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The full-tails gamma distribution to model extreme values in climate time series

Isabel Serra (1) and Joan Del castillo (2)

(1) Universitat Autònoma de Barcelona, Matemàtiques, Cerdanyola, Spain (iserra@mat.uab.cat), (2) Universitat Autònoma de Barcelona, Matemàtiques, Cerdanyola, Spain (castillo@mat.uab.cat)

The analysis of extreme values in climate time series is based on models Poisson-Pareto. The Pareto distribution to model the intensity of the exceedences on a threshold and the process Poisson to model the frequency. Many authors as Davison and Smith (1974) or Coles and Sparks (2006) agree prioritize the distribution of intensity, since for high thresholds the instant at which the event occurred is negligible and its measurement error also.

The extreme value theory is based on the Pickands-Balkema-DeHaan Theorem, see McNeil, et al. (2005). Hence, in practice, the conditional distribution of any random variable over a high threshold is approximated by a generalized Pareto distribution (GPD). In particular, heavy-tailed are modeled by Pareto distributiuon. This result justifies that Pareto distribution is a mathematical solution, but the practical problem whether the threshold is high enough still remains. We proppose a new statistical approach as the solution. The new statistical model is based on the new family of distributions: full-tails gamma (FTG).

Really, certain phenomena that may be fitted by the power-law distribution or Pareto distribution present a deviation from these laws for very large values. It is often due to the interference that produces an overall limit, for instance, a tropical cyclones has a finite ocean basin. The motivation of this work was to find a model to explain this fact in several cases. Our main achievement is that Pareto distribution is nested in this model, hence, likelihood inference is available. We show the utility of the new model applying it to tropical cyclones. The data is obtained from Corral, et al. (2010) in the study of the influence of climate variability and global warming through the occurrence of tropical cyclones.

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