1.45 CLOUD ELECTRIFICATION MODEL IN THE COSMO NUMERICAL WEATHER PREDICTION MODEL

Z. SOKOL [1], J. MINAROVA [1]

[1] Institute of Atmospheric Physics CAS, Czech Republic
sokol@ufa.cas.cz

In this contribution, we implemented the Cloud Electrification Model (CEM) in the COSMO non-hydrostatic numerical weather prediction model. CEM computes with 2-moment cloud microphysics and consists of both the inductive and non-inductive charging mechanisms with the last the dominant. CEM explicitly describes the concentration of ions and the ion interaction with six kinds of hydrometeors to which the concentration of charge is bounded.

CEM models the advection of charges bounded to hydrometeors, changes in charge concentration in cloud microphysical scheme, ion equation, separation and transfer of charge related to collisions of hydrometeors, and lightning. Lightning scheme is based on bidirectional concept of the flash leader and the propagation of the flash is given by probabilistic branching (dielectric breakdown concept).

The results of simulations show that CEM enables to capture the typical thundercloud tripole charge structure with two positive layers separated by a negative layer. The negative layer is related to high concentration of graupel, ice and snow hydrometeors which are the hydrometeors the most participating in the charge transfer due to their collisions. In more detail, CEM also simulates the charge distributed following the updrafting and downdrafting motion, similar to that given in literature.