

Review of Synthesis of ARM User Facility Surface Precipitation Datasets to Construct a Best Estimate Value Added Product (PrecipBE), by Silber et al.

This paper presents a new ARM product that generates a best estimate (with uncertainties derived from the variability from different sources) of surface precipitation. Although I have a few comments on the paper aimed at improving it, my opinion is that the paper should be accepted for publication after addressing these comments.

Comments:

1. Use of precipitation throughout the manuscript. After reading the title, I was quite excited to see that this study offers a precipitation product, because rainfall is easier to extract from these sensors than melting snow or snow or hail. However, digging through the paper, it appeared quickly that the study focusses on rainfall, not all types of precipitation. First, the study only uses SGP data, which presumably encounters little solid precipitation at ground. Since the investigation required to develop a solid precipitation product would require another paper of its own, the only option seems to change "precipitation" to "rainfall" throughout the manuscript. The name of the product is also very misleading for the same reason.
2. To continue on the same subject, unless I missed it, I assume that you have screened out solid and melting precipitation with a ground-level temperature threshold (10C is what I'd do)?
3. The relevance for all precipitation regimes covered by the ARM program. I understand why you have focussed on the SGP data (multitude of sensors), however the main issue I have with this is that the precipBE product is expected to be produced over all ARM sites. If that's the case, I really wonder how the findings of this paper would change if you were to repeat the same analysis for tropical rainfall or drizzling clouds in the Sc regimes. At the very least, I think this limitation of the study needs to be acknowledged and discussed.
4. Figure 1 and associated discussion: The main issue here is that the tipping bucket type of instruments needs some accumulation before tipping. However, for the "continuous" measurements, when all instruments are working, the different onset and end times of events is part of the errors and are associated with the different sensitivities of the instruments. So I feel that by discarding these data, you are not including that error source in your analysis. I would suggest a separate analysis for the continuous measurements.
5. Figures 2,3,4,5: I have a few comments about all these figures.
 - a. First you miss an x-axis on them (at the bottom).
 - b. Because you are showing PDFs of differences, it is difficult for the reader unfamiliar with typical rainfall values to assess from these figures whether those biases and std are large. I would suggest adding one figure between the current figure 1 and 2 that shows the PDFs of the quantities themselves (from the PWD since that's what you use as a reference) to help assessment of figures 2 to 5. For instance, is 3-5 mm a big difference in event total amount relative to the typical total amounts? Can't tell from the material presented here.
 - c. I think the analysis could be a little deeper about the differences in those plots. For instance, taking the example of event total amount again, how do these errors look like for low, intermediate or extreme event total amounts? This is a very important information to provide to downstream users. What I would suggest is split your PDF

of event total amount (as an example) in three or four (terciles or quartiles) and produce the difference PDFs for each of these terciles or quartiles.

Minor edits:

1. Table 1: should RAINCAP be defined itf it's an acronym (I don't know what that is).
2. Lines 253-255: I think that observations / suggestion is a very good reason to do the tercile or quartile analysis. We need to see a quantitative analysis of this for all quantities plotted in Figures 2 to 5.
3. Line 332: maybe add explicitly the temporal resolution of the time series (I expect it's 1 minute ?).
4. Lines 394-395 " trends are consistent with studies ...". Could you briefly mention what sort of data was used in these studies and maybe what range of trends was found in these studies ?

Good luck with the revision,

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