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Assessment of the measuring errors in tipping rain gauge located on a small mountain basin

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Precipitation measurement has always been of human interest. Its estimation can guide the decisions concerning flooding prevention and irrigation scheduling in semi-arid regions.

Nowadays, manufactures offer several types of rain gauges. Among them, the tipping-bucket rain gauges (TBRs) is the most frequently used worldwide to collect rainfall data. It structure is simple and the manufacturing cost is reasonable. Also, the operating mechanical mechanism saves energy and can be easily automated. Its manufacture began in the seventeenth century although the recent models have improved their original characteristics.

Likewise, these gauges have some disadvantages such us: measurement errors, that can be significant during heavy rainfall or light drizzle; losses from evaporation and wind effects; time of onset; sampling procedure and rain residue in the bucket. Therefore, calibration is often needed.

This study assesses the data from a set of 12 TBRs spread in the small mountain basin “Venero Claro”, Avila (Spain). This is highly monitored due to its capacity to generate torrential flows and flash floods. The data comprised a time interval of 14 years; the oldest TBRs were installed in 2006. The objective was quantified the errors, especially those caused by high precipitation intensities, which are common in the area. Thus, calibration curves for data analysis were estimated by a dynamic laboratory calibration for two different TBRs’ models.

The results from the calibration data have been statistically analysed in order to determine the errors and their significance along time and topography. A significant underestimation was observed in TBRs, especially in those located at higher areas.