

Interactive comment on “Glacial-Interglacial changes and Holocene variations in Arabian Sea denitrification” by Birgit Gaye et al.

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Reply to reviewer 3:

Thank you very much for your review and the detailed comments which we will carefully go through in our revised version. We greatly benefit from four the four detailed reviews of colleagues who are very well acquainted with the study area so that we can critically check the entire ms. and avoid mistakes and unprecise statements.

Reviewer 3 questions whether the binning of data into 1 ka intervals is useful and also points out that some of the records have few age tie points while other records are very highly resolved. Due to these differences in resolution we decided to bin the data in 1 ka intervals. The idea was to use this procedure to eliminate some of the local

C1

variations and identify the main trends. But we think that it is a good idea to strengthen our points by showing some of the highly resolved records in the revised version (see also comments to reviewer 4).

Another suggestion of reviewer 3 is that we should look at the Holocene only. We think that looking at the last 25 ka is one of the main focusses of this paper. Our idea was to provide a comprehensive picture of glacial-interglacial changes for the entire basin and the Holocene development and to identify the main drivers of changes in the N cycle. We have received many comments by Dr. A. Singh and the other reviewers to be able to improve this version of the ms. with a better presentation of the role of circulation/ventilation changes, of the reasons for correcting $\delta^{15}\text{N}$, of the applicability of this tracer and of model results.

Lines 19-20 will be clarified, we will refer to ETNP and ETSP upwelling

Line 37-38 we will add ref.

A description of the N cycle will be added to the intro (see reviewer 1) which will give us the chance to satisfy most of your requests.

Line 79-80 will be rephrased.

References added where required and Banakar et al. 2005 vs. 2010 will be rechecked.

Naik et al., 2014, 2015 will also be checked

Sample collection

Line 183: Data on core SL 163 and MC680 will be made available on Pangaea – data repository.

Line 215: The age model of SL163 was published by Munz et al. 2017 and the hiatus was identified by change of facies. TOC and N curves could be paralleled between the cores so that a relatively good age model becomes available also for MC680 (short multicore).

C2

The d15n data are from Banakar et al. (2005) and the SST curve was from Banakar et al. (2010) made available by Dr. Banakar.

The normalization procedure was carried out in order to be able to look at changes in d15N sources and eliminate the local biases. In the revised version we will discuss the possible biases in more detail. In the supplement we have indicated the average value used for normalization for each core. Averages were in a similar range even when cores did not cover the entire 25 ka but when the main shift in d15N values from the glacial to Holocene conditions was covered. In some cases the records were indeed too short to use the average of the particular core. In this case the average was derived from near-by cores when the d15N values in the available time periods were in the same range. All values used for normalization are shown in the Supplement and we will recheck them in the revised version.

The new data are indicated in Table 1 and the supplement and will be available on Pangaea. They are a small contribution to the d15N records but one of only two SST records available for the Oman upwelling region.

Dates and terminology will be checked.

A paragraph on water mass structure will be added (see above, reply to reviewer 2) and the seasonal circulation off the west coast of India will also be expanded. Kessarkar et al. 2010 and 2013 will also be discussed.

References will be checked (see review 1).

Fig. 4: data availability is best for 17-18 ka and this period has lowest temperatures of the glacial period

TOC covers the entire Arabian Sea (see review No. 4).

Changes suggested in the many other minor comments will be made.

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