

Electrostatic based model for the recoil leader in cloud-to-ground lightning with multiple strokes

Lightning Physics

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This paper intends to present an electrostatic based model for numerical simulation of recoil leader and multiple stroke generation in negative cloud-to-ground (CG) lightning. Basically three processes are modeled that seem to be crucial for the stroke multiplicity: (i) the development and branching of the cloud positive leader in two dimensions inside thundercloud electric field, and consequent current generation; (ii) the cloud leader branches decay; and (iii) the recoil (dart) leader generation on decayed channels. Long arc $V \times I$ non-linear curve (King, 1961) is used to compute circuit parameters for each leader channel segment. The channel current cut-off criterion proposed by S. Heckman (1992) is used, comparing time constants RC and τ . Temperature time decay of the defunct channel from Uman and Voshall (1968) model is used as a parameter for the electric field breakdown calculation through Borovsky (1995) formula. The final purpose of such modeling is to evaluate which are the key factors that define the stroke multiplicity in negative CG flashes.