Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

The Relativistic Feedback Mechanism of Electrical Breakdown. HAMID RASSOUL, JOSEPH DWYER, Florida Institute of Technology — In 2003, a new electrical breakdown mechanism, referred to as Relativistic Feedback, was introduced. Relativistic Feedback involves the production of runaway electron avalanches by positive feedback from runaway positrons and energetic photons and allows runaway discharges in gases to become self-sustaining, dramatically increasing the flux of runaway electrons, the accompanying high-energy radiation, and resulting ionization. Based upon detailed Monte Carlo calculations, properties of Relativistic Feedback are presented. It will be shown that once Relativistic Feedback commences, electrical breakdown will occur, and the ambient electric field, extending over cubic-kilometers, will be discharged in as little as 20 microseconds. Furthermore, the flux of energetic electrons and x-rays generated by this mechanism can exceed the flux generated by the standard relativistic runaway electron process by a factor of 10 trillion, making Relativistic Feedback a good candidate for explaining Terrestrial Gamma-ray Flashes and other high-energy phenomena observed in the Earth's atmosphere.

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Date submitted: 24 Aug 2007 Electronic form version 1.4