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An extension and new interpretations of the Dash theory of the molecular dynamics of vapour growth in the Relative Growth Rate mechanism of thunderstorm charging

C. Emersic, C. Saunders

The University of Manchester, England

(christopher.emersic@postgrad.manchester.ac.uk, clive.saunders@manchester.ac.uk)

Work has continued using the cold room facility at The University of Manchester in thunderstorm electrification studies. Previous work has highlighted the importance of the surface states of the ice crystal and graupel particle at the instant of collision in determining the resultant charge transfer [Baker et al., 1987; Saunders et al., 2001; Mitzeva et al., 2005]. Recent work has identified that the microphysical situation giving rise to charge polarity reversal with changing temperature and cloud water content is heavily dependent on the experimental technique and procedures undertaken [Saunders et al. 2006]. This finding is offered as a solution to the differing results of the work of Jayaratne et al. [1983] and Takahashi [1978].

More recently, charge transfer has been considered using an extended application of the Dash theory of molecular dynamics of vapour growth [Dash et al. 2001] in the Relative Growth Rate theory of thunderstorm charging. New ideas considering both polarity and magnitude of charge transfer between interacting ice crystals and graupel particles offer possible explanations of recent observations. New explanations for large positive charge transfer are also offered, and are supported by experimental observations.