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Interactive comment on "Strong indications for nonlinear dynamics during Dansgaard-Oeschger events" *by* H. Braun

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The article presents a statistical test of non-linearity of NGRIP data (time interval 10,000 -> 60,000 years) BP, based on a "M-statistic" and concludes that these data cannot be generated by a linear autoregressive process. The author then urges the climate community to go beyond the simple use of linear time-series analysis to understand the origin of Dansgaard-Oeshger events.

The good news about the paper is that the results are reproducible. I went to the process described by the other, and obtained $M_{\text{NGRIP}=0.224}$ (the author has 0.226), and the 1-99 percentiles of the distribution of M statistics on phase-randomised times series is in my case $(0.253, 0.259)$, consistent with the numbers given by the author. At the same time, I am interrogative about the small amount of analysis here. It took me about

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one hour to reprogram the phase-randimization routine and test it on GRIP data and obtain the numbers above. This is quite cheap for a scientific paper. Furthermore, the analysis technique is not particularly novel. Ashkenazy (2003) provided analyses of a similar flavour using Vostok data, and the phase randomisation technique is discussed in length in the Kantz and Schreiber book referred to by the author.

The message is not revolutionary either: DO events are not-linear. The main message of the author is legitimate: care should be taken when using linear time-series analysis techniques... but note that Kantz and Schreiber introduce their book by drawing attention on the many pitfalls of non-linear time series analysis. This is where the present paper comes short, really. Can one be content with the M-statistic only? What motivated this choice? What is the result sensitivity on dating assumptions ? What is the effect of the running mean procedure? Svensson et al. propose an regularly time-sampled time series, which probably required some post-processing. What is the effect of this post-processing? etc.

In summary, the point is interesting, but but I would really have seen the statistical test presented here almost as a motivating example of a broader paper and not as a paper on its own.

References

Y. Ashkenazy, D. R. Baker, H. Gildor, and S. Havlin. Nonlinearity and multifractality of climate change in the past 420,000 years. *Geophys. Res. Lett.*, 30:Art. 2146, 2003.

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