



Emergence of sprite streamers from ionization waves in the lower ionosphere

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Up to now, the necessary conditions for sprite streamer emergence and the actual sprite streamer propagation have been studied with different simulation models because the characteristic length scales differ widely. Here simulations with a locally refined numerical grid are presented; they catch within one simulation the essentials of the parent lightning stroke, the ionization and density profile of the atmosphere, the formation of an ionization wave in the lower ionosphere and the consecutive initial sprite streamer formation with emergence altitude, diameter and velocity.

Within a parameter study, we discuss how emergence and properties of the sprite streamer depend on the temporal evolution of the charge moment of the parent lightning stroke and on the ionization density profile in the upper meso- and lower ionosphere.

The ionization wave preceding the sprite might be sometimes visible as a halo. Indeed, our model includes standard models of halo formation as well, but we also include electron motion. This creates a polarity dependence during late stages of halo evolution.