



A possible lightning-gigantic jet interaction and mass of elves associated with negative cloud-to-ground lightning occurred over a very active thunderstorm

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On the night of 2 August 2010, dozens of TLEs were observed to occur over a very active thunderstorm near the coastal area of Luzon Island – Philippines, which is 500 km away from the Kenting observation site in the very southern tip of Taiwan. Among the 50 recorded TLEs, one was a tree gigantic jet(GJ) [Su et al., 2003], 37 were elves, 3 were isolated sprites, 8 were halos, and others were sprites accompanying by elves and halos. In the observation window, the lightning flashes from this storm were obscured by the thick cloud and were not discernible in the recorded images. Hence the NCKU ULF/ELF and the WWLLN (World Wide Lightning Location Network) location data of the TLE-associated lightning are also utilized to assist the analyses of these events. Except for three sprite-producing lightning, all the other parent TLE lightning have negative polarity. The highest occurrence rate of elves for this active system is about 1 event per minute, while about 60% of elve-producing lightning found no matching WWLLN records. For comparison, during the ISUAL (The Imager of Sprites and Upper Atmospheric Lightning) 2.5 min observation window, the highest elve occurrence rate ever recorded was also about ~ 1 event per minute, roughly in line with that for this thunderstorm. The polarity of the gigantic jet is found to be positive, which implies it was a negative cloud-to-ionosphere (-CI) discharge event. About 50 ms before the occurrence of the GJ, there is a dim, cone-shaped discharge associated with positive CG or Intracloud lightning (IC) occurred near the location of the ensuing GJ. Hence it is likely that the preceding CG or IC discharges may have created the charge imbalance that have favored the -CI GJ to initiate as suggested in Krehbiel et al. [2008, Nature Geoscience]. In addition, the characteristics of the triggering lightning and the correlation of the physical features of TLE events will also be reported.