlinde, Luke, Shupe, Dong, Chiu etc. So please add two separate paragraphs at the end and rename the section as “Summary and Discussion”.

Minor Issues:

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It is unclear to me if the authors are referring to the funding agency ARM or their observatories through the user facility. I recommend using the ARM Climate User Facility throughout the article. Thanks.

Page-1, Line 16: Add "collectively" before "Over". Thanks.

Page-1, Line 12: Add :1990s

Page-1, Line 15: the sentence doesn't read well, please rephrase.

Page 2, Line 8: "Surprise" not "surprised".

Page 3: Add outline of the paper before the section 2.

Page 3, Line 19: "At couple of sites".

Page 4, line 1-2: Please rephrase and remove "us".

Page 4, Line 15: "Computed" and not "computer".

Page 5 Line 10, Page 7 line 13: It is unclear which numbers to believe.

Page 5-6: It will be good if you mention the equation used for doing gaseous correction in CloudSat. Thanks.

Page 8 Line 15: "were" not "where".

Page 10 Line 15: you mean "observatory" and not "laboratory"?

Page 11 Line 20: there is a typo, it should be 616 samples according to Page 7 line 32. Thanks.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-34, 2019.