



The spatial and temporal relations between sprites and meteors during the 2009 Geminid shower

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Meteors had long been suggested as a possible factor affecting the generation and location of sprite elements, via deposition of dust particles and ablation products that serve as ignition points by locally enhancing the transient quasi-electrostatic electric field in mesospheric altitudes (Zabotin and Wright, 2001). Since during a meteor shower the flux of incoming particles is much larger than during non-shower nights, it is conceivable that the presence of relatively large amounts of particles at mesospheric altitudes facilitates the generation of sprites above active thunderstorms, when the TLEs occur directly below the deposition region of the shower.

We report observations of the co-occurrence in space and time of bright meteors and sprites during the night of December 10-11 2009, three days before the reported peak of the Geminid meteor shower (IMO) which had a maximum ZHR ~ 120 per hour. A typical winter storm system was located over the Mediterranean Sea, some 300 km north-west of Tel-Aviv, where our cameras were located. A total of 37 sprites (columns and carrots) were imaged during a 5 hour period, intermittently with 12 meteor trails detected within the same field of view.

By calculating the meteor trajectories and the locations and the dimensions of the sprite elements, we show a close proximity between them in space and time. From the angular distance between the shower radiant and the observed bright segment of the meteors orbit, the beginning altitudes were found to be $87\text{-}102\pm 5$ km (Koten et al., 2004), and termination heights $82\text{-}96\pm 5$ km. Sprite altitudes were also computed, and found to overlap with the heights where meteors visually terminated. In some cases the sprites were observed just minutes after the meteors occurred, with only a couple of km separation from their location. However no direct and immediate one-to-one causality was detected. Possible mechanisms for meteor effects on sprites will be discussed.