Terrestrial Gamma-Ray Flashes and Sprites/ELF/VLF radiations

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Terrestrial gamma-ray flashes (TGFs) associated with simultaneous cloud to ground lightning discharge was reported in 1994 based the data obtained by BASTE onboard Compton Gamma-Ray Observatory (CGRO) satellite observation. Recently, a new satellite, Reuven Ramaty High Energy Solar Spectroscopic Imager (RHISSI), detected over 100 events around the earth with an gamma-ray energy on the order of 20-40 MeV. It is shown that the distribution of the TGF events on the world map is quite similar to that of sprites occurrence observed by ROCSAT-2 satellite. The relationship between the TGF and the ELF/VLF waves which are indicators of sprites and/or elves occurrence are examined with Tohoku university network. The conditions for generating TGF and sprites in thunderclouds are discussed.