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A dynamical model approach to structuring of sprites

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Our recent theoretical studies for structuring of sprites on the basis of quasi-electrostatics and multi-body dynamical model are presented in this talk. The phase transition theory between halo and streamer states has been proposed, and a similar transition could be found in a variety of macroscopic structures of sprites as column and carrot shapes. We construct a multi-body dynamical model that treats the interaction, acceleration, and splitting of streamers in a lightning-induced quasi-electrostatic field. We investigate sensitivity of streamer development to the lightning (measurable) parameters and provide implications for the condition of the phase transition of sprites.

Keywords: sprite, dynamical model, phase transition