

Interactive comment on “Coastal versus open-ocean denitrification in the Arabian Sea” by S. W. A. Naqvi et al.

Anonymous Referee #2

Received and published: 1 August 2006

The paper compares the two large oxygen-deficient zones in the Arabian Sea - the permanent central oxygen minimum zone and the seasonal oxygen depletion off the Indian coast - with the focus on nitrogen cycling. Through a comparison of several different aspects, substantial functional differences between the two zones are demonstrated, while it is also made clear that there are still many details to explore. I find it to be an interesting and well-written paper, which summarizes much of the current knowledge and, as far as I can judge, also contributes with new data. The distinction between previously published and new data is not quite clear, however, and I agree with the comment by Maren Voss concerning this issue. I also miss a brief summary of the main differences between the two regions, preferably in the form of a table.

Specific comments: Heavy N₂O, p. 675-676: The inference of large N-fractionation

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associated with the N₂O-N₂ step (p. 676 l. 1 on) is contradicted by the later statement that other processes than the (stepwise) denitrification contribute to N cycling (l. 9 on). Thus, the first part should be softened, e.g., "The higher delta¹⁵N of N₂O SEEMS to imply ..."

In parts of the paper NO₃⁻ means nitrate and in other parts, it means nitrate + nitrite. This ambiguity is confusing and becomes awkward in places such as p. 680 l.10-12. Throughout the paper NO₃⁻ should be used only for nitrate, while NO₃⁻ + NO₂⁻ should be used whenever the data pertain to the combined pool.

It should be stated explicitly that the calculation of expected delta¹⁵N values for nitrate, on p. 679 l. 2 on, are based on the assumption of a rayleigh distillation (which is first introduced at the bottom of p. 680), i.e. that the waters behave as what isotope geochemists typically refer to as a closed system. In the discussion of mixing as a possible explanation of the low observed values, it should also be noted that continuous mixing ("open system behaviour"), would also result in an under-estimation of the fractionation factor.

Minor comments: Isopleths should always be accompanied with a description of the interpolation method used for their generation. The string-of-pearls-like surface oxygen curves in Fig. 2 indicate that the method used for this plot might not be optimal.

Interactive comment on Biogeosciences Discuss., 3, 665, 2006.

BGD

3, S345–S346, 2006

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