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A natural long detrending tool for long climate time series

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To study variability of a time climate series or to correlate two distinct climate time series one must, almost always, take out the linear trend. However, many climate fields experience a long-term evolution far from a simple linear behavior. A decade ago the Detrended Fluctuation Analysis (DFA) was introduced as a tool for detection long-range (auto-)correlations in time series with non-stationarities in studying DNA nucleotides, after DFA was also applied to climate fields. Despite being developed for detecting long-range correlations (auto-correlations) in a time series the DFA methodology can be used as a pure long detrending tool allowing the search for correlations between different time series after removing the slow time evolution. Nevertheless, the slow evolution obtained by DFA is discontinuous and that is not desirable in climate time series. To add to this inconvenience is the inexistence of an objective method for choosing the time interval division in DFA approach. In this work we present a new way of detrending climate time series whenever the small evolution is well represented by a continuous set of straight lines (Karl et al 2000, Tomé and Miranda 2004) by fitting on the time series a set of continuous line segments, where the number of segments, the location of the breakpoints between segments, and the slopes of the different segments are simultaneously optimized.