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3, S35–S37, 2007

Interactive Comment

Interactive comment on “Anomalous flow below 2700 m in the EPICA Dome C ice core detected using δ^{18}O of atmospheric oxygen measurements” *by* G. B. Dreyfus et al.

Anonymous Referee #2

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Overall this approach represents a great improvement in constraining the EPICA Dome C core chronology. I have a few minor criticisms, but overall this is an excellent contribution.

I think the authors’ conclusions could be bolstered by some further cross-checks:

1) It would be useful to independently match the del18O(atm) record to obliquity. The authors note on Page 69 that they ignore the obliquity component, but do not really return to discussing the implications of this choice as mentioned. It would be well worth exploring the use of obliquity as a tuning target for several reasons:

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a) interhemispheric phasing is not a problem; one does not have to choose a season or month to calculate the obliquity parameter as for precession.

b) As the authors note, precession has relatively low amplitude through the interval they're concerned with. The obliquity signal is relatively stable in both amplitude and frequency over 1.5 to 0.5 Ma interval (Berger et al., 1997).

c) Figure 3 shows that although the relative spectral power of the obliquity-associated peak is lowered somewhat in the EDC3 chronology (compared to EDC2), EDC3 puts the peak closer to the obliquity orbital frequency. It's worth noting that the EDC3 spectrum brings out a spectral peak that looks (to my eye - the authors should check this) close to a period of about 29 kyr. This period is a minor side peak of the dominant 41-kyr component of obliquity (Berger et al., 1997).

2) It would also be useful to map the EDC oxygen isotopic record directly into the Liesecki & Raymo marine 18O stack, since ice volume is still presumed to be a significant component of the 18O(atm) variability.

3) In Figure 3 it would be well worth showing the coherency spectra. Since the focus is on precession, this signal's amplitude modulation makes coherency a useful evaluation tool.

4) Another (somewhat)independent check could be derived from comparing the deuterium record to Southern Ocean sea-surface temperature (SST) time-series, as there are a number of Southern Hemisphere SST records which cover the the MIS 12-20 interval. These show, similarly to EDC, that sea-surface temperatures were low during MIS 12-15 compared to subsequent interglacial intervals. See for example: King and Howard (2000), Becquey and Gersonde (2002), and Schaefer et al. (2005).

5) Finally, an independent stratigraphic tie-point to the marine record may exist in the EDC core in the form of the Brunhes-Matuyama magnetic reversal, detected by Raisbeck et al. (2006) via 10Be. The utility of using the B-M boundary as a tie point is

CPD

3, S35–S37, 2007

Interactive Comment

that it has been dated in marine records by both radiometric and orbital means, and tying it to atmospheric records is independent of any assumptions about time-scales of isotopic fractionation or phase relationships to orbital forcing. So it would be well worth checking to see that the EDC3-implied ice-gas age differences put Raisbeck's 10Be peak at 780 ka, or the MIS 19-20 boundary. (I note that the 18O(atm) record presented here stops just short of MIS 20).

References:

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Interactive comment on Clim. Past Discuss., 3, 63, 2007.