Tracking positive charge regions and microphysics in storms throughout various regions of the United States

Cloud Electrification Processes

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There is a wealth of data provided by the Deep Clouds and Convective Chemistry (DC3) field campaign that took place during the summer of 2012. Polarimetric and dual-Doppler radar data provide valuable information about the microphysics and the dynamics of thunderstorms in multiple regions of the United States. These data are combined with X/S dual frequency radar data from the CHILL Microphysical Investigation of Electrification (CHILL-MIE) field project in northeast Colorado during the summer of 2013. Simultaneous dual frequency observations provide additional information including higher resolution data along with differential attenuation and Mie scattering effects. These radar data provide an unparalleled suite of microphysical information that can be used in concert with total lightning and charge structure information from high resolution Lightning Mapping Array (LMA) data to investigate lightning processes and evolution and their relation to microphysics and processes taking place in a storm.

Preliminary results include an investigation into “Zdr columns”, indicative of larger drops lofted above the freezing level, and their influence on first lightning. Recent studies suggest that microphysical processes can be inferred from monitoring polarimetric variable changes along a parcel trajectory. This study explores the feasibility of this technique and the implications for production and maintenance of positive charge regions in thunderstorms.