Influence of the DSD variability at the radar subgrid scale on radar power laws

Joël Jaffrain, Alexis Berne

EPFL-LTE, Switzerland, joel.jaffrain@epfl.ch, alexis.berne@epfl.ch

Presenter : Alexis Berne

Power laws relating the different radar observables (from conventional or polarimetric radar systems) are commonly used in the processing of radar measurements (e.g., attenuation correction) and in their conversion into rain rate values (e.g., Z-R relationship). These power laws are usually established from measured raindrop size distributions (DSD) collected by disdrometers (at the ground level), that correspond to point-scale measurements. These power laws are then applied at the scale of a radar sampling volume (in the order of 1 km^3). The DSD can be variable within a radar pixel, and this variability hence questions the representativity of power laws derived from point measurements and applied to radar observations.

To investigate the small-scale variability of the DSD, a network of 16 disdrometers (Parsivel, 1st generation) has been deployed over EPFL campus in Lausanne, Switzerland, during 16 months. 36 rain events have been selected and classified in 3 groups of rain types: convective, transitional and stratiform. This set of events can reasonably be seen as representative of the local climatology. The spatially distributed DSD measurements from the disdrometer network are used to quantify the spatial variability and the spatial structure of the DSD within a typical radar pixel. The coefficients of the Z-R and the R-Kdp power laws are estimated at the point and the pixel scales. The influence of their variability within a radar pixel on the quality of the rain rate estimate is quantified and is shown to be potentially significant.