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Ocean Science Discussions

Interactive comment on "^{15}N enrichment in the surface Particulate Organic Nitrogen of the north-eastern Arabian Sea from the middle to the waning phase of the winter monsoon: possible causes" *by* S. Kumar and R. Ramesh

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Comment on the paper by S. Kumar and R. Ramesh The authors present a data set from the eastern Arabian Sea, where they sampled PON from surface waters and measured the delta 15N in PON and nitrate concentrations from 13 locations in January and 5 in Feb/March. Profiles of temperature and salinity from the 18 stations were collected as well. They observe higher stable isotope values in the later month (7-11 ‰) and lighter ones in January (2-8‰). The presentation of more isotopic data from the Arabian Sea is very helpful. However, the data base is used for rather far

reaching hypothesis on the biological production, denitrification processes and their effects on the development of isotopic signatures in the Arabian Sea. The interpretation - although generally plausible - goes beyond what can be clearly proved by the data and makes the discussion very weak. I have identified a number of points that the authors should consider for their revision.

There is no analysis of wind measurements and the structure of the water column to state that “we did not see the signature of denitrificationĚimmediately after the entrainment of enriched nitrate in the surface layer” (page 252, line 7/8). Nitrate upwelling can not be proved by just surface measurements it needs a denser information on the hydrography of the area. The assumptions that the temperature increase led to a water column stabilization has not been shown. The profiles only show a snapshot situation. Over time nitrate may be consumed in the surface waters and the remaining nitrate may then develop increasing delta 15N values. But this has neither been measured nor can it clearly be inferred from the data presented.

In chapter 5.2 the authors argue that nitrate may have the same signature as the PON and thus the delta 15N -PON reflects the original nitrate delta 15N signature before growth started. This may indeed happen but the figure 3b implies that this is not the case. The zero nitrate concentration occurs at delta 15N -PON values between 4 and 10 (roughly). So why do the authors select 7.5 and 11%o as possible values (page 254)? Furthermore, the PON values do never only reflect phytoplankton but also detritus, microzooplankton etc. These other organic sources bias the phytoplankton signature. The calculation of the dilution (page 254 below) is presumably much affected by this unknown error in the original nitrate isotope value.

On page 255 the authors assume a nitrate delta 15N value of 15%o under denitrification. They do not explain where they took the value from. Even if it is accepted the authors continue and assume the 15%o are diluted to result in 11%o nitrate delta 15N value ready for uptake by phytoplankton. A certain degree of fractionation is still necessary to explain the observed PON data. These are a lot of assumptions and

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speculations to explain a handful of values. In line with this I also do not agree that fractionation of nitrate by phytoplankton varies depending on the nitrate concentration. It has been shown by a number of field studies or lab experiments that a relationship between nitrate concentration and fractionation does not happen, fractionation stays rather constant (e.g. Waser et al. 1998).

In chapter 5.1 the role of denitrification is evaluated and this is based on the general knowledge of the region (see also Naqvi et al. 2006 Biogeosciences 3, 621) However, seasonal variability of the denitrification is large due to the change in the sedimentation rate from surface waters. Under these circumstances at least the oxygen concentration would be a helpful indicator to place the own data in some framework, but no such data are presented. Overall a short note would probably be an appropriate presentation of the data and not so much a full research article.

Interactive comment on Ocean Sci. Discuss., 4, 245, 2007.