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Dancing red sprites and the lightning activity in their parent thunderstorm

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Red sprites are brief optical emissions initiated in the mesosphere by intense tropospheric lightning discharges. A group of red sprites, in which the elements appear in rapid succession with some lateral offset from one another is referred to as a dancing sprite event. The occurrence of such events implies that significant and sequential charge removal extending to large regions of the thunderstorm can take place in the underlying cloud system. In this work, we examine the relation of the locations and observation times of appearing sprite elements to the temporal and spatial distribution of the lightning activity in a specific sprite-active thunderstorm. The selected mesoscale convective system (MCS) composed of several extremely active thundercloud cells crossed Central Europe from South-West to North-East through Germany, Austria, the Czech Republic, and Poland on the night of 6 August, 2013. This MCS has triggered over one hundred sprites including several dancing sprite events. Video recordings of sprites captured from Sopron, Hungary (16.6°E, 47.7°N) and Nydek, Czech Republic (18.8°E, 49.7°N) were used to identify dancing sprite events and to determine the exact locations of the appearing sprite elements by a triangulation technique used originally to analyze meteor observations. Lightning activity in the MCS can be reviewed using the database of LINET lightning detection network which fully covers the region of interest (ROI). The poster demonstrates how cases of sequential charge removal in the thunderstorm can be followed by combining the available information on the occurrence time, location, polarity, and type (CG/IC) of detected lightning strokes in the ROI on one hand and the occurrence time and location of elements in dancing sprite events on the other hand.