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Using a cloud electrification model to study charge separation processes and their relationships with cloud microphysical structure

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We use a one-dimensional cloud electrification model, called Explicit Microphysics Thunderstorm Model (EMTM), to interpret the non-inductive electrification processes and to find quantitative relationships between the simulated electrical activity and microphysical properties in convective clouds. For selected case studies, the simulated lightning activity is compared with LINET ground network lightning data, used as ground truth, to verify the ability of the model to reproduce electrical activity consistent with the observations. Analyzing the output from the model explicit microphysics scheme in conjunction with the simulated electrical activity, a correlation is found between some key microphysics properties of the cloud and the corresponding lightings. These relationships constitute the foundation for future applications where the EMTM model output can be used to infer cloud properties based on lighting observations.