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Earth System Dynamics
Discussions

Interactive comment on "Are there multiple scaling regimes in Holocene temperature records?" *by* T. Nilsen et al.

Anonymous Referee #2

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Summary:

The manuscript presented by T. Nilsen et al. focuses on the scaling of variance with timescale (i.e. changing slopes in the power spectrum) of Holocene temperature records. They investigate to what extent the power spectra can be approximated with a single linear fit ("mono-scaling"), or two linear lines intersecting at a "scale break". They fit these models to proxy data with predefined scale break at ,100 years, and with adaptively estimated scale breaks. They find that a scaling model with two slopes is not supported by the proxy data analyses.

General comments:

- The manuscript is well written, though with short passages that are technical.
- It is not overly exciting, as the relevance of the scaling models for future prediction is not made very clear.
- As a manuscript with paleoclimate focus this manuscript may be more suitable for a journal like "Climate of the Past".
- At present several data (independence of the temperature reconstructions, calibration of the ice core data, effects of noise) and method aspects (bias in the estimation procedure around beta=1, use of Lomb-Scargle periodograms) are not sufficiently discussed and justified in the manuscript to allow for firm conclusions.
- I suggest that the manuscript be subjected to minor revisions before it can be published.

Specific comments:

page 1202
l8: Starting a sentence with "Nor..." is not idiomatic. Please rephrase.
l15: Is this an important model for temperature prediction on centennial timescales?

page 1203
l14: "will in this paper mean" sounds awkward
l21: "A white noise... was identified" - incomplete sentence

page 1205
l10: It is not obvious why a Lomb-Scargle periodogram should deal better with

irregularly sampled data than conventional techniques or other techniques such as spectral estimation via "correlation slotting" . There is evidence that it does not (Rehfeld Kurths, 2011). Uneven sampling causes bias when overcome by standard interpolation (leading to a red bias), but the LS periodogram also shows considerable high-frequency biases (blue bias) which may be worse. The argument that "the data is not standard, therefore the methods have to be special" is not necessarily true. A much more critical point, with a potentiallly larger impact on the scaling question, is the question of signal-to-noise ratios, and/ or the global representativeness of the used proxy records (see e.g. Laepple and Huybers, 2014).

page 1206
l9: Re-phrase sentence please.
l11: "degrees" or "for a different degree"
l22: This length limit assumes indepence of the data points - which is not justified for proxy records.

page 1210
l12: Which figures in the supplement are referred to? Why is the case of beta=1 so awfully difficult? This is a significant drawback of the methodology! And: Is the LS-Periodogram actually doing a better job here than interpolation+(multitaper) spectral estimation?

p1211
l15: Why are the wavelet analyses necessary? What are they supposed to contribute to the main message of the manuscript?
l16: typo "ice core"
l24:Are these reconstructions actually independent, or do they use the same background proxy series for reconstruction?

p1212
l23: If these are temperature reconstructions, what were the calibration models? Linear regression based on O18? Or nonlinear models? Were they adjusted for Holocene and Glacial differences? Same for l. 4 on p1213 (deuterium)

p1216
l10: Why should DO-events flatten the spectrum on centennial and shorter timescales? This is not obvious (to me).

p1217
l19: typo “uncertainties”
l24/25: Basically, what you write here is that there is no power in this test of beta differences. So why use it?

p1218
These paragraphs are nice to read.

p1219 l8: "has implications"- rephrase please
l28: This sentence, and the following one, is hard to digest, in particular to the nice and easy to read discussion before

p1220
l1: Capitalize “Gaussian”
l12: omit the “,”