



Climacogram-based pseudospectrum: a simple tool to assess scaling properties

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Power-spectrum is a powerful stochastic tool to assess important properties of a process, including scaling behaviour. However, when constructed from time series with short lengths, as is typically the case in hydroclimatic applications, the empirical power spectrum is too rough and the information it provides may be distorted and misleading. Typical smoothing techniques may induce further distortion and bias. A pseudospectrum technique is proposed, which is based on the climacogram of the process. The climacogram expresses the variance (or standard deviation) of a process as a function of time scale of aggregation and an appropriate transformation thereof resembles the power spectrum. In particular its asymptotic slopes for frequency (inverse time scale) tending to zero or infinity are the same as those in the formal power spectrum. In this respect, it can be used to infer the scaling properties of a process. This pseudospectrum does not involve direct or inverse Fourier transforms and thus it is very easy to construct. Furthermore, it is smooth by definition because it is derived from variances of the time series aggregated at several scales, rather than the time series per se.