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Tuning of radar algorithms with disdrometer data during two extremely wet months in the Paris area

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Radar algorithms convert quantities measured by radars to rain rate, the quantity hydrometerologists are interested in. They basically rely on power law relations between these quantities. This paper focuses on three relations between the horizontal reflectivity (Zh), the differential reflectivity (Zdr), the differential phase shift (Kdp) and the rain rate (R) : Zh-R, R-Kdp and R-Z-Zdr. Data collected during the extremely wet months of May and June 2016 by three disdrometers operated by Ecole des Ponts ParisTech on its campus is used to assess the performance of these respective algorithms.
In a first step the temporal variability of the parameters characterizing the radar relations is investigated and quantified. It appears to be significant between events and even within an event.
In a second step a methodology relying on checking the ability of a given algorithm to reproduce the very good scale invariant multifractal behaviour (on scales 30 s – few h) observed on rainfall time series is implemented. It is compared with the use of standard scores computed at a single scale as commonly done. We show that a hybrid model (Zh-R relation for low rain rates and R-Kdp for great ones) performs best. In also appears that the more local possible estimates of the parameters should be used in the radar relations.