

A POINT PROCESS APPROACH FOR SPATIAL STOCHASTIC MODELING
OF THUNDERSTORM CELLS

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Abstract: In this paper we consider two different approaches for spatial stochastic modeling of thunderstorms. Thunderstorm cells are represented using germ-grain models from stochastic geometry, which are based on Cox or doubly-stochastic cluster processes. We present methods for the operational fitting of model parameters based on available point probabilities and thunderstorm records of past periods. Furthermore, we derive formulas for the computation of point and area probabilities according to the proposed germ-grain models. We also introduce a conditional simulation algorithm in order to increase the model's ability to precisely predict thunderstorm events. A systematic comparison of area probabilities, which are estimated from the proposed models, and thunderstorm records conclude the paper.

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Keywords and phrases: Stochastic modeling, Cox process, cluster process, germ-grain model, Monte Carlo simulation, thunderstorm cell.

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