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Analysis of the dynamic memory of the sunspot number time series.

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Monthly average sunspot numbers have been analysed with the maximal overlap discrete wavelet transform for the period 1750 to 2005. The estimated power spectrum shows a slope following that of red noise up to level 3, eqivalent to a wavelength of 2.7 years. The monthly average time series is accordingly filtered by removing details up to level 3. Linear and non-linear empirical single step prediction models are developed to explore the predictability and memory of the sunspot time series. We find that the useful prediction lead time is 50 months or less, in accordande with past non-linear studies, and that the memory of the system is shorter than a solar cycle, thus very weak dependence on past cycles. As the models used are capable of modelling a broad class of non-linear systems the results are the consequence of one of two possible explanations: 1) The sunspot number time series has a memory shorter than 8 years, or 2) The sunspot time series is too short to capture the underlying dynamics.