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Composite likelihood inference for spatial max-stable processes : a threshold approach

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For environmental processes such as climate ones, characterizing the behavior of spatial extreme values is of fundamental interest to understand how extreme events tend to occur. Max-stable processes are an infinite-dimensional generalization of multivariate extreme value theory that is of particular interest to model extremes of spatial processes. Recently, practical methods have been developped in the literature for the fitting of such processes to spatial data sets (Padoan et al, 2010) and a R-package named "Spatial Extremes" (Ribatet, 2010) is now available. It is well known that statistical inference for extremes can be based on block maxima (often over a given period of time) or on exceedances over a high threshold. Today the parameters of spatial max-stable processes are estimated using composite likelihood methods on samples of bivariate vectors of maxima. In practice, the sizes of such samples are small. As a consequence, the model parameters may be poorly estimated. Here we deal with estimation procedures based on exceedances over a high threshold. Two models are considered. The first one comes from Smith *et al* (1997) and is adapted to model the simultaneous exceedances of bivariate vectors. The second one is based on bivariate generalized Pareto distributions (Rootz'en and Tajvidi, 2006). The current block maxima fitting procedure and our proposals are compared through numerical examples.

Padoan S.A., Ribatet M., Sisson S. (2010) Likelihood-based inference for max-stable processes. Journal of the American Statistical Association 105 :263–277.

Ribatet M. (2010) SpatialExtremes : Modelling Spatial Extremes. R package version 1.6-0.

Rootz'en H., Tajvidi N. (2006) Multivariate generalized pareto distributions. Bernoulli 12 :917–930.

Smith R., Tawn J.A., Coles S. (1997) Markov chain models for threshold exceedances. Biometrika 84 :249–268.

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