

Local random analogue prediction of nonlinear processes

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Abstract

Given that it is not possible to predict the precise evolution of either stochastic processes or chaotic processes from observations, a data-based algorithm with minimal model-structure constraints is presented for generating stochastic series which are realistic, in that their long-term statistics reflect those of a process consistent with the observations. This approach employs random analogues, and complements that of deterministic nonlinear prediction which estimates an expected value. Contrasting these approaches clarifies the distinction between Lorenz's predictions of the first and second kind. Output from several nonlinear stochastic processes and observations of quasar 3C 345 are analysed; the synthetic time series have power spectra, amplitude distributions and intermittency properties similar to those of the observations.