



How should we define terrestrial gamma-ray flashes?

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There is currently an argument in the community, whether production of relativistic electrons and gamma-rays are only occurring in a sub-set of lightning. It is quite well established that TGFs observed from space are related to positive intra-cloud (IC+) lightning bringing negative charges up to the upper positive charge layer. Our working hypothesis has been that all IC+ in principal could produce TGFs, although the potential drop ahead of the leader will determine whether the relativistic run-away electron avalanche (RREA) process will be able to generate the typical RREA spectrum. This requires at least ~ 50 MV potential drop (4-5 avalanche lengths). However, smaller potential drop will also produce relativistic electrons, but not up to tens of MeV. The intensity will also be somehow lower as the multiplication process will be weaker. The question is whether there is a significant difference between gamma-rays that are produced by >50 MV and <50 MV potential drops, or do they just produce an unbroken continuous fluence distribution as well as distributions of energy spectra. So the question is: how do we define TGFs?