Spatial Dependence of Extreme Rainfall

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Abstract
This study aims to model the spatial extreme daily rainfall process using the max-stable model. The max-stable model is used to capture the dependence structure of spatial properties of extreme rainfall. Three models from max-stable are considered namely Smith, Schlather and Brown-Resnick models. The methods are applied on 12 selected rainfall stations in Kelantan, Malaysia. Most of the extreme rainfall data occur during wet season from October to December of 1971 to 2012. This period is chosen to assure the available data is enough to satisfy the assumption of stationarity. The dependence parameters including the range and smoothness, are estimated using composite likelihood approach. Then, the bootstrap approach is applied to generate synthetic extreme rainfall data for all models using the estimated dependence parameters. The goodness of fit between the observed extreme rainfall and the synthetic data is assessed using the composite likelihood information criterion (CLIC). Results show that Schlather model is the best followed by Brown-Resnick and Smith models based on the smallest CLIC's value. Thus, the max-stable model is suitable to be used to model extreme rainfall in Kelantan. The study on spatial dependence in extreme rainfall modelling is important to reduce the uncertainties of the point estimates for the tail index. If the spatial dependency is estimated individually, the uncertainties will be large. Furthermore, in the case of joint return level is of interest, taking into accounts the spatial dependence properties will improve the estimation process.