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Interactive comment on "Evaluation of the WMO-SPICE transfer functions for adjusting the wind bias in solid precipitation measurements" *by* Craig D. Smith et al.

Anonymous Referee #2

Received and published: 6 November 2019

The focus of this manuscript is to test the transfer functions derived from WMO-SPICE on an independent set of data. The authors utilized data collected over two years from unshielded gauges, single Alter-shielded gauges and DFAR-shielded gauges. Overall, the manuscript is well-written and well-structured and the analysis is well explained and is an excellent follow-on to the initial work done by the SPICE group.

Major comments:

In the abstract and section 1.1, the authors discuss using liquid, mixed phase and solid precipitation. A possible useful addition to Table 1 would be statistics on the percentage of data that was liquid or mixed phase precipitation and the percentage of the data that

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was solid precipitation for each site. This could potentially help explain some of the results you see in the other tables when comparing all precipitation phases to snow only.

The authors show analysis using the wind data collected from 10m heights and gauge height and discuss many issues related to measuring the wind speeds. In the discussion starting on page 13, line 20, as well as the first part of the conclusions section, no mention is made of the possible impacts of wind variations over the 30-minute averaging period. For the windier sites used in the study, how variable were the winds over the 30 minutes and what role might that have played in some of the results? I agree with the discussions and results the authors have expressed regarding some of the other wind-related issues but this should also be addressed.

Regarding the GEONOR gauges used in the study, the authors state they were GEONOR T-200B3 gauges. I believe this implies a three-wire GEONOR gauge. If that is the case, how were the data from the three wires used? Were they averaged? This should be discussed and/or clarified in the introduction or methods sections.

With regards to Fig 1, equation 2 shows a collection efficiency of 1.1 at a wind speed of 0, but I don't see a clear explanation for this. There is some discussion on P4, L1 that this might be indicative of rain at air temps > 2C, but equation 2 does not use temperature so I'm a bit confused as to why temperature is mentioned there and why eqn 2 would result in a catch efficiency > 1 at 0 m/s. Some clarification and additional explanation would be useful here.

In section 3.2 and 3.3, there is mention of potential shadowing of the wind sensor at the MAR site. Was anyone at the site contacted and asked for pictures of the sensor at the site to confirm this (assuming none of the authors have visited or work at this site)? This would seem to be an easy thing to do without supposition. Could this also be a calibration issue with the wind sensor at that site?

Minor comments:

Throughout the manuscript: There is inconsistent use of the hyphen in the phrase “single Alter shielded”. In some places, there are two hyphens, in others, just one. I believe it should be “single Alter-shielded”.

P1, L17 – Intercomparison is hyphenated here but nowhere else. The official SPICE title appears to not have the hyphen.

P1, L20 – The term “windshield” is typically used to describe the front glass on a car. In the case of precipitation measurement, I believe “wind shield” is more commonly used.

P1, L25-27, The sentence on these lines is somewhat awkwardly written.

P1, L29 – What is meant by gauge configuration?

P5, L24 – This sentence reads a bit awkwardly and may just be missing a comma. Perhaps revise into two sentences.

P6, paragraph 2 – How often were the temp/wind speed data missing?

P6, L34 – there is an extra comma on this line

P6, L35 – there shouldn’t be a comma after “snow”.

P7, L5 – The term “both” is not necessary in this sentence.

P8, L6 – The term “both” is not necessary here either.

P11, L18 – season should be plural.

P11, L20 – I think you meant to say compounding instead of confounding?

P12, L16 – There is a) missing on this line.

Figures 5 through 8 – One suggestion the authors might want to consider is to change the colors of the bars and use warm colors (e.g. red, orange, yellow, or shades of red) for the single Alter data and cool colors (blue, green, purple or shades of blue) for the unshielded data. This would really make the differences between the two data sets

much more obvious and quickly draw the reader's attention to the points you make in the manuscript.

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