

Stuart G. Coles

A Censored Point Process Model for Extreme Volcanic Eruptions

Point processes provide a natural framework for characterising the asymptotic extremal characteristics of stochastic processes. More recently, limiting point process representations for extremes have also become popular as models with which to make inferences on extreme events. In this talk we consider the problem of inferring the distribution of the magnitude of extreme volcanic events from a catalogue containing all such reported events from the last two millennia. The problem is important as eruption magnitude is a key component in risk assessment for volcanic regions. What makes the problem unusual is an apparent under-reporting of historical eruptions, especially for eruptions of relatively low magnitude, and ignoring this aspect could lead to biased estimates of extreme volcanic behaviour. In part the talk will be an overview, introducing the point process representation for extremes and making the connection with other, better-known, representations. We will also propose a simple parametric solution to the under-reporting problem, in which the Poisson intensity function that derives from standard extreme value theory is modified by a parametric censoring function that models the assumed under-reporting feature of the data. The model enables an assessment of the historical under-reporting, an extent to which this effect is genuinely dependent on magnitude and an unbiased measure of present volcanic activity exploiting the entire historical catalogue.

Stuart Coles is Associate Professor of Statistics at the University of Padova, Italy. His main research area is the development of methodological tools for the study of extreme values, principally for application to environmental problems. He is also interested in statistical techniques for the study of environmental problems more generally, and in the use of Bayesian techniques for data modelling. He is the author of a book 'An Introduction to Statistical Modeling of Extreme Values', published by Springer, 2001.