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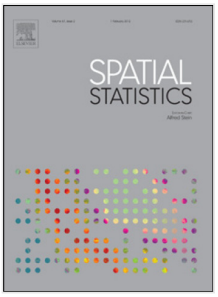

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Spatio-temporal pareto modelling of heavy-tail data

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Abstract

In this work we introduce a spatio-temporal process with pareto marginal distributions. Dependence in space and time is introduced through the use of latent variables in a hierarchical fashion. For some specifications the process becomes strictly stationary in space and time. We present the construction of the process and study some of its properties and dependence measures such as correlation and tail dependence. We follow a Bayesian approach to estimate model parameters and show how to obtain posterior inference via MCMC methods. The performance of the process is illustrated with a pollution dataset of monthly maxima ozone concentrations over the metropolitan area of Mexico City. Our results show that our model is in many instances, superior to a couple of alternative models based on the generalized extreme value distribution.

Key words: Space-time model, Pareto distribution, MCMC, latent variables, pollution data, GEV distribution.

1 Introduction

The are two main approaches for the analysis of extreme value data in the literature as described in Coles (2001) which are related to the generalized extreme value (GEV) distribution and the generalized pareto (GP) distribution. Both distributions arise as a limit behavior argument under independent and identically distributed (iid) observations and for strict stationarity in space and time. In particular, the GEV distribution refers to the limit