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# Scaling in North Atlantic sea level observations

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Sea level is an important parameter in climate and oceanographic applications. In this work the scaling behaviour of sea level is analysed from time series of sea level observations. Both sea level measurements at coastal sites from tide gauges and over the North Atlantic from satellite altimetry are considered.

The wavelet domain is particularly attractive for the identification of scaling behaviour in an observed time series. The discrete wavelet transform is a natural tool for the analysis of scaling processes. The wavelet spectrum from a scale-by-scale wavelet analysis of variance constitutes a second order description of the process and a simple summary of the spectral density function. The wavelet spectrum reproduces in the wavelet domain the power laws underlying the scaling process, allowing the estimation of the scaling exponent from the slope of the wavelet spectrum.

Here the scaling exponent is estimated from time series of sea level observations in the North Atlantic. Both tide gauge and altimetry time series exhibit scaling behaviour. Furthermore, the degree of stochastic persistence is spatially-coherent and distinct at the coast and in the open ocean. Near the coast, the stochastic structure of the sea level observations is characterised by long range dependence with a moderate degree of persistence. Larger values of the scaling exponent, consistent with weaker persistence, are concentrated in the northern Atlantic. At mid-latitudes the stochastic dependence of sea level observations is characterised by strong persistence in the form of strong long range and 1/f dependence.