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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "An inkling of the relation between the monofractality of temperatures and pressure anomalies" *by* A. Deliège and S. Nicolay

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We thank the reviewer for taking time to consider our manuscript. We have carefully read his comments and consequently we provide below our answers to his remarks. The reviewer's comments are in italics.

- The method proposed to test for monofractality is not convincing. It is applied to two deterministic functions. It should be applied e.g. to a fBm. Furthermore, a good test of monofractality is simply to check if a moment function is linear. The most classical form is the structure function, for non-stationary data with stationary increments. There is no need for a complicated phase shuffling as proposed here. Or if this method is a powerful one to test for monofractality, the authors should prove that it is better than simply to see if a moment function is linear.

The surrogate data method mentioned in the paper is well-known and has already been used in many published works (two of them are cited). Of course, it has already been tested on fBm's and it works perfectly, therefore we did not feel the need to expand on that subject: further information can easily be found by simply googling "surrogate data method". For example, it has been explicitly showed by Foufoula-Georgiou, Roux, Arneodo and Venugopal that "The surrogates of a multifractal function destroy the long-range correlations due to phase randomization" (AGU meeting, Dec 2005).

- The data considered are not mean quantities, there are the mean between daily minimum and daily maximum. This is a rather strange mixture and it seems more realistic to estimate a better defined mean value, if available.

The mean temperatures considered are simply the standard data directly provided by the ECAD. As weird as you may find it, everybody has to deal with it.

- There is a strange sentence, line 17 p. 1343: "For the purpose of reducing the noise, the data f(t) were replaced by their temperature profiles". What noise? Why is it called a noise, is it a stochastic variability? Scaling methods are indeed devoted to characterize stochastic variability and averaging in order to smooth out fluctuations is not recommended, at least prior to any analysis. What is t in the proposed equation (line 18)?

The same technique is used in Koscielny-Bunde, E., et al, Phys. Rev. Lett., which is cited in the text. It can be seen as replacing the noise of a fBm with the associated walk. By the way, "t" stands for the time, but the choice of the letter does not really matter, does it?

- Some portion of the time series are not displayed. The scaling range of the data is not commented nor shown. Figures showing the scaling range are needed before any plot of the scaling exponents. Some power spectra for some stations should be provided.

As explained, only small scales are mathematically relevant for the Hölder regularity

(see the ref. in the text). From a theoretical point of view, one can thus stop as soon as the behavior ceases to be linear. The scaling range is shown on Fig.4 and all the spectra look like those on this figure (associated to Rome), therefore we feel that it would be both unclear and useless to display more of them.

- Most studies of temperature fluctuations show that it is a multifractal quantity. The monofractal claim here is an important point which is not enough documented. Most likely, it is false.

The reviewer should check the literature, especially the references given in our paper as well as e.g. “D.M. Sonechkin and N. M. Datsenko, Pure Appl. Geophys. 157 (2000) 653” suggested by the referee himself, which shows that many previous studies agree with the results obtained here. We can conclude that there is no consensus of opinion; maybe we use here the term “multifractal” in a narrower sense than usual, since we define it through the Hölder notion. Nevertheless, the signal is not multifractal from the “Hölder point of view”, which is the rigorous definition of multifractality in general settings.

- The link with available methodologies and data analysis studies is not satisfactory. There are many other methods to test for monofractality or multifractality and these are not discussed. There are many studies in the topic of scaling analysis of climate temperature, which are not cited nor discussed. A quick google scholar search gave me the papers below (and many others are certainly existing)...

Most of the references given by the referee only use the MF-DFA method, which is discussed in the paper. Moreover, as mentioned above, wavelet-based methods support our results. We did not intend to write a review article; we just claim here that a rigorously defined method for studying the Hölder regularity brings interesting sharp results. Our approach agrees with some previous studies. The lack of consensus obviously makes it impossible to write down specifications for a method to be significantly better than another.

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 1339, 2015.