Relationships between total lightning activity, microphysics, and kinematics in thunderclouds: case studies observed during the HyMeX SOP1 campaign

Intended for the Lightning Occurrence Relative to Meteorology Session

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We explore the total lightning activity recorded by the NMT Lightning Mapping Array, the CG lightning impacts detected by the EUCLID/Météorage network, and the radar observation performed by the Météo France operational network during the HyMeX (Hydrology cycle in the Mediterranean Experiment) SOP1 (Special Observation Period 1; September-November 2012) campaign for analyzing relationships between lightning activity, microphysics, and kinematics in thunderclouds. As regards the radar observation, 3D radar reflectivity and wind fields are deduced from the multiple-Doppler analysis of operational ARAMIS Doppler data; and microphysics species (rain, wet snow, dry snow, ice, graupel and hail) are provided by an improved version of the Météo-France HID (fuzzy logic hydrometeor identification) algorithm with observation performed by the dual polarization radars of Nîmes (S band) and Montclar (C-band).

We focus on microphysical particles (mass and mass fluxes) that are involved in cloud electrification via the non inductive charging mechanism, i.e. ice crystals and graupel, on volume of high radar reflectivity ($Z > 40$ dBZ), and on volume of high vertical updraft. The goal is to address the following questions: could cloud physics be deduced from lightning flashes observation? Could lightning data be good candidates to be assimilated in order to improve the numerical prediction of heavy precipitations?

The French MISTRALS program and the ANR IODA-MED project support this study.