Reviewer #2

Aaron M. Barth et al, present an interesting study and well written manuscript, but the large number of figures (17 figures) make the reading difficult.

The number of figures by moving figures 3, 10, 13, and 16 to the supplemental materials.

This work addresses a statistical characterization of changes occurring during Mid-Brunhes Transition (MBT) over the last 800kyr. This work is based on already published data of SST, benthic d13C and dust records from Atlantic, Pacific and Indian Ocean. The main proposal of this work is to demonstrated that MBT is a global event. However the representability of the selected recorded in order to discuss global /regional patterns is not clear. There are several record, some of them on North Atlantic that they show different pattern at least on SST trend and warmer interglacial are record on pre-MBT interval as also was mentioned on previous review papers (Pages, 2016). So should be very interesting to analyze the differences observed on these patterns and clear define what the global concept is, if it is the patterns similar with the Ice core records or the regional forcing are always imprinted on our climate records.

We note that while there are some aspects of regional variability, our method using Empirical Orthogonal Function analysis extracts the dominant modes of variability by all records. As such, it is a means of representing the fullest global signal from available data sets. Additionally, factor loadings for each data set within the EOF analysis dictate whether a particular record contributed positively (in agreement) or negatively (in disagreement) with the resulting principal component. In the case of the first principal component of SST's we explain that all records contributed positively and thus PC1 is representative of the dominant mode of variability from the global compilation of SST data sets.

A sentence in the SST Results section has been changed to more clearly reflect this: "While some degree of regional variability in each record exists, factor loadings indicate that each record positively contributed to PC1 with a larger contribution coming from high-latitude records. Thus, PC1 is representative of a global SST signal."

It would be good to add in the introduction a few sentences to explain why it was selected these sites.

Site selection was based on the maximum number of available data sets that met our selection criteria with no emphasis on any particular region. The sentence below was added to the Methods section to emphasize this point:

"We compiled all available published records of sea-surface temperature (SST), benthic marine carbon isotopes ratios ($\delta^{13}C$), and dust accumulation (Dust) that met our selection criteria and closely represented a global distribution as attainable"

Special focus was been done on MIS 14 and 13 and the interconnections between strong Asian monsoon on MIS 13 and the followed weak glaciation MIS14, however this assumption does not take in account the ventilation and the changes in the d13C on North Atlantic during this interval as also involved on the main changes at the CO2 and SST pattern.

We believe the reviewer is referring to the increased Asian Monsoon activity during MIS 15 that was subsequently followed by a "weak" glacial during MIS 14 which lead to the carbon isotope

excursion at MIS 13.

Records of North Atlantic $\delta^{13}C$ equally demonstrate the enriched carbon isotope excursion during MIS 13 discussed in our manuscript. Additionally, atmospheric CO_2 concentrations during the same interval show low-level, pre-MBT interglacial values – consistent with the previous interglacials up to 800 ka. A record of calcium carbonate preservation derived from Ca/Al concentrations during MIS 13 show greater preservation at that time (Jaccard et al., 2010). This could suggest greater preservation of organic matter in the sediments as a potential reservoir for light carbon during the excursion. However, heavy enrichment of the oceanic $\delta^{13}C$ signal indicates relatively little light carbon in the oceans at this time. Thus, it is more likely stored in another reservoir – potentially the biosphere as described in our manuscript.

The following sentence was changed in the manuscript to address this:
"Ba/Fe records of organic export productivity from the AZ that acts as a sink for light carbon indicate no increase during this interglaciation while Ca/Al records from the SAZ indicate increased preservation and thus a deeper lysocline and lower dissolved inorganic carbon (Jaccard et al., 2010). The question thus becomes: if the ocean is heavily enriched in □^{13}C during MIS 13 while CO_2 and export productivity remained at low levels, what reservoir contained the isotopically light carbon?"

As the major comments on the manuscript I consider that would be good to add other sites and integrated different patterns on this global concept.

At the time of analysis, these were the maximum number of data sets available.