Global distribution of TLEs and new results from the ISUAL experiment

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Transient luminous events (TLEs; sprites, elves, jets and etc.) are lightning-related optical flashes occurring above thunderstorms. Since the first discovery of sprites in 1989, scientists have learned a great deal about the morphological, spectroscopic and electromagnetic characteristics of TLEs through ground and spacecraft campaigns.

However, most of the TLE studies were based on events recorded over High Plains of American Continent. To elucidate the possible biasing effects, space-borne observations are needed and have their merits. Imager of sprites and Upper Atmospheric Lightning (ISUAL) on the FORMOSAT-2 satellite is the first instrument to carry out a true global measurement of TLEs from a low-earth orbit. In this talk, Current status ISUAL experiment and the measured global distribution of TLEs will be presented. We also apply a common astronomical data analysis technique, two-color diagram, on the ISUAL spectrophotometer (SP) data to study the elves events with ring or disk morphologies. We will also demostrate the proper method to process the recorded images to distinguish these two types of elves, and to study their spectral properties. A possible mechanism involving intercloud discharges is proposed to account for the disk-shaped elves.