Geophysical Research Abstracts
Vol. 15, EGU2013-1923-2, 2013
EGU General Assembly 2013

A study of the relativistic runaway electron avalanche and the feedback theories to explain terrestrial gammaray production

Alexander Broberg Skeltved (1), Nikolai Østgaard (1), Thomas Gjesteland (1), and Brant Carlson (2)

(1) University of Bergen, Department of Physics and Technology, Bergen, Norway, (2) Carthage College, Kenosha, WI, United States of America

A series of important discoveries were made in the early 1990's and led to the new field High-Energy Atmospheric Physics (HEAP). Amongst these was the discovery by the Burst And Transient Source Experiment (BATSE) which measured unexpected bursts of energetic photons originating in the Earth's atmosphere. This phenomenon was named Terrestrial Gamma-ray Flashes (TGFs) and was characterized by short bursts of energetic photons ranging from a few keV to several tens of MeV and probably initiated at altitudes between 11 and 25 km in thundercloud regions. This characterisation were also determined from measurements obtained by the Ramaty High Energy Solar Spectroscopic Imager (RHESSI). Two compelling theories explaining the production of TGF's have later been presented. Both theories involving the acceleration and multiplication of electrons in strong electric fields through Runaway Relativistic Electron Avalanches (RREAs). We have used the well established Geant4 simulation toolkit to model RREAs in air, in order to study the feedback theory presented by J. R. Dwyer. We will compare results obtained by the Geant4 model to Dwyers results. In particular we will study the electron energy distribution, avalanche lenghts, average energy of runaway electrons in RREAs aswell as the feedback factor.