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A study of the dependence of the ratio between rainfall amounts measured using fixed and unrestricted intervals on the characteristic rainfall pattern of a place

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It is known that the use of fixed time intervals to measure rainfall quantities could lead to an underestimation of the true maximum rainfall amounts for the duration considered. Several studies recommend an adjustment of quantities measured using fixed intervals (Hershfield, 1961; Weiss, 1964; Dwyer and Reed, 1995; Van Montfort, 1997), usually using a multiplicative factor. For instance, Hershfield (1961) proposed multiplying the results of a frequency analysis of annual maximum amounts measured using a single fixed time interval of any duration from 1 to 24 hours by the factor 1.13 to approximately yield these amounts to true maxima. On the basis of probability theory, Weiss (1964) determined a theoretical value of 1.143 for this factor, being the adjustment lower in case the available fixed time intervals are shorter than the considered duration.

In this work we're presenting a study about the observed ratio between quantities measured using fixed and unrestricted intervals, for durations of 24 hours to several days. This study has been performed using more than a hundred rainfall daily series from rain gauges distributed all around Catalunya (Spain). The longitude of the selected series, which passed a rigorous quality control, has a mean value of 20 years of data, covering a temporal period between 1988 and 2016. As well as found by some authors (Asquith, 1998) performing similar studies, our empirical ratios differ in some cases from Weiss' theoretical results. Discrepancies might be due to Weiss's assumption that the probability of a storm event occurring is equal throughout any time interval and the assumption that the distribution of precipitation during the time interval is uniform. Our study shows how the observed ratio depends on the characteristic rainfall pattern of the place, and a spatial distribution of its values over the Catalan territory is presented.

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