Geophysical Research Abstracts
Vol. 14, EGU2012-5952, 2012
EGU General Assembly 2012

Robustness of Estimators of Long-range Dependence and Self-Similarity for Non-Gaussian Datasets.

N. W. Watkins (1), C. L. E. Franzke (1), T. Graves (2), R. B. Gramacy (3), and C. Hughes (1)

(1) British Antarctic Survey, Cambridge, United Kingdom (nww@bas.ac.uk), (2) Statistics Laboratory, University of Cambridge, Cambridge, United Kingdom, (3) Booth School of Business, The University of Chicago, Chicago, USA

Evidence for long-range dependence and non-Gaussianity is ubiquitous in many natural systems like ecosystems, biological systems and climate. However, it is not always appreciated that both phenomena frequently occur together in natural systems, and that self-similarity of a system can result from the superposition of both phenomena. These features, which are common in complex systems, impact the attribution of trends and the occurrence and clustering of extremes. The risk assessment of systems posessing these properties will lead to different outcomes (e.g. return periods) than the more common assumption of independence of extremes.

We discuss two paradigmatic models which can simultaneously account for long-range dependence and non-Gaussianity: Autoregressive Fractional Integrated Moving Average (ARFIMA) and Linear Fractional Stable Motion (LFSM). The statistical properties of estimators for long-range dependence and self-similarity are critically assessed as applied to these models. It is seen that the most popular estimators are not robust. In particular, they can be biased in the presence of important features of many natural systems like annual cycles, trends and multiplicative noise.

[Related paper in press, Phil. Trans. Roy. Soc. A; preprint at arXiv:1101.5018]