Role of the spatial correlation of extreme rainfall events in the flood risk assessment

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The spatial and temporal structure of rainfall is fundamental for correctly assess the flood hazard and risk of large areas. The occurrence of multiple catastrophic events within a given time span affecting the same portfolio of insured properties may induce enhanced loss. Therefore in the insurance industry it is of interest to characterize not only the point probability of catastrophic events, but also their spatial dependence structure. For floods, multiple simultaneous events in different parts of the same basin may result in significantly different losses in a portfolio. Understanding spatial structure of precipitation field is necessary for proper modelling of spatial correlation of river discharge. Several multi-site stochastic models are available in the scientific literature for generation of precipitation: good performance for mean values, but not so good for temporal variability and inter-site dependence of extremes.

We present here a methodology to model multi-sites rainfall based on a Bayes' approach and Copula transformation. The implication in terms of flood risk are discussed on a realistic case.