

## ***Interactive comment on “Natural isotopic composition of nitrogen in suspended particulate matter in the Bay of Bengal” by S. Kumar et al.***

**Anonymous Referee #2**

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The manuscript by S. Kumar et al. on  $\delta^{15}\text{N}$  values of suspended PON in the Bay of Bengal is said to constitute the first such detailed measurements in the Bay of Bengal. However, no reference is made to earlier, more cursory or limited measurements for comparative purposes which would have been of interest and perhaps supportive of some of their hypotheses regarding the observed patterns. This is symptomatic of a larger problem of not placing their data in a broader context. I would have liked to see the authors to at have least produced a table that compared  $\delta^{15}\text{N}$  values in the Bay of Bengal to other large regional bodies of water around the globe. I believe the manuscript suffers from too regional an approach. Perhaps it is a failing on my part, but I found the presentation of the results did not clearly point out the most important findings of the study. The figures are poor, particularly Fig. 3 which is almost impossible to decipher. The map with station locations drawn for Fig. 1 should be enlarged and should include the major rivers discharging into the Bay of Bengal, especially since the latter plays a prominent role in the authors' interpretation of the data. In addition, there are too many latitude and longitude lines. Below are a series of points the authors

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should consider in revising the manuscript. Again, the most important item is a better systematic presentation of the results, improving the figures, and placing the observed trends within a broader context than the Bay of Bengal.

1. The pre- and post-monsoon sampling took place over two months. Could this have influenced the results? Were there any cyclones or major rainfall events along the Indian coast during these time periods? Were the discharge rates of terrestrial-derived materials from the continent low or high preceding the taking of samples along the coast? Do any such measurements exist from the mouths of these major rivers for the sampling periods in question?

2. When differences were claimed to be significant or insignificant what statistical approaches were employed to analyse the data? What were the p values for the regressions characterising the data points of Fig. 3? What were the regression equations? Also, an  $r^2$  of 0.21 (pre-monsoon regression) is fairly low even if it is significant. Finally, the authors point out that post-monsoon oceanic stations show a bimodal distribution, but it seems to me that they could be better described as forming two clusters of data points.

3. The authors state that the nitrogen-fixing cyanobacterium *Trichodesmium* can be assumed to be absent because the observed  $\delta^{15}\text{N}$  values. Granted, this is probably the case, but why didn't the authors at least take a cursory look through the microscope and identify the dominant groups of algae (and perhaps species) composing the phytoplankton? After all, the  $\delta^{15}\text{N}$  values are single data points summarising the  $\delta^{15}\text{N}$  values of what are assumed to be phytoplankton-dominated organic matter. These are complex and highly dynamic assemblages of organisms that may be quite different in species composition between seasons and stations, and this could have a bearing on the observed spatial and temporal patterns for  $\delta^{15}\text{N}$ .

4. The authors state that they have no measurements of  $\delta^{15}\text{N}$  for nitrate or ammonium in the Bay of Bengal and no information is presented regarding rates of denitrifi-

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cation, nitrification, or nitrogen fixation during the times of sampling. Such information seems to me to be critical to interpreting patterns in  $\delta^{15}\text{N}$  and concentrations of PON in the Bay of Bengal. Thus, the data as presented here are of a preliminary nature until additional parameters can be measured.

5. I am a bit uncomfortable with the authors' approach that a two-end member model can be assumed with the end members being continental input and marine phytoplankton. First, the situation may well involve several end members that remain to be discovered from additional work and the adding of  $\delta^{15}\text{N}$  values of parameters not yet measured. Second, I'm not sure that something as undefined as continental input should be considered as a possible end member and I think marine phytoplankton is more of a result or compositing of end member uptake. At least in my mind, end members are very specific sources of nitrogen rather than merely an input of PON from continental sources or the phytoplankton itself. Perhaps it might be better to talk more about possible influences on  $\delta^{15}\text{N}$  of coastal and oceanic phytoplankton and for now abandon the idea of end members until much more is known about the system and its dynamics.

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