Supporting Information for

**Causes and climatic influence of centennial scale denitrification variability in the southeastern Arabian Sea since the last glacial period**

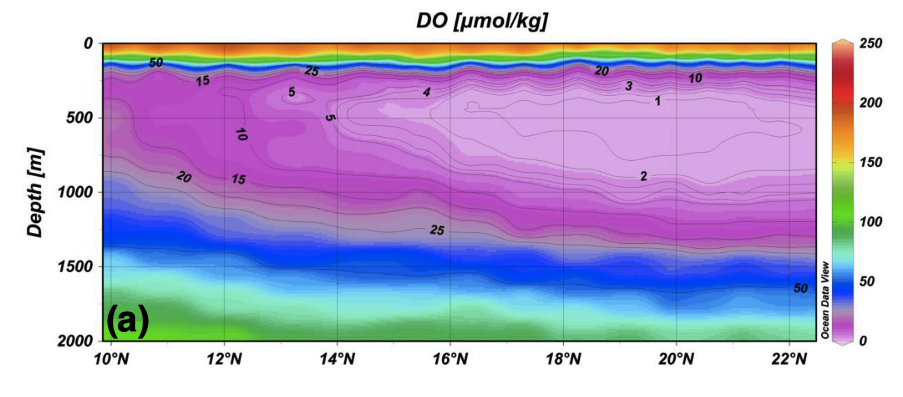
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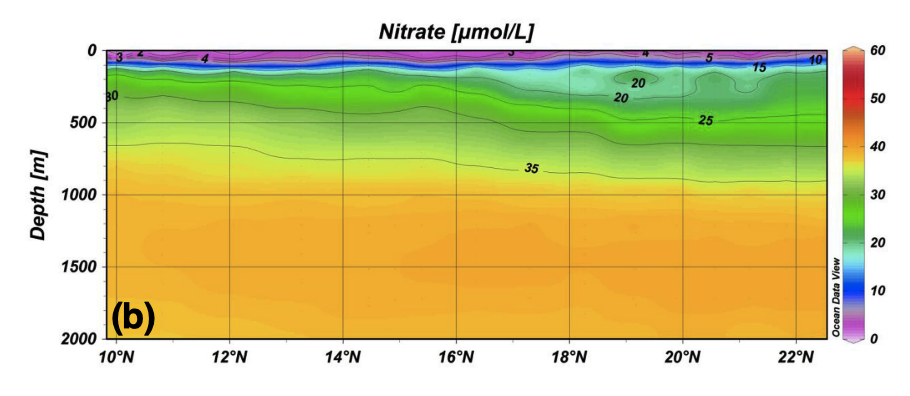
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This supplementary file containsFigure 1a, 1b, 1c, and 1d and the text evaluating the effect of diagenetic alteration and terrestrial organic matter input on nitrogen isotopic composition with the help of supporting Fig. 2.

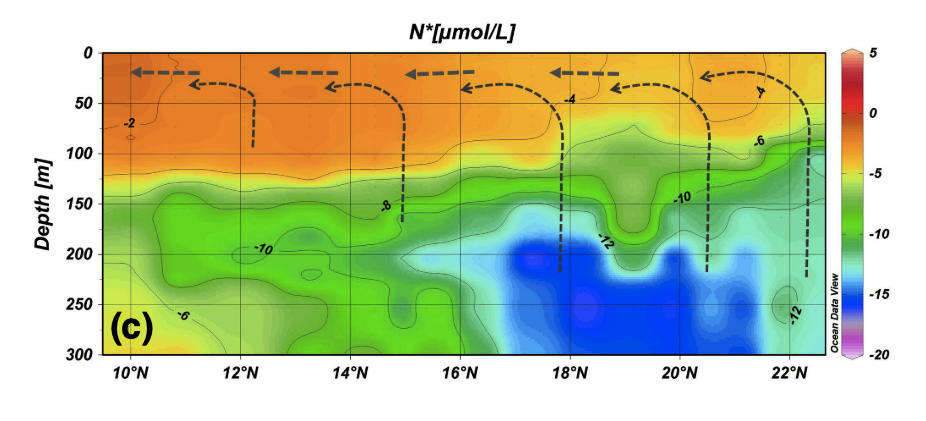
**Figure 1a.** Dissolved oxygen (DO) transect for the upper 2000 m (data from World Ocean Atlas 09).



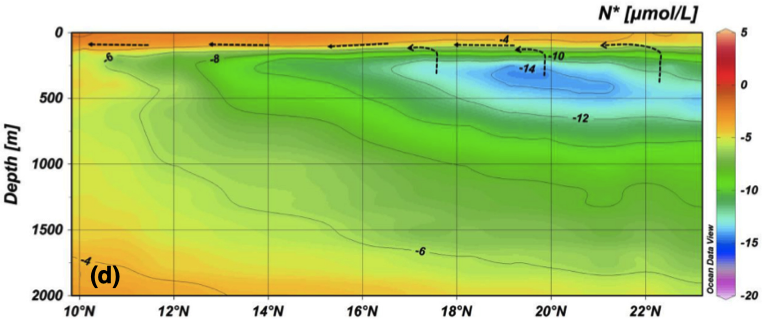
**Figure 1b.** Nitrate transect for the upper 2000 m (data from World Ocean Atlas 09).



