Computer simulations on the sprite initiation for realistic lightning models with higher frequency surges

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Computer simulations on transient luminous emissions in the mesosphere/lower ionosphere have been performed for realistic lightning modelings with M components (fast-varying current surge superimposed on the lightning continuing current). The algorithm used here is EM (electromagnetic) code, which enables us to estimate self-consistently the reduced electron field, electron density, conductivity and luminosity as a function of space and time by solving the Maxwell's equations. It is found that the M components with small amplitude, but with fast-varying EM effect, can initiate or enhance the sprites. Drastic changes in transient luminous emissions are noticed with higher occurrence frequency, shorter repotition period etc of those M components. These computational results are used to provide some useful hints on the unsolved problems of sprites/halos, including polarity asymmetry, long-delay characteristics and morphological characteristics of sprites.