Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-257-RC2, 2016

Atmospheric Measurement Techniques Discussions

Interactive comment on "Performance of post-processing algorithms for rainfall intensity measurements of tipping-bucket rain gauges" *by* Mattia Stagnaro et al.

R. Uijlenhoet (Referee)

remko.uijlenhoet@wur.nl

Received and published: 16 August 2016

This paper deals with a comparison of two post-processing algorithms for tipping bucket rain gauges. The analysis is based on eight rainfall events collected in Hong Kong. Two algorithms are compared, one based on the number of tips per time interval and another based on the inter-tip time interval. An optical drop-counting rain gauge with a 10 sec time resolution is used as reference. The intercomparison is carried out at a time step of 1 min. Both tipping bucket rain gauges have a nominal volume resolution of 0.1 mm, which means that a tip frequency of one per minute corresponds to a rain rate of 6 mm per hour.

The main conclusion of the paper is that the algorithm based on inter-tip times outper-

forms the algorithm based on tip counts, except for very small rain rates (< 0.6 mm/h), where the performance of both algorithms becomes nearly the same. Up to a rain rate of 6 mm/h the performance of the inter-tip algorithm is found to be nearly equal to that of an artificial "ideal" tipping bucket rain gauge, simulated on the basis of the optical drop-counting gauge data. Beyond that, the inter-tip algorithm still outperforms the tip-counting algorithm, but its performance is less than that of the ideal gauge. The authors convincingly show that sampling errors play a major role for low to intermediate rain rates, whereas mechanical errors play a dominant role for larger rain rates. The latter lead to underestimation of rainfall accumulations for events containing intervals with such large rain rates (Fig. 2).

Tipping bucket rain gauges are the standard in many applications in meteorology and hydrology. Therefore, a clear understanding of their performance and the sources of error involved is of significant practical and scientific relevance. As such, the topic of this paper fits AMT well. The first reviewer has a number of editorial remarks, which I largely agree with. I have attached an annotated version of the manuscript for the authors to improve their paper for resubmission.

A few remarks added to the annotated manuscript are repeated here. First of all, I am not convinced Fig. 6 (the Taylor diagram) is the best way to present the results of the intercomparison. In any case, it was not easy for me to decipher it (particularly the choice of colors for the symbols was confusing to me). Also, the "residual uncertainty in the calibration process" (see the Conclusions section) asks for further discussion. Are there ways to account for this remaining error source in the calibration process? It is an important issue, because we are not only talking about uncertainty (random error), but also about bias (systematic error), in this case underestimation (see Fig. 2), which can have important consequences in (meteorological and hydrological) applications.

Please also note the supplement to this comment:

http://www.atmos-meas-tech-discuss.net/amt-2016-257/amt-2016-257-RC2-supplement.pdf

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-257, 2016.