Space-time modelling and simulation of extreme rainfall

Flash floods caused by heavy rainfall may trigger considerable damage. To study flood risk in urban areas, flow models, whose key boundary condition is the spatial rainfall forcing, can be used. As rainfall is one of the most complex meteorological processes, its simulation requires an accurate characterization of the spatio-temporal variability and intensity of rainfall from available data. Classical stochastic approaches are unable to deal with extreme events and most existing generators are likely to underestimate them. We will propose two approaches based on exceedances over high thresholds. The first one is based on a hierarchical model defined over continuous space and time by embedding a space-time Gamma process convolution for the rate of an exponential variable, leading to asymptotic independence in space and time. The second one is semi-parametric and draws sound theoretical justification from extreme value theory, building on generalized Pareto limit processes. The practical usefulness of the proposed models will be illustrated on hourly precipitation data in Southern France.

Gwladys Toulemonde
IMAG, CNRS, Université de Montpellier, Inria
Gwladys.toulemonde@umontpellier.fr