

Global Distribution and Occurrence Rate of Transient Luminous Events

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Abstract

Based on 2.5-year survey by ISUAL experiment, the transient luminous event (TLE) global distribution and occurrence rate of TLEs including sprite, elve, and halo are derived. 80% of recorded TLEs were identified as elves, and only 20% are recognized as sprites and halos. The results show that sprites mainly congregate over continent as lightnings do, whereas elves scatter mostly over oceans. Theoretical calculation indicates that only less than 1% continental CG lightnings are able to generate elves which are detectable by ISUAL. The strong dependency of elve occurrence on the sea surface temperature and updraft flow of global atmosphere circulation implies that the warm tropical oceans provide the heat source to drive vertical convection and produce intense oceanic lightnings, which induce a large fraction of observed elves. This finding suggests that oceans, atmosphere and ionosphere are coupled.