Explicit simulations of the storm electrical activity with the mesoscale model Meso-NH

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A complete electrification scheme with a lightning flash parameterization has been developed in the mesoscale model Meso-NH. The electrical scheme is made up with three parts : the electric charges, the electric field and the lightning flashes. Non-inductive processes which are responsible for charge separation are first considered. Inductive processes are taken into account when the electric field is large enough. Once separated, charges are exchanged between hydrometeors during microphysical processes. They are transported through the cloud by convection and sedimentation. When the electric field inside the cloud becomes higher than a threshold, a lightning flash is triggered with a bidirectional leader. Then, branches are generated by a stochastic algorithm obeying a fractal law. Finally, charges are neutralized along the lightning channel. This branched structure permits a large horizontal extension of the intra-cloud flashes in order to reach scattered spots of high charge.

Relashionships between dynamics, microphysics and electrical activity will be emphasized on different convective cases : multicell and supercell storms, and a squall line.