Clim. Past Discuss., 9, C3179–C3182, 2014
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Climate of the Past Discussions
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Interactive comment on "A major change in North Atlantic deep water circulation during the Early Pleistocene transition 1.6 million years ago" *by* N. Khélifi and M. Frank

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Received and published: 21 January 2014

General comments

Dear authors,

On page 6503 you briefly describe/discuss the link of your work to orbital forcing, which is of interest. Though orbital forcing is not the main focus of the manuscript, in our opinion the discussion points below are important for parts of your manuscript.

- You refer to Laskar et al., 1993 (p. 6503, l.21), while Laskar et al. 2004 provide the most recent and most precise solution for obliquity (and precession) though differences

are small.

- You discuss an 'event near 1.65 Ma' (million years before present). At 1.6 Ma, a long term (0.4 Ma) eccentricity minimum occurs with lowest precession amplitudes (see the figure below, see also Meyers Hinnov, 2010). Huybers (2007) suggested that at 1.6 Ma (and also 1.2 Ma) at least some δ^{18} O records 'skip' an obliquity cycle. This probably leads Meyers Hinnov (2010) to discuss a relatively high ratio of deterministic (vs. stochastic) energy at 1.6 Ma during a minimum in eccentricity.

- When discussing a major climatic change at 1.6 Ma, it may also be worth including the discussion about a change in the marine carbon cycle at 1.6 Ma (Wang et al. 2010).

Generally, because of the low precession amplitudes and the relatively strong obliquity component in the time interval from 1.50 Ma to 1.65 Ma, a relatively strong obliquity component in high latitudinal insolation is present in the insolation (see the Figure below, data according to Laskar et al. 2004; available online at http://www.imcce.fr/Equipes/ASD/insola/earth/online/index.php).

In the conclusion you state 'The enhanced climatic response to the Earth's obliquity forcing during the Early Pleistocene transition most likely ultimately triggered the re-organization of North Atlantic deep water circulation towards a more stratified water column and more distinct water masses after 1.4Ma.' At 1.68 Ma both eccentricity and obliquity amplitude are exceptionally low; at 1.45 Ma both eccentricity and obliquity amplitude are relatively high. This combination may make a clear statement on the orbital cause of a climate change 'around this time' difficult.

Best Regards,

Christian Zeeden, Stefanie Kaboth

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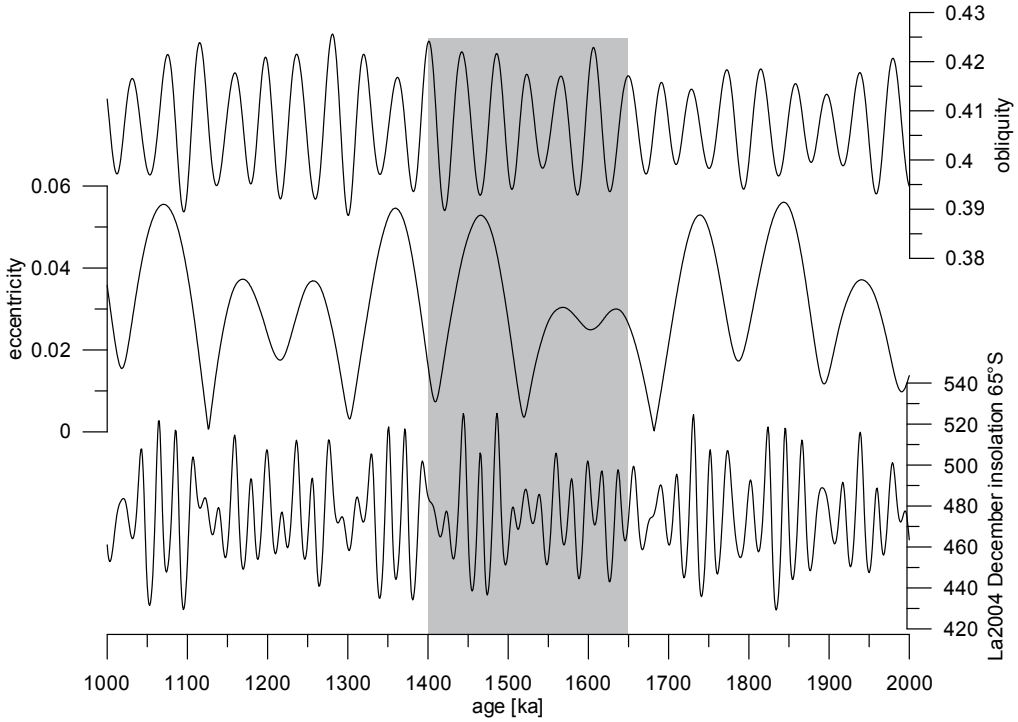

Fig. 1. Obliquity (top), eccentricity (middle), and the 65 degree Southern latitude December insolation, all from Laskar et al. (2004).

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