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Estimation of the $1/f^{\alpha}$ exponent for very short and fragmented time series: An "Extended Multiple Segmentation Method'' (E-MSM)

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Ecological studies are often confronted with short and fragmented or unevenly sampled time series. Examples are, e.g., time series of biogeochemical fluxes measured on a variety of scales. Characterizing the observed time series patterns, particularly the correlation structure is crucial for an integrated ecosystem assessment or possibly for improved processes understanding.

Miramontes & Rohani (2002)[(1)] proposed the "Multiple Segmentation Method'' (MSM) a simple method based on pseudo replicates of the observed time series to estimate the $1/f^{\alpha}$ exponent of very short time series. We extended this approach by coupling MSE to the Lomb-Scargle Periodogramm. This "Extended Multiple Segmentation Method'' (E-MSM) permits estimating the α parameter not only for short but also from fragmented and unevenly sampled time series

We show the usefulness of E-MSE on both, synthetically generated time series with known spectral properties and with real world time series. For the latter we used short unevenly sampled and fragmented biogeochemical time series. We showed that the proposed methodological extension is very useful for characterizing biogeochemical behaviour on an ecosystem scale.

[(1)] Miramontes & Rohani (2002), Physica D 166: 147-154