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Simple "Reactor model" of relativistic runaway electron avalanches dynamics

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A possible mechanism responsible for Terrestrial Gamma-ray Flashes (TGFs) is feedback in the relativistic runaway electron avalanches (RREA) dynamics. In this research, a new way of RREAs self-sustaining is suggested. This self-sustaining feedback can be described in the following way. Let the thundercloud consist of two regions with the electric field so that runaway electrons accelerated in one region move in the direction of another one and vice versa. For instance, such an electric field structure might appear with one positive charge layer situated between two negative charge layers. In this system, the following feedback mechanism occurs. An RREA developing in one region will produce bremsstrahlung gamma-rays. These gamma-rays will propagate into another region and produce RREAs within it. These RREAs will develop backward and radiate gamma-rays, which will penetrate the first region, generating secondary RREAs. In this way, the primary avalanche reproduced itself by the gamma-ray exchange between two sideways oriented areas with the electric field. In this work, it is shown that the electric field values required for TGF generation by this mechanism are lower than values required in Relativistic Feedback Discharge Model.