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

Anonymous Referee #1

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The manuscript represent a substantial contribution to scientific progress, it addresses an important topic involving the processing of data of liquid precipitation using a set of different rain gauges. The results help researchers and technologists in making the decision for possible updates of the measurement systems and statistical treatment of data of liquid precipitation (rain). The manuscript is well-organized. The sections are well-developed requiring some revisions. The authors answer the questions that they set out to answer. The methodology is clearly explained, but requiring minor revision. The author's results are convincing because reports detailing the performance of algorithms with temporal resolution more precise based on measures of different rain gauges. The title could be "Performance of post-processing algorithms for rainfall

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Discussion paper

intensity using measurements of tipping-bucket rain gauges" or "Performance of post-processing algorithms for rainfall intensity using measurements of observation system with tipping-bucket rain gauges" because TBRGs measure the amount of rain (precipitation liquid) and determination of RI is calculated using a system (software). In the "1 Introduction" section: - a) it is interesting to describe the term "measurement uncertainty" according to the VIM (International Vocabulary of Metrology – Basic and General Concepts and Associated Terms). In the "2 Field site and instrumentation" section: - a) page 2, line 25 include a better description of the OSK, such as operating principle (optical), technical characteristics (catchment area, accuracy of measurement, nominal uncertainty, etc.) and the calibration date (corrections, expanded uncertainty, coverage factor, confidence level, etc.); - b) page 2, line 32, in Table 1, include more information on the manufacturers' specifications (catchment area, accuracy of measurement, nominal uncertainty – if provided, etc.); - c) page 3, describe the installation of rain gauges (height, distance between them, obstacles, etc.). These factors may be relevant sources of uncertainty of measurements. If possible include figure of site; - d) page 3, describe the complete system from the rain gauge (measurement) until the final data. The TBRGs measures the amount of rain, it means that there is a data acquisition system for storing the tips and timestamp (hh:mm:ss) and a system for calculating the RI. How the RI was obtained (datalogger, software)?; - e) page 3, was calibration performed for the complete system (sensors and data acquisition system or only sensors)? The datalogger's contribution may be insignificant, but what is the uncertainty of the datalogger in the time record (timestamp)? Describe uncertainty or accuracy of datalogger. It may be important to one of the algorithms; - f) page 3, report data from the "Calibration Certificate" / calibration (correction, uncertainty, etc.) of all sensors and range. Instruments with different measuring principles produce different results, but compatible in most cases (statistically equal), depending on their measurement uncertainties; - g) abbreviations or acronyms used in figures should be explained in the legend (see figure 2 and review all figures). In the "3 Method" section: - a) review all acronyms, for example

RIref and not RIref, RIraw and not RIraw (see attached revision pdf), etc, including the graphics and legends of graphics and figures (see the “Manuscript composition” of Manuscript preparation guidelines for authors of AMT); - b) use the same acronym for reference (DC or OSK or REF?) in the text, graphics and the chart legends, as well as other sensors; - c) Figure legends should clarify all the symbols used and should appear in the figure (see the “Manuscript composition” of Manuscript preparation guidelines for authors of AMT); - d) Use the term uncertainty, as described in VIM; - e) Describe all terms used in the formulas, for example RIn (and which values for n?, review all formulas); - f) page 4, equations should be referred to in the text according to the Manuscript preparation guidelines for authors of AMT; - g) What were the computational tools (language, software, operating system) used to run programs (algorithms under study) and how RI is calculated using the TBRG LGO, SL3 and OSK/REF? In the “4 Results” section: - a) page 5, the TBRG measures the amount (tips) of rain. The limit is the limit of the system that calculates the RI; - b) and how the propagation of uncertainty for calibration of the sensors was treated in the results? It is interesting to express “the measure $\pm$ uncertainty” for each rain gauge; - c) due to the graphic resolution; it is interesting to show clearer in the chart when the exception occurs; - d) the abbreviation "Fig." should be used when it appears in running text and should be followed by a number unless it comes at the beginning of a sentence, e.g.: "The results are depicted in Fig. 5. Figure 9 reveals that..." (see the “Manuscript composition” of Manuscript preparation guidelines for authors of AMT); - e) The TBRi(Ttip) acronym is not commented in the text and in the figure legend; - f) page 5, line 21, list the figure of this paragraph; - g) improve the Y axis scale of graphic of figure 5 (review all scales of all graphics). In the “5 Conclusions” section: - a) page 6, line 31, cite examples of sources of uncertainties in field operation; - b) rewrite the paragraph to make the text clearer, once the rain intensity is calculated from the measured rain (tips) made by TBRGs and the time resolution used is usually 1 minute, but other time resolutions may be chosen. Make it clear when compare results obtained by different forms of RI calculations.

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/amt-2016-257/amt-2016-257-RC1-supplement.pdf

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