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Terrestrial gamma ray flashes (TGFs) are high-energy bursts of photons bright enough to be routinely observed from space. They originate in thunderstorms in association with lightning activity. As the gamma rays propagate through the atmosphere, interactions of photons with air molecules produce secondary electrons. When trapped around geomagnetic field lines, some of these electrons can be observed as terrestrial electron beams (TEBs) at satellite altitude. Most of secondary electrons do not make it as far as space; rather they lose their energy through interactions with the atmosphere. Through bremsstrahlung, the secondary electrons also produce another population of photons in the X-ray energy range.

The satellite Taranis (CNES) and the observatory ASIM (ESA) have been specifically designed to study TGFs and other lightning-related phenomena, and will have X- and gamma ray detection capabilities.

Through Monte Carlo simulations of particle propagation and interaction with the atmosphere, we model the production and properties of secondary electrons and the induced second generation of photons. We aim to predict how secondary X-rays might be detected by space-based instruments. We find that especially at the lower end of the TGF energy range, the secondary X-rays make a noticeable contribution to the spectrum.