Point process models for short-term rainfall

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Point process theory has been widely used to model the stochastic structure of rainfall occurrences, and of hourly and daily rainfall depths. Cluster-based models are found to be useful for modelling short-term rainfall, as they preserve the clustering properties of the rain generating mechanism. Smith and Karr [*Water Resour. Res.* **19** (1983), 95-103] highlighted the applicability of Cox processes with Markovian intensity in rainfall modelling as they have an appealing physical interpretation. We study two point process models based on the Cox process. These marked Cox process models are used to describe the probabilistic structure of the rainfall intensity process. Different mechanisms for the process of marks are employed. For the first model the marks are rainfall volumes (depth) per event, whereas for the second model the marks are volumes and durations of events. The models we discuss here are similar in form to those described in Rodriguez-Iturbe *et al.* [*Water Resour. Res.* **20** (1984), 1611-1619] but are somewhat different in their basic structure. Mathematical formulation of the models is described and some second-moment characteristics of the rainfall depth, and aggregated processes are considered. The derived second-order properties of the accumulated rainfall amounts at different levels of aggregation are used in order to examine the model fit. A brief data analysis is presented.

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