



Inference of Statistical Patterns in Complex Geosystems: Fitting Power-law Distributions.

Anna Deluca (1,2) and Alvaro Corral (1,3)

(1) Centre de Recerca Matemàtica, Complex Systems Group, Bellaterra, Spain (crm@crm.cat), (2) Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, (3) Department of Mathematics, Universitat Autònoma de Barcelona, Barcelona, Spain

Power-law distributions contain precious information about a large variety of physical processes. Although there are sound theoretical grounds for these distributions, the empirical evidence giving support to power laws has been traditionally weak. Recently, Clauset et al. have proposed a systematic method to find over which range (if any) a certain distribution behaves as a power law. However, their method fails to recognize true (simulated) power-law tails in some instances, rejecting the power-law hypothesis. Moreover, the method does not perform well when it is extended to power-law distributions with an upper truncation. We present an alternative procedure, valid for truncated as well as for non-truncated power-law distributions, based in maximum likelihood estimation, the Kolmogorov-Smirnov goodness-of-fit test, and Monte Carlo simulations. We will test the performance of our method on several empirical data which were previously analyzed with less systematic approaches.