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A FLIGHT FORMATION MISSION TO OBSERVE THE BEAMED STRUCTURE OF TERRESTRIAL GAMMA RAY FLASHES FROM ORBITAL ALTITUDES.

Abstract

The University of Valencia has written an extensive LEPTRACK software package to simulate the Relativistic Runaway Electron Avalanche mechanism (RREA) that is thought to explain the recently discovered phenomenon of high energy Bremsstrahlung emission of Terrestrial Gamma Ray Flashes.

With this software UV has been able to produce plausible models of TGF spectra, its diffuse beam structure, and the light-curves likely to be seen at the 400 km orbital altitude of the ISS, which will be home to the pathfinder MXGS imager-spectrometer of the ASIM mission to observe and locate TGFs originating at 12-20 km altitudes inside thunderstorms.

In evaluating the performance parameters of MXGS it is clear that it is difficult to measure the atmosphere exit angle of a TGF beam to decide if its origin is in the electron acceleration at the intense micro-electric-field at the tips of randomly oriented lightning streamers or in the nearly vertical macro-electric-fields below and above cloud tops.

To do this a flight formation mission is proposed, of several imager-spectrometers of high sensitivity and imaging resolution, each with EMP antennae and fast band filtered optical cameras, to observe TGFs and return observation data from which 3D angular variations in gamma-ray spectra, fluence and light-curve structure can elucidate their beamed origin and altitude.

We will present videos of the electron-photon expansion of a TGF through the atmosphere to flight and orbital altitudes, their associated spectra and light-curves, along with details of the mission imaging-spectrometer instruments and how they will observe TGF beamed structure and their thunderstorm origin.