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Earth System Dynamics Discussions

Interactive comment on "Power-law behavior in millennium climate simulations" *by* S. V. Henriksson et al.

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We thank Anonymous Referee 2 for his/her review and agree that the references mentioned in the review are essential to discuss in the article. They are now added to the list of references and discussed in the text, and we feel this has improved the manuscript, especially in more clearly isolating what the important novel contributions of our study are. The changes made in our manuscript our described below in reply to the comments of Anonymous Referee 2. The original comments are in italics.

The paper by Henriksson et al "Power-law behaviour in millennium climate simulations" is a comparative study of scaling properties of modelled and observed global temperature data. I find this research useful, but it lacks references (and somehow repeats substantial results) of the community of statistical physicists who have been studying

scaling properties in the climate data since the 90s using detrended fluctuation analysis. Therefore, I request a major revision with comparison of earlier studies. In particular, a JGR paper by Rybski et al (2008) studies long-term memory in 1000- year simulated temperature record, which is directly related to the present paper, and its results should be cited and compared with the findings of the authors.

Furthermore, it is necessary to add references to related papers by Koscielny-Bunde et al (PRL 1998), Kantelhardt et al (Physica A 2001). Furthermore, the influence of forcings on the model scaling performance was studied in Vyushin et al (GRL 2004). The influence of distribution on scaling performance, which the authors mention as an unresolved problem, was studied in the highly-cited paper by Kantelhardt et al (Physica A, 2002). Without discussing these materials, the present study is incomplete, in my opinion.

All the mentioned references have been added. Rybski et al. (2008) is cited in the introduction and discussed in the context of local and regional features in Section 5. Vyushin et al. (2004) is now briefly discussed in the introduction, in Section 3 when discussing simulations with only solar forcing and only volcanic forcing and also in Section 6 when comparing simulation results with measurements. The references Kantelhardt et al. (2001, 2002) are cited and discussed in the last paragraph of Section 3 discussing theoretical explanations of the power-law spectrum. As a result of this updated discussion, the focus and main findings of our paper are now more clearly formulated in the second paragraph of the introduction and in the conclusions.

In the abstract, it is necessary to give the precise description of the studied data: not just "long time series" but rather "long annual temperature time series", otherwise the abstract is not informative enough. I understand that one of the series was monthly (Fig.4), but most datasets were annual, and it is necessary to mention. Also, the abstract says about El Nino and Nyquist frequencies but does not provide values, which would be useful to give for the general readership.

ESDD

3, C369–C371, 2012

The abstract has been modified to mention that most time series are annual mean temperatures, the monthly mean time series are mentioned separately and numerical values of the different frequencies are now also mentioned.

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