

Evaluation of noninductive charging mechanisms and simulation of charge structure in the early thunderstorm based on RAMSV6.0

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A new regional thunderstorm model, coupled with two primary non-inductive electrification mechanism, namely Takahashi1978 and Saunders1991 schemes, has been developed based on the newest version of RAMSV6.0. Based on the simulation on a thunderstorm in its early stage occurred in Beijing, the results show that the total charge distribution is tripolar in both schemes when the electric field reached to breakdown. The results are agreement with some observations and other model results. However, the evolution process and shapes of cloud charge distribution have some difference in the two schemes. The result of Takahashi's (1978) scheme produces a tripolar charge distribution in the cloud before the first lightning. The Saunders' (1991) scheme produces a transform from inverted dipole to tripolar charge distribution. This is because they used different experimental conditions and influenced by different factors. The results from both schemes show that the positive charge carrier in low level of thunderstorm is rain droplet, the aggregates and graupels located in high level of thunderstorm, and the charge distribution center of graupels are similar with the characteristics of total charge in thunderstorm cloud.