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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaporation from weighing precipitation gauges: impacts on automated gauge measurements and quality assurance methods" *by* R. D. Leeper and J. Kochendorfer

Anonymous Referee #2

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General comments

This discussion paper is twofold. At first it presents the methodology and results of an intercomparison between two identical and collocated weighing gauges, one with evaporative suppressant to avoid bucket content to evaporate, and the other gauge without evaporative suppressant. In a second stage, the results of this intercomparison are used to compare two different calculation methods for data treatment. It appears that the choice of the method is determinant, since the impact of the evaporation on

the measured precipitation varies from one method to the other. Though the analysis and comparison of the two measurement series is relevant and definitely provides an added value for an operational weighing gauge use (decision on the use of evaporative suppressant), it is not particularly innovative. The second part of the paper and the demonstration of the impact of the calculation method on the measurement interpretation is, to my opinion and knowledge, much more innovative, and is the core point of this paper. Since it might not be always feasible to use evaporative suppressant to prevent the bucket content from evaporation (environmental and costs aspects), the use of appropriate algorithms to analyze raw data is of high importance. All in all this paper presents a scientifically rigorous and solid approach with some questionable steps, that needs some clarification or adaptation (see comments below).

Specific comments

1. In the Introduction, you describe the different networks (USCRN and COOP), and mention that gauge type affect evaporation rate. You need to better describe which gauges are used in which network and how the measurements are done (manual, automatic, time resolution), since this is relevant when you compare the behavior and impact of the evaporation (lines 15-24, p. 12852, lines 5-7, p. 12854).

2. You pretend that USCRN observations are slightly lower than the COOP ones, even though the USCRN gauges are shielded and the COOP gauges are not (lines 7-9, p. 12854). Please explain what "slightly" is, especially whether these differences are significant in regard to gauges specifications, and if this is a general behavior on all sites.

3. Then you point out that this behavior (see point 2) was shown to be the opposite in previous studies, where results matched with what we actually would expect (line 9, p. 12854). Here again, please provide some numbers (differences shielded vs unshielded) from the past studies (the references you choose to mention). Please specify whether they concern the same gauge type.

4. In the Methodology, you describe the set-up of the experiment. You need to give more information on the suppressant used (type), including quantity and quantity of water that was poured in the bucket at the beginning of the experiment.

5. Ancillary measurement (lines 5-7, p. 12856): please provide location (compared to the gauges) and measurement height for temperature and wind.

6. Description of the two QA methods used in this study (lines 12 ff, p. 12856) is quite lacunar or confusing (e.g. line 16, p. 12856: "The initial QA methodology uses a pairwise approach to combine redundant observations of depth change and will be referred to as pairwise") and not easy to understand for a person who is not familiar with these methods. As this represent the core of the paper, more information should be given on algorithms (description) and current use by other institutes, met services, operational networks.

7. Dry conditions description (3.2): You compare the average losses from the two gauges, and give a sort of range for this value (e.g. 0.122 ± 0.07 for the evap gauge). What does this range represent? Standard deviation? Uncertainty? How did you come to these numbers, and what is the conclusion (significant)?

8. Investigation of the correlation between weather conditions and evaporation (lines 5-10, p. 12858). Did you investigate the combined effect of wind and temperature, and in particular events with low wind speed and high temperature? This is a typical condition for high gauge evaporation (bucket heating).

9. The statement "The largest average increase (0.03mm/h) and decrease (0.04mm/h) over the diurnal scale from the control (nonEvap) gauge were considered negligible" (lines 18-19, p. 12858) needs to be completed: what is the cause for these variations? Instrument sensitivity? Atmospheric conditions (e.g. wind)? Is it a common signal for this gauge type? Moreover, the increase at 06:00LT in both gauges needs also some explanation: why is the positive signal not of the same magnitude for both gauges if it is condensation coming from the air humidity?

10. The statement on "near systematic (evap < nonEvap) differences reported from the pairwise method" (line 1, p. 12861) does not correspond to the precipitation event data presented in Table 1, where it is the case for only 13 events out of the 29 listed. This statement needs to be corrected.

Technical corrections

1. The terminology used to differentiate both gauges is confusing (evap and nonEvap).

2. Reference to Sevruk publication are not correctly written (Survek instead of Sevruk) on page 12853 (line 13 and 21).

3. Line 22, page 12853: affect, and not effect

4. Line 7, page 12854: Despite COOP gauges were monitoring

5. Line 13, pahe 12854: Additional, and not addition

6. Line 15, page 12854: sensitive, and not sensitivity

7. Line 6, page 12855: true for networks, and not true of networks

8. Line 10, page 12855: equipped with three redundant load sensors

9. Line 6, page 12861: sensitive, and not sensitivity

10. Figure 2: evap gauge is indicated with red arrow, nonEvap with blue arrow, which is the other way round than in the graphes later on. It should be the same for all figures to avoid confusion.

11. Figure 6 and 7: the same colors (blue and red) are used to display the two different algorithms. Other colors than for the gauges should be used to avoid confusion.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 12851, 2014.