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Exploratory analysis of rainfall events in Coimbra, Portugal: variability of raindrop characteristics

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Laser disdrometers can monitor efficiently rainfall characteristics at small temporal scales, providing data on rain intensity, raindrop diameter and fall speed, and raindrop counts over time. This type of data allows for the increased understanding of the rainfall structure at small time scales. Of particular interest for many hydrological applications is the characterization of the properties of extreme events, including the intra-event variability, which are affected by different factors (e.g. geographical location, rainfall generating mechanisms). These properties depend on the microphysical, dynamical and kinetic processes that interact to produce rain.

In this study we explore rainfall data obtained during two years with a laser disdrometer installed in the city of Coimbra, in the centre region of mainland Portugal. The equipment was developed by Thies Clima. The data temporal resolution is one-minute. Descriptive statistics of time series of raindrop diameter (D), fall speed, kinetic energy, and rain rate were studied at the event scale; for different variables, the average, maximum, minimum, median, variance, standard deviation, quartile, coefficient of variation, skewness and kurtosis were determined. The empirical raindrop size distribution, N(D), was also calculated. Additionally, the parameterization of rainfall was attempted by investigating the applicability of different theoretical statistical distributions to fit the empirical data (e.g. exponential, gamma and lognormal distributions).

As expected, preliminary results show that rainfall properties and structure vary with rainfall type and weather conditions over the year. Although only two years were investigated, already some insight into different rain events' structure was obtained.