Climate of the Past Discussions

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Comment on cp-2022-61

Anonymous Referee #2

Referee comment on "A 1.5-million-year record of orbital and millennial climate variability in the North Atlantic" by David A. Hodell et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2022-61-RC2, 2022

The manuscript of Hodell et al provides not only a set of high-resolution data for the last 1.5 Ma from a climate sensitive region, but also a quite comprehensive, up-to-date and insightful review for the MCV. The characteristics of the MCV and their links with orbital forcing, glacial state and CO2 are discussed for different periods of the 1.5 Ma. The discussions are made not only based on the U1385 data but also on a wide collection of important literature. I also agree with the authors that "*In addition to documenting MCV, the planktic and benthic isotope records from Site U1385 provide unprecedented detail of the amplitude and shapes (waveforms) of the glacial cycles on orbital time scales for the last 1.45 Ma*". I believe it will be a very useful paper for researchers and students in paleoclimate study. I would recommend its publication after some minor revision. Please find here under my comments and questions which I hope will help to clarify a few things and potentially make the paper more attractive.

1. Figure 6 seems very noisy. There are many peaks between the blue and red shade. I wonder why these are not discussed in the paper. If these peaks are considered as noise, how can we tell the blue and red shaded parts are not noise? I would suggest to try with another software to check whether the result of the spectral analysis is affected by the software used.

2. The evolutive power spectrum figures (Figures 16 and 17) are not sharp nor nice, which is a pity for such a nice paper where all the other figures are of very high quality. A color bar is also missing. Similar to my comment for Fig.6, I wonder whether the result is affected by the software used, and I would suggest to test with another software to perform wavelet analysis and compare with the results shown in Figures 16 and 17 and to improve the quality of the figures.

3. Lines 733-736: In addition to the 41-kyr signal, Figures 16 and 17 also show strong signal around the low-frequency 0.005-0.01 (200 - 100 kyr cycles) between 1450-900 ka, but I don't see this is mentioned anywhere in the manuscript. Could the authors comment

on this and add some discussions in the paper?

4. The 28-kyr cycle has been suggested to originate from the non-linear interactions between eccentricity and precession/obliquity, or between the 41-kyr cycle and its multiples or from a non-linear response of the glacial cycle to obliquity (lines 32, 739-748, 934, 1056-1058). I would like to draw attention that 28 kyr is one of the important periodicities of obliquity although its magnitude is only one eighth of the magnitude of the 41-kyr periodicity (see Table 1 of Berger, 1978, Journal of the Atmospheric Sciences), so the possibility of a direct and more linear response to obliquity can not be excluded, although the reason why the 41-kyr is switched to 28-kyr at ~800 ka BP remains to be explored. I would suggest to mention this in the manuscript to open more possibilities.

5. Lines 752-753: I wonder to which extent the good relationship between obliquity and MCV depends on the way to build chronology, and to which extent the obliquity threshold 23.5 is affected by age uncertainty. Could the authors add some discussion on this? The obliquity minimum around 1180 ka seems not playing a role, what might be the reason?

6. Line 803: It would be more accurate to say "obliquity through its effect on the mean insolation but mainly on the total summer insolation at high latitudes (see Berger et al., 2010, Quaternary Science Reviews, https://doi.org/10.1016/j.quascirev.2010.05.007), because a large part of the mean insolation is depending on precession.

7. Lines 816-818: It is a repetition of lines 804-805, not related to the subharnomics as discussed in this paragraph, and is better to be integrated with lines 800-805.

8. Line 932: Figs. 10 and 11 should be Figs. 16 and 17?

9. Zr/Sr is less familiar at least for me. Adding some explanation on its paleoclimate interpretation would be welcome.

10. Both ka and kyrs are used through the paper. Better to use only one?