

Cellular-Automaton Modeling of Mesospheric Optical Emissions

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The presentation is devoted to modeling of mesospheric optical emissions named sprites with cellular-automaton network. A large scale model of sprites based on a phenomenological percolation-like probabilistic approach to modeling of streamer discharges in sprite is developed. We show that sprite is a self-affine structure rather than simple fractal one. This self-affine structure of sprites tightly connected with directed percolation phenomena. The system evolves in vicinity of percolation threshold and that results in wide spread of sprite characteristics under similar initial conditions. The developed approach allows us to estimate maximum size of the discharge pattern to be formed.