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Tuning radar algorithms with disdrometer data in the Paris area

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Dual polarimetric weather radars measure the horizontal reflectivity (Zh), the differential reflectivity (Zdr), the differential phase shift (Kdp) while hydrometeorologists are interested in the rain rate (R). Radar algorithms are used to convert the former to the latter. They usually basically consist in power law-relations with fixed values of prefactor and exponent. This paper will quantify the temporal variability of these parameters and explore the consequence on rainfall retrieval with radars.

Data collected between November 2016 and May 2017 by two types of devices operated by Ecole des Ponts Paris in the framework of the Fresnel Platform will be used in this study: (i) Dual-pol X-band radar (ii) Three co-located optical disdrometers installed approximately 30 km of the radar.

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 these variable parameters are used in radar algorithms and the corresponding changes with regards to the use of fixed parameters is quantified. The analysis will primarily focus on the radar pixels adjacent to the disdrometers locations. Preliminary results on the quantification of the uncertainty associated with the great measurement gap between the two devices will be presented. The goal being to be able to account for the fact that parameters obtained by Drop Size Distribution (DSD) measured over roughly 50 cm2 by disdrometers are used for a radar averaging over a volume typically of 100 m x 100 m x 100 m. DSD parameters exhibit scale invariant features which will be used to simulate its spatio-temporal variability with the help of discrete multifractal cascades and get insights into the investigated uncertainty.