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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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Analysis of carbon isotope records and gradients (depth and intra-basinal) indicate an important transition occurred in deep-water circulation and/or ventilation at ∼1.5 Ma. Carbon isotopes are a non-conservative tracer, however, so it is important to complement these data with a tracer like Nd isotopes that is generally thought to display more conservative behavior than carbon.

Although the shift in εNd in the North Atlantic at 1.6-1.5 Ma is an important observation that merits publication, the discussion of the cause of the event and especially the comparison to benthic δ13C records are misleading. In the body of the manuscript the authors are careful to note that the shift in εNd occurred primarily during INTERGLACIAL intervals. Indeed, this is clear in Figure 4 as there is no change in εNd for the glacial periods. This is a vital piece of evidence that governs the interpretation and comparison of the Nd results with other proxy records, yet it is absent from the abstract and title of the paper.

The discussion is confusing because the authors have conflated two events at 1.5 Ma, which may have had different causes; i.e., the INTERGLACIAL shift in εNd demonstrated in this paper and the primarily GLACIAL shift in benthic δ13C values observed in deep Atlantic and Southern Ocean carbon isotope records. The paper implies the two were related but they are occurring in fundamentally different climate states. To explain the Nd results, a discussion focused on deep-water processes during INTERGLACIAS would be more appropriate than comparison to circulation changes associated with dominantly GLACIAL periods (e.g., see Raymo et al. 2004, Paleoceanography, 19,PA2008, for a discussion of interglacials).

The resolution of the Nd records in the three sites is very low and likely don't fully capture the full range of glacial-to-interglacial values. I would therefore advise caution when stating that the "glacial/interglacial" amplitude of the Nd signal increased after 1.5 Ma. How were the samples chosen (based on O18)? Do they come for peak glacial and interglacial periods? If so, which ones? For example, Raymo et al. (2004) showed that extreme interglaciations of the late Pleistocene (including the Holocene) had anomalous d13C profiles, albeit their shift occurs at $\sim$0.6 Ma rather than 1.5 Ma.

The authors attribute their change in eNd at 1.5 Ma to an increase in the amplitude of the obliquity cycle but they don't have the time series needed to rigorously test this hypothesis. A recent paper by Lisiecki (2014; accepted in Paleoceanography) reported cross-spectral analysis of benthic d13C with obliquity and precession signals and concluded the phase between benthic δ13C and obliquity were the same before and after 1.6 Ma, whereas the phase with precession differs considerably after 1.6 Ma. They found 41-kyr power in benthic δ13C peaks during a maximum obliquity forcing at

1.4 Ma but also at 0.8 Ma during a minimum in obliquity forcing. I think the speculation about obliquity forcing should be removed from the paper and the results of Lisiecki (2014) cited.

In summary, the Nd results reported are significant but the paper requires substantial revision to clarify the aforementioned points.

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