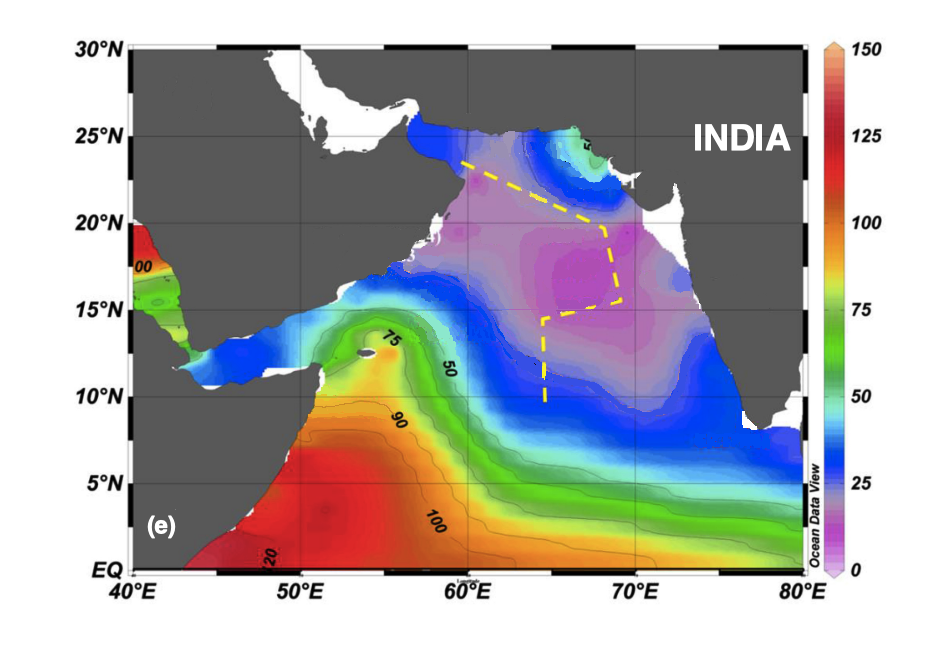
**Figure 1c.** Nitrate deficit (N\*) transect for the upper 300 m (data from World Ocean Atlas 09); arrows show the flow direction.



**Figure 1d.** Nitrate deficit (N\*) transect for the upper 2000 m (data from World Ocean Atlas 09); arrows show the flow direction.



**Figure 1e.** Yellow dashed line indicates the transect for the data shown above (Fig. 1a to 1d); colour contours represent dissolved oxygen concentration at 300 m depth in mol/kg.



