

## **ELF/VLF SIGNATURES OF SPRITE-PRODUCING LIGHTNING DISCHARGES OBSERVED DURING THE 2005 EUROSPRITE CAMPAIGN**

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During the summer of 2005, transient luminous events were optically imaged from the French Pyrénées as part of the *EuroSprite* campaign. Simultaneously, ELF (Extremely Low Frequency: 3-3000Hz) and broadband VLF (Very Low Frequency: 3-30 kHz) data were recorded continuously at two separate receivers in Israel, located about 3300 km from the area of the parent lightning discharges responsible for the generation of sprites. Additionally, narrowband VLF data were collected in Crete, at about 2300 km away from the region of sprites.

The motivation for the present study was to identify the signature of the sprite-producing lightning discharges in the ELF and VLF electromagnetic frequency bands, to qualify and compare their parameters, and to study the influence of the thunderstorm activated region on its overlaying ionosphere. For the 15 sprites analyzed, their causative positive cloud-to-ground (+CG) discharges had peak current intensities between +8 and +130 kA whereas their charge moment changes (CMC) ranged from 500 to 3500 C·km. Furthermore, the peak current reported by the Météorage lightning network are well correlated with the amplitudes of the VLF bursts, while showing poor correlation with the CMCs which were estimated using ELF methods.

Additionally, more than one +CG was associated with 6 of the sprites, implying that lightning discharges that produce sprites can sometimes have multiple ground connections separated in time and space. Finally, for a significant number of events (33%) an ELF transient was not associated with sprite occurrence, suggesting that long continuing current of tens of msec may not always be a necessary condition for sprite production, a finding which influences the estimation of the global sprite rate based on Schumann Resonance (SR) measurements.

Lightning, Schumann Resonance, Sprites

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