Xu, L., Y. Zhang, F. Wang, and X. Cao, 2019: Simulation of inverted charge structure formation in convective regions of mesoscale convective system. *J. Meteor. Soc. Japan*, **97**, https://doi.org/10.2151/jmsj.2019-062.

Plain Language Summary: The inverted charge structure of a mesoscale convective system is simulated using the Weather Research and Forecasting (WRF) model coupled with electrification and discharge processes. The evolution of a normal–inverted–normal charge structure in the convective region can be reproduced only by the rime accretion rate (RAR)-based electrification scheme. The results reveal that the inverted charge structure is caused by the strong updraft, high LWC and high RAR, which appear above the height of the −20°C layer.

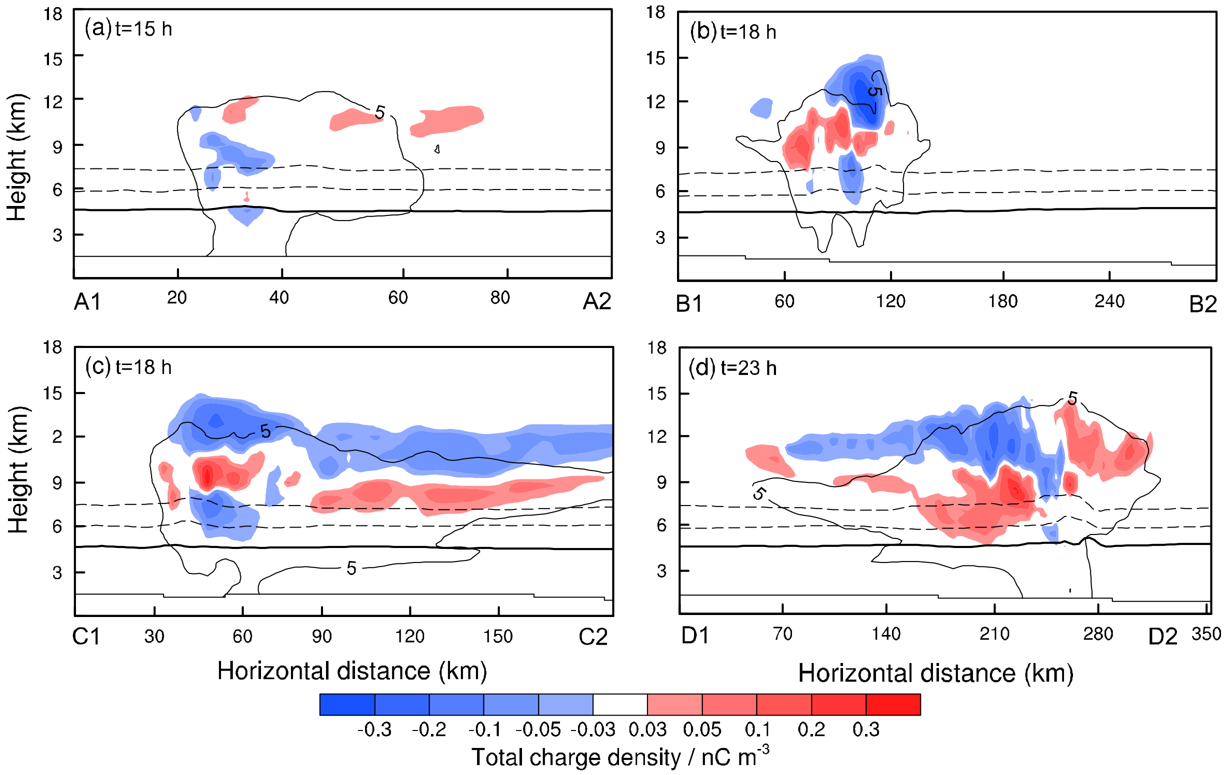

Figure 1. Vertical cross-sections of total charge density (nC m^{-3}; shaded) in different time with the RAR-based scheme. The horizontal lines represent the isotherm lines of −20, −10 (dashed lines), and 0°C (solid line). The solid line labeled "5" represents the contour line of 5 dBZ.

- The evolution process of a normal–inverted–normal charge structure in the convective region of a mesoscale convective system is successfully simulated by an electrification and discharge model.
- A positive graupel charging region is generated above −20°C layer due to the strong updraft (>16 m s^{-1}), high LWC (>2 g m^{-3}) and high RAR (>4.5 g m^{-2} s^{-1}), resulting in the inverted tripole charge structure.
- In the high plains of the United States, the microphysical-derived mechanism is responsible for inverted charge structure, while the dynamical-derived inverted charge structure is more likely in North China.