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2D axisymmetrical particle modelling of the production of thermal runaways electron by sprite streamers

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Sprites are transient luminous flashes occurring in the mesosphere above large thunderstorms, usually produced after positive cloud to ground lightnings. Telescopic imaging has shown vertical filamentous structures of sprites that have been interpreted in terms of streamer discharges. It is thought that sprite streamer contribute to the generation of terrestrial X- or γ-ray. We present in this paper results from a 2D axisymmetrical particle code that can reproduce the streamer discharge process at sprite altitude and the creation of thermal runaway electrons. These runaway electrons can reach energies high enough to produce X- or γ-rays through the Bremsstrahlung process. The simulations confirm that sprite streamers can be a source of Terrestrial X- or γ-ray flashes.