

Interactive comment on “The origin of the 1500-year climate cycles in Holocene North-Atlantic records” by M. Debret et al.

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The authors apply Fourier and wavelet analysis to several Holocene climate proxy records and discuss the presence and absence of cycles with a period length of 1000, 1500 and 2500 years.

This manuscript is a very interesting contribution to the discussion about millennial scale climate cycles throughout the Holocene and the last glacial. In particular, I enjoyed reading the review of the scientific discussion about the origin of the 1500 year cycle.

As my main scientific expertise is in time series analysis I will comment on this aspect only.

The time series analysis presented in the submitted manuscript must be improved to justify a publication in *Climate of the Past*. In particular, work must put on the statistical part to allow statements about the significance of the results.

Major comments:

-The software/technique used for doing Fourier or wavelet analysis is not or not sufficiently cited.

- The authors describe and refer to a wavelet analysis technique that can be applied to evenly sampled data. They do not explain how to deal with (likely to be) unevenly time-sampled records. So, it remains unclear how they produced their results. I am familiar with two approaches to overcome this problem (but there might be more): (A) There are wavelet analysis techniques for unevenly sampled data (for instance Foster 1996, and updated versions). Foster's technique has been applied to Holocene climate records already (Witt & Schumann, 2005) where millennial scale climate cycles in different records of the GISP2 ice core have been discussed. (B) Alternatively, the data can be interpolated with different techniques to make them evenly sampled. Then the authors have to test (may be simulatively) how the applied interpolation technique influences on the significance of identified periodicities.

- Unlike the presented Fourier analysis, the wavelet analysis comes without any statistical test to evaluate the significance of the findings/ the presence of the cycles. This is not acceptable.

- I am wondering if wavelet analysis of a non-trivial record with less than one hundred data points (as the IRD, grain size and the diatom concentration record have) can lead to a proper identification of periodic cycles.

Minor comments:

The six panels of Figure 3 would benefit from larger y-axis notations and from horizontal bars indicating the three considered cycles. "Time" in the x-axis title should be replaced

by "Age".

References:

Foster, G.: Wavelets for period analysis of unevenly sampled time series, *Astronom. J.*, 112, 1709-1729, 1996.

A. Witt, A. Y. Schumann: Holocene climate variability on millennial scales recorded in Greenland ice cores, *Nonlinear Processes in Geophysics*, Vol. 12, 345-352, 2005.

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