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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.

Anonymous Referee #4

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In this paper, the performances of two different post-processing algorithms employed in the calculation of the rainfall intensity from tipping-bucked rain gauges (TBRGs) are compared and discussed. Data recorded at a field test site by two TBRGs using different tipping bucket assemblies are used, and a catching-type drop-counting gauge is used as the working reference. The comparison demonstrates the benefits, in terms of improved accuracy, of employing an inter-tip algorithm to compute intensities rather than the simpler and widely used procedure of counting tips within the time intervals. The paper is well written and the results are clearly explained. The main conclusion drawn by the authors is well supported by the evidence they have provided, namely that the inter-tip algorithm provides a much better basis for deriving intensity data than

simply counting the tips within the time intervals. The paper should therefore be published, but would benefit from some discussion of the points raised below, and some minor corrections. In particular, the characteristics of the errors, as summarized by the relatively large observed biases and variabilities relative to the reference measurements, merits some discussion. One of the referees has commented on the need for a site description which should include the spatial layout/separation distances/mounting heights of the gauges etc that might influence the characteristics of the errors. Given that the TBRGs are stated in the paper to have been subjected to laboratory calibration/correction of the intensity data using a correction curve, it does not seem that the errors observed in relation to the reference raingauge can be attributed to 'instrumental mechanical errors', given that the correction curve is supposed to account largely for these effects. Small scale rainfall variability across the measurement site must make a contribution to the observed variability. In relation to the consistent underestimation observed, which should be largely removed by the correction curve, was a volumetric check gauge run alongside the two TBRGs and the reference gauge to check on the total volumes from each over the period of the experiment? The authors are invited to discuss these points and to clarify them, given their extensive experience of conducting laboratory and field experiments on the performance of TBR rain gauges.

Some minor points: P1, L20: 'Following the effort led. . .' P1, L23: Uncertainty can be defined in a number of ways. The authors should explain early on how they are going to quantify the accuracy of their measurements. P2, L5: 'in rain gauge measurements'. Suggest eliminating this as it is redundant P2, L8: change to ' . . .to achieve this aim. . .' P3,L2: 'This is not a common solution for TBRGs. . .. . .' Suggest no new para here as you are continuing the discussion of the dual layer assembly. P3,L6: '. . ..systematic mechanical errors. . .' Suggest a brief explanation of how they arise. P3,L8-11: was the correction curve based on data derived from interval data or inter-tip data? Based on what follows in the paper, the former would appear to be preferable.

P3,L23: replace 'cumulated' with 'accumulated' throughout. P3,L24: change to '. . .

gauges respectively.' P3,L24: '. . .13.6% and 12.5% for the SL3 and LGO rain gauges respectively.' Presumably, these underestimation errors are after the correction curve referred to above has been applied. They are therefore quite large, so can they just be ascribed to systematic mechanical errors? P4,L1: change to '. . .allows various algorithms to be used. . .' P4,L6: change to '. . ..allows systematic mechanical errors to be accounted for. . ..' P4,L22-24: a brief description of how the ideal series of tips was derived would be helpful. P4,L24: change to '. . ..when using tipping-bucket mechanics. . .' P5,L1:'normalized' is a term used to describe a transformation to a normal distribution. Better to use 'standardized' P5,L21-22: the ideal TBR generally exhibits a significant positive bias for values in the range 0-6 mm which is different from the other two TBRs – reason for this? Figure 2.. Replace 'cumulated' with 'accumulated.(twice) Figure 3. It would be good to remind the reader what the bounds are in the box-and-whisker diagram

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