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Maximum entropy bootstrap of climate time series

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The identification and estimation of trends is a fundamental task in the analysis of climate time series. Even more important than estimating a trend is assessing its significance, which is far from a trivial task, due to the serial dependence in the time series, which invalidates most methods based on independent data. The issue is particularly crucial in the case of short records, as often happens in palaeoclimate time series. Bootstrap is an appealing non-parametric alternative for assessing the significance of estimated linear trends. However, bootstrapping is also more delicate in the case of time series than in the case of independent data, since the temporal structure of the series should be preserved in the bootstrap samples. Furthermore, bootstrap procedures often assume stationarity, an assumption which is not verified by most climate time series. Maximum entropy bootstrap (Vinod, 2006) allows to preserve the basic temporal structure of the original time series in the bootstrap replicates without assuming stationary behavior. In this work maximum entropy bootstrap is applied to assess the significance of trends estimated from short ($\sim$17 years) records of satellite measurements of the height of the sea surface.