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Filament-induced electric events in thunderstorms

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Investigation on the physics of thunderbolts requires on-demand lightning strikes. Ultrashort lasers provide long conducting plasma channels through the filamentation process, which can trigger and guide high voltage discharges of several meters length. We investigated the scalability of these results to real-scale lightning control, using the Teramobile laser at the Langmuir Laboratory of the New Mexico Tech. Considering only time periods when the electrical field was sufficient for rockets to trigger lightning, i.e. E $>$ 10 kV/m, an array of VHF detectors identified a set of 6 events synchronized with the 10 Hz repetition rate of the laser, out of a total of 17 events, yielding a high statistical significance (α = 3.3x10^{-5}). Such effect was only observed over the laser location. This shows that plasma filaments generated by ultrashort laser pulses can initiate electric events in thunderclouds, although the triggering of actual lightning strikes could not be achieved at this stage. This limitation is due to the plasma lifetime within the filaments, which could be enhanced in the future by using pulse sequences.