Bayesian inference for multivariate extreme value distributions

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The density of parametric multivariate extreme value distributions involves a huge number of terms in higher dimensions. In many applications maximum likelihood estimation of model parameters using full likelihoods is thus infeasible. Composite likelihood methods based on bivariate densities only have therefore been widely applied. Recently, Thibaud et al. (2015, http://arxiv.org/abs/1506.07836) introduced a Bayesian hierarchical model framework using the partition of occurrence of the maxima as a latent variable to fit a Brown-Resnick process to temperature extremes. This enables the use of full likelihoods for the estimation of model parameters by Markov Chain Monte Carlo methods where the updating step for the partition is done by the Gibbs sampler in Dombry et al. (2013, Biometrika). In this talk, we explore the Bayesian hierarchical model framework for general max-stable distributions. Applying this approach for popular models in extreme value statistics, we show how the estimation accuracy can be substantially improved compared to composite likelihood methods. Further, the Bayesian framework allows for new hypothesis tests for multivariate extremes.