Geophysical Research Abstracts
Vol. 21, EGU2019-11833-1, 2019
EGU General Assembly 2019

Low frequency radio pulses produced by terrestrial gamma-ray flashes

Yunjiao Pu (1), Steven Cummer (1), Michael Briggs (2), Gerard Fitzpatrick (3), Sheila McBreen (3), and Oliver Roberts (3)

(1) Duke University, Electrical and Computer Engineering Department, Durham, NC, United States, (2) University of Alabama in Huntsville, Huntsville, AL, United States, (3) University College Dublin, Dublin, Ireland

This work examines the temporal connection between low frequency (LF) radio pulses and terrestrial gamma-ray flash (TGF) generation on microsecond timescales. We employ long-term (2010 July to 2018 September) continuous data from Fermi GBM, NLDN and multisite LF sensors to identify the highest quality examples for analysis. We find that 138 out of a total of 2403 TGFs are matched with NLDN lightning locations within $\pm$10 ms and $\pm$600 km horizontal range, identifying a possible source location. Among these, 72 TGFs are in close range (<800 km) to at least one of LF sensors to provide a detailed waveform. Six of these 72 LF waveforms are found to contain an isolated LF slow pulse (mean width $\sim$120 μs) within the lightning pulse sequence of multiple fast pulses (<10 μs risetime). We analyze the simultaneity of the slow pulse and the TGF, accounting for the uncertainties in NLDN locations and assumed source altitude (13$\pm$3 km), and find that in all six cases they are effectively simultaneous within the overall timing uncertainty of each event. Our results add support to the idea that the LF slow pulse is a signature of TGF-production process and perhaps of the electron acceleration itself.