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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the scaling effect in global surface air temperature anomalies" *by* C. A. Varotsos and M. N. Efstathiou

Anonymous Referee #1

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Recommendation: Major revision

My comments are as follows:

1) As in many studies on long-range dependence (LRD) no error estimates are given in this manuscript. While in many studies different LRD values are given it is hard to judge if they are really distinct or inside each other's error bounds. This is a big disadvantage of DFA. There are other methods which give error bounds like spectral estimators (e.g. Geweke and Porter-Hudak 1983; J. Time Series Anal.) which seem also to be superior to DFA as a previous study showed (e.g. Franzke et al. 2012; Phil. Trans. A). The inclusion of error estimates is vital before the manuscript can be considered for publication.

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On page 4 a standard deviation of 0.03 is mentioned but it is not clear what this refers to. This should be clarified.

2) The authors mention that it is not clear how long a time series needs to be before reliable LRD estimates can be inferred. Again, a method which provides error bounds would be a much more powerful tool to address this question because the answer will depend on how narrow an estimate one wants to get. Furthermore, if the time series are truly scaling than the use of annual or monthly means should lead to the same results. Otherwise, the time series is not scaling. Considering the reported results that alpha=0.65 for annual means and alpha=0.74 for monthly means do not provide much confidence that the global mean temperature is scaling or has long-range dependence (assuming that the detrended anomalies are nearly Gaussian distributed). This should be discussed in the manuscript.

Most natural time series are not well described by some idealised stochastic process like fractional Gaussian noise or fractional Gaussian motion. They are better described by some superposition of of different stochastic processes. A paradigmatic example is the Autoregressive Fractional Integrated Moving Average (ARFIMA) process with possible non-Gaussian increments (e.g. Franzke et al. 2012). This 'corruption' of any pure LRD signal by other stochastic and/or deterministic processes will also influence the time series length.

3) The first sentence of the introduction reads awkward. Not the surface air temperature is driving the greenhouse effect. Anthropogenic greenhouse gas emissions are driving the surface temperature. This should be changed.

4) How do you deal with the seasonal cycle of the monthly mean data?

5) What is the order of the best fit polynomial for detrending the data?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 14727, 2012.