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Polarimetric and multi-Doppler radar observations of sprite-producing storms

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Sprites are caused by luminous electrical breakdown of the upper atmosphere, and frequently occur over large mesoscale precipitation systems. Two sprite-producing storms (on 8 and 25 June) were observed in Colorado during the summer of 2012. Unlike most past studies of sprites, these storms were observed by a polarimetric radar - the CSU-CHILL facility - which provided both PPI and RHI scans of the cases. Also available were multiple-Doppler syntheses from CSU-CHILL, local NEXRAD radars, and the CSU-Pawnee radar; as well as data from the Colorado Lightning Mapping Array (COLMA), high speed cameras, and other lightning-detection instrumentation. This unique dataset provided an unprecedented look at the detailed kinematic and microphysical structures of the thunderstorms as they produced sprites, including electrical alignment signatures in the immediate location of the charge layers neutralized by sprite-parent positive cloud-to-ground lightning strokes. One of the sprite-producing cases (25 June) featured an anomalous charge structure and may serve as a model for how sprites can be produced over convection rather than the more typical stratiform regions. Also to be presented will be evidence for advection of charge into a common stratiform precipitation region (on 8 June), which was then tapped by lightning originating from multiple different convective cores to produce sprites. Depending on the outcome of the 2013 convective season, polarimetric data from additional storms that produce sprites and other transient luminous events (TLEs) may be presented.