

Interactive comment on “Patterns of millennial variability over the last 500 ka” by M. Siddall et al.

Anonymous Referee #1

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In this article, the authors investigate millennial scale variability using a 500 kyr temperature proxy record from Dome 3 and correlate it with a sea level record extracted from the Red Sea (proxy for ice volume).

The authors identify clusters of millennial scale variability that occurs mainly when ice volume is equivalent to 40–80 m of sea level and during terminations. This characteristic of the time distribution of millennial scale variability is new, and I find it interesting and worth publication. Although previous studies found millennial scale variability during periods of both large and small ice volumes, as far as I am aware, this is the first study that systematically investigates the connection between millennial scale variability and ice volume for such a long period.

The authors also confirm that there is no consistent link between Heinrich events and millennial scale variability. This suggests that iceberg discharge cannot be the

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sole mechanism behind millennial scale variability, and they suggest that an additional source for the millennial scale variability might be changes in atmospheric circulation driven by precession.

Few comments/suggestions:

1. Method: I am not sure I understand why A_Aprobed is not minimal during the period of A₂, even if the alignment is not perfect. How different will A_Aprobed be for different spacing between the windows? Why did you choose a window of 100 kyr, which is quite long compared with the total length of the record?

2. References list: Several are missing, such as Seager et al., 2002; Seager and Battisti, 2006, Li and Battisti, 2008 ...

3. Additional references you may want to include:

a. Orbital modulation of millennial-scale climate variability in an earth system model of intermediate complexity, Friedrich et al., *Clim. Past Discuss.*, 5, 2019-2051, 2009 (precession and millennial scale variability)

b. A wind-induced thermohaline circulation hysteresis and millennial variability regimes Ashkenazy and Tziperman, *J. Phys. Oceanogr.* 37 (10), 2446-2457, 2007 (changing wind and millennial scale variability).

Minor comments:

p. 20, line 16: should be millennial and not decadal

p. 22, line 27: expand EDC (EPICA Dome C) (it is defined only in the next page)

p. 26, line 24: change ice-berg to iceberg

p. 31, line 6: Heinrich with Capital H

Interactive comment on *Clim. Past Discuss.*, 6, 19, 2010.

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