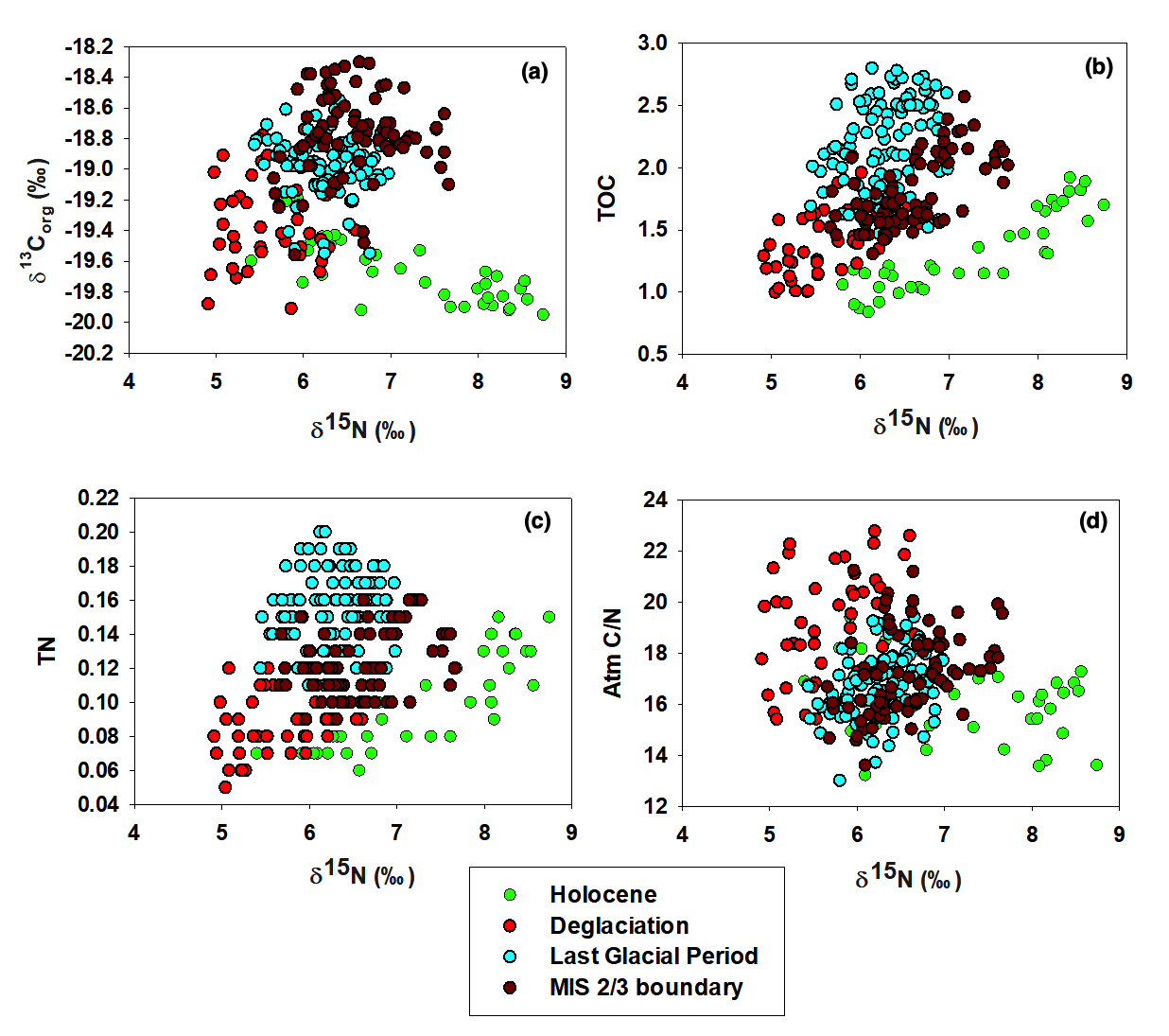
**(1) No Effect of Terrestrial Organic Input on Nitrogen Isotopic Composition**

As the organic matter in the present study contains a small amount terrestrial organic matter, the possibility of it affecting the δ15N values was further examined using the relationship between δ13Corg and δ15N. It has been shown than terrestrial organic material is characterized by relatively low δ15N values (2-4 ‰) (Sweeney and Kaplan, 1980, Sigman et al., 2001) and therefore different admixtures of material could influence the δ15N values. A positive correlation is expected between δ13Corg and δ15N (Peters et al., 1978) if the terrestrial organic matter had any influence on δ15N values thereby producing a mixing line in the δ13Corg–δ15N plot, with lower δ13Corg corresponding to lower δ15N values (Sweeney and Kaplan, 1980). However, in the present study, scatter found in the δ15N versus δ13Corg plot (r = -0.17, n= 256; Fig. 2a) rules out the possibility that mixing of terrestrial and marine organic matter had any influence on δ15N values in the SEAS.

**(2) No Effect of Diagenetic Alteration on Nitrogen Isotopic Composition**

The early diagenetic effects on the δ15N values of the present study were examined through relationships among δ15N and TOC, TN and C/N ratios. δ15N values will increase if early diagenetic degradation affects it (Agnihotri et al., 2003). It would result in an anti-covariance trend with TOC and TN contents and covariance with atomic C/N ratios. However, no such trends were observed in the case of the present study. We do not find any relationship between δ15N and TOC (r = 0.21, n = 256, Fig. 2b), TN (r= 0.22, n= 256, Fig. 2c), and atomic C/N ratio (r = -0.14, n =256, Fig. 2d) suggesting that diagenesis affecting δ15N is not a significant factor. Further, the rate of diagenetic alteration of the δ15N at the near-surface is ascribed to the particle downward sinking rate and its preservation in the marine environment (Altabet, 1988). Interestingly, δ15N of sinking particles reported by Gaye-Haake et al. (2005), using five sedimentation traps deployed from 500 m throughout a depth of 3200 m from the Arabian Sea (ranged from 5.1 to 8.5‰), overlaps largely with δ15NNO3- values at 100–150 m (ranged from 7 to 9 ‰) reported by several workers at different stations in the Arabian Sea (Altabet et al., 1999; Naqvi et al., 2006). It indicates that not much alteration had occurred in δ15N of sinking particles during sinking in the water column in the Arabian Sea, which was also suggested by Altabet (2006).

**Figure 2.** Panel (a) shows cross plot of δ15N with δ13Corg. Panel (b), (c), & (d) shows the cross plot of δ15N with TOC, TN, and atomic C/N respectively. The r (correlation coefficient) and n (number of data points) values are given in the text. Different colours show data points belonging to four different time periods viz. the Holocene, deglaciation, the last glacial period, and those near the MIS2/3 boundary

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