REVIEW REPORT

Review of amt-2019-466

By Michael Fehlmann, Mario Rohrer, Annakaisa von Lerber, and Markus Stoffel

Manuscript Title – Automated precipitation monitoring with the Thies disdrometer: Biases and ways for improvement

GENERAL COMMENTS

The manuscript describe the performance of Thies Clima disdrometer with respect to OTT pluviometer and 2D video disdrometer in terms of precipitation detection, precipitation amount and intensity and classification between rain, snow and mix phase. Furthermore the manuscript describe two methodology to correct the Thies data and analyzed the effects of these methods on the precipitation intensity. The paper is well written and organized. Following there are some specific comments. I suggest the publication on AMT after addressing my comments.

SPECIFIC COMMENTS

- Page 2. Lines 20-25: Several studies have been done to evaluate the performance of Thies Clima and some references related to this topic need to be added in the Introduction section.At that regard, following there are some suggestions
  - Lanza et al. 2012 and Lanzinger et al. (2006) described the result of a a WMO experiment that showed a bias that range between 5% and 20% comparing rain gauge and Thies Clima disdrometer rainfall amount
  - In Upton et al. (2008), Angulo-Martínez et al.(2017), and Adirosi et al. (2018), the Thies Clima perfromance has been evaluated with respect to Parsivel disdrometer.

- Section 2: Did the Authors applied any filtering method to eliminate the so called "spurious drops" due to win, splashing, or mismatch? Several studies that used disdrometer measured DSD applied a filter criterion based on fall velocity such as the one adopted in Tokay et al. 2001 and valid only for rain.
- Section 2: Different classification methods are applied to Thies disdrometer and 2DVD data to distinguish between rain, snow and mixed phase. Is it possible to applied the proposed classification method to Thies data (of course applying the method to binned data instead of drop-by-drop data)? In this way the obtained results can be compared with the classification provided by the Thies software. If not, why do not apply a classification method that can be easily applied to 2DVD and Thies data? It can help to exclude the possible effect of the application of different classification methodologies on the obtained results
- Section 2: Is there a minimum values of precipitation amount that can be detected by OTT pluviometer? Such as the 0.2 mm for the tipping bucket gauge?
- Page 6 last sentence: it is not clear to me. Please clarify.
- Page 7, first paragraph: which is the range of variability of the thresholds used to obtain the ROC diagram? The threshold are applied to both disdrometer and gauge data?
- Figure 8 right and Table 3: How do the Authors compute the correction factor in these cases?

- Page 9, third line: "This suggest.......intensities". Looking at the results obtain for rainy minutes in terms of bias it seems that the adjustment to the OTT pluviometer is the one that reduces the bias while the other adjustment provides same or higher bias values. In all the other columns of Table 4 the differences between the uncorrected data, the data corrected with OTT pluviometer and the data corrected with 2DVD are negligible! Please provide a more detailed comment on this

MINOR COMMENT

- Figure 3: please move the legend. In this position it covers the data
- Figure 6: Check x-label

REFERENCES

Adirosi, E., Roberto, N., Montopoli, M., Gorgucci, E., & Baldini, L. (2018). Influence of disdrometer type on weather radar algorithms from measured DSD: Application to Italian climatology. Atmosphere, 9(9), 360.

Angulo-Martínez, M.; Beguería, S.; Latorre, B.; Fernández-Raga, M. Comparison of precipitation measurements by Ott Parsivel2 and Thies LPM optical disdrometers. Hydrol. Earth Syst. Sci. Discuss. 2017.

Lanza, L.G.; Vuerich, E. Non-parametric analysis of one-minute rain intensity measurements from the WMO Field Intercomparison. Atmos. Res. 2012, 103, 52–59.

Lanzinger, E.; Theel, M.; Windolph, H. Rainfall amount and intensity measured by the Thies laser precipitation monitor. In Proceedings of the WMO Technical Conference on Meteorological and Environmental Instruments and Methods of Observation (TECO), Geneva, Switzerland, 4–6 December 2006

Tokay, A., Kruger, A., & Krajewski, W. F. (2001). Comparison of drop size distribution measurements by impact and optical disdrometers. Journal of Applied Meteorology, 40(11), 2083-2097.

Upton, G.; Brawn, D. An investigation of factors affecting the accuracy of thies disdrometers. In Proceedings of the Technical Conference on Instruments and Methods of Observation (TECO-2008), St. Petersburg, Russia, 27–28 November 2008.