Analysis of TLEs Observed in the Southeastern U.S.

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Triggered low light video observations have been made from a site near Duke University in North Carolina, USA beginning in early 2008. More than 60 lightning-driven high altitude transient luminous events have been captured in the first 6 months of operation, the overwhelming majority of which are sprites. These transient luminous events were produced by a wide variety storms that spanned winter to summer and include over-ocean and over-land systems. Simultaneous ultra low frequency to very low frequency (0.01 Hz to 30 kHz) electromagnetic field waveforms also recorded at Duke University and provide relatively detailed information about the causative lightning strokes, including polarity, time scales, and current and charge magnitudes. We will report analysis of the causative lightning and the lightning-generated electric field responsible for these events and contrast them to those observed in other parts of the United States.

We also were fortunate to capture, in different storms, images of two of the most uncommon forms of transient luminous events: a negative polarity sprite and a gigantic jet. During both of these events, ground-based low frequency electromagnetic fields were recorded. We report the quantitative analysis of these signatures to measure the low altitude and high altitude electric charge motion that occurred either inside or in association with these transient luminous events. Our analysis will focus on the high altitude electric fields driving the negative sprite in comparison to observations of more common positive sprites, and on the association of charge motion in the gigantic jet with specific stages of its temporal development.