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**Discharge inception in atmospheric air above the breakdown field**

ANBANG SUN, JANNIS TEUNISSEN, Centrum Wiskunde & Informatica, UTE EBERT, Centrum Wiskunde & Informatica; Eindhoven University of Technology, MULTISCALE DYNAMICS TEAM — Streamers play an important role in creating the path of lightning and sprites. They also have wide applications in industry. In this work, we use a 3D particle code to investigate streamer formation in atmospheric air, in a homogeneous electric field above the breakdown threshold. We include the effect of natural background ionization and of photoionization. We see that numerous avalanches start from different locations, these avalanches overlap and screen the electric field in the interior of discharges. Finally, no isolated streamer forms in this region. We give an analytical estimation of the screening ionization time which is a generalization of the Maxwell relaxation time in ionizable media. Our results are very different from so-called double-headed streamers that were found in previous fluid models. Our simulations are in agreement with recent experimental observations. [A. Sun et al., *Geophys. Res. Lett.*, 40, 1-6 (2013)].

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