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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Errors and adjustments for single-Alter shielded and unshielded weighing gauge precipitation measurements from WMO-SPICE" *by* John Kochendorfer et al.

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General Comments:

Large measuring uncertainties for solid precipitation measurements are a major issue in hydrology. The paper "Errors and adjustments for single-Alter shielded and unshielded weighing gauge precipitation measurements from WMO-SPICE" by John Kochendorfer et al. is clearly a substantial contribution to improved solid precipitation measurements.

Besides improved, robust correction formulae there is also an estimate of the remaining uncertaitiy given. Outliers in the results are clearly explained and hints for improvement

are given. The text is well structured and language, explanations, graphs and tables are very clear and don't need any change. I have only minor questions in some parts That I address below.

The intention of this paper is to provide a simple and practical method for correcting solid precipitation data by ancillary data that is available at most of the meteorological stations world wide. The scientific significance, quality, and the presentation quality are therefore excellent.

Specific Comments:

P. 1, lines 23/24: Choose a more appropriate word for "differences". What you mean here are "errors" or "measuring uncertainties". The word "difference" is too neutral, i.e. different amounts of precipitaion could indeed occur in different regions without being an error.

P. 2, line 4: In "...changes in the velocity of the air around the gauge..." velocity and direction of the airflow could be added, as the air flow is bended around the gauge which is also leading to an uplift of light particles over the gauge orifice.

P. 2, line 19/20: Could you eventually find the original citations that served as a rationale for the WMO decision of 2010? Your citation is of 2012. you could use

P. 2, lines 27-29: It is not understandable for everybody, what the term "WMO-SPICE weighing precipitation gauges" means. I suggest two sentences: The focus of the work described below is on unshielded and single-Alter-shielded weighing precipitationgauges. Based on results of a previous CIMO survey (Nitu and Wong, 2010), WMO-SPICE selcted two weighing gauges which represent the two most ubiquitous configurations used in national networks for the measurement of solid precipitation.

P. 2, line 32: DFIR needs a citation.

P. 3, lines 7-8: "Some of this variability is driven by differences in ice crystal shape (habit), mean hydrometeor fall velocity, and hydrometeor size...". Actually hydrometeor

fall velocity is a function of its size, shape and mass (or mass density). Therefore it should not be mentioned side by side with the other variables. Hydrometeor shape and density are very difficult to measure for each particle, and are therefore generally not available. But some disdrometers provide hydrometeor size and fall velocity. By using fall velocity you implicitely take into account crystal shape and mass density.

Please check again the given citation (Thériault et al. 2012) for details.

P. 9, line 3: "mixed precipitation was defined as..." I wonder whether "mixed precipitation" is a good term here, because you would expect a mixture of rain an snow for each of the events. I guess most of the events were snow only? Isn't the temperature used to distinguish between wet and dry snow? I would suggest "wet snow/mixed precipitation" and for the colder regime eventually "dry snow."

P.9, line 5: I suggest to delete the phrase "and the negligible magnitude of the liquid precipitation adjustment", because for drizzle the CE in windy conditions is negatively affected and needs correction. What you might have in mind is that the corrections for snow are generally larger. But as the fall speed of small droplets and small snow particles are very close it is clear that both will be affected by wind in a comparable way.

P. 13, line 1: PE was improved by the application of tranfer functions for all sites, except one: Sodankylä. It is really a very very small difference, but it could be mentioned that in a site that is well shielded by trees and where there are generally low wind speeds, a SA shield is already sufficient and no further correction is needed. As you mentioned, the correction curves are not precise at the low and high wind speed end. Could this be a reason, why the Sondakylä results with SA shield are getting a bit worse after correction?

With the same argument, that you require to keep the correction constant for wind speeds higher than 7.2 m/s you could think about keeping the correction constant to 1 (or some value close to 1) for wind speeds lower than a threshold. By these two means

you get closer to the sigmoid curves published elsewhere.

Typos and linguistic comments:

P. 5 line 11: rationale

P. 5, line 15/16: "false precipitation error" sounds a bit like "false error". I suggest "false accumulation" instead.

P. 6, line 2: "10 m wind speed". I suggest "wind speed at 10 m height"

P. 8, line 4: threshold of 0.1 mm in 30 min was chosen. . . the 30 min could be added.

P. 17, line 1: ...reduce the horizontal wind speed impacting...

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