

## ***Interactive comment on “Spatio-temporal variations of nitrogen isotopic records in the Arabian Sea” by S.-J. Kao et al.***

**Anonymous Referee #1**

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The paper by Kao et al. entitled "Spatio-temporal variations of nitrogen isotopic records in the Arabian Sea" presents new  $d_{15}N$  data from a marine sediment core collected South of the tip of the Indian peninsula. Along with water column  $d_{15}N$  data and a compilation of already published data, they tentatively reconstruct past changes in the gradient between the northern and southern part of the Arabian Sea through applying a correction factor that accounts for the water depth at which the core were collected, observe opposite  $d_{15}N$  trends for the Holocene and explain it by denitrification in the north which echoes with nitrogen fixation in the South.

The paper is straightforward and relatively easy to read and follow, despite numerous english mistakes. I suggest the paper to be published after minor/moderate revisions described below. As I haven't spotted any really problematic point to be addressed I

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add my comments paragraph by paragraph.

Abstract: should be revised, and specifically talking about the modern-day first, and then the downcode record and its implications.

Introduction: The second paragraph deals with how the  $d_{15}N$  signal might be altered. It is an important paragraph, though, I would put it at the beginning of the "results" paragraph, somewhere in paragraph 4.2 or 5.1, where it is useful to understand how the  $d_{15}N$  signal might be altered. In the introduction it just alters the flow of the manuscript.

Study area: A rapid sketch explaining how intermediate-depth water mass ventilate the AS would be useful to figure out how the OMZ erodes from below, especially since the core depth might be sensitive to that as well (see e.g. the Pichevin paper). For example, it is unclear what is meant by in the last sentence of the paragraph. Arrows on the transects, and their expansion, should help envision what you write.

Material and methods: Second sentence: why pushing this? It is an useless sentence that alters the flow of the text - and it's probably wrong (check core MD77-191 in Bassinot et al., 2012, Climate of the Past).

Results: In paragraph 4.2, you can't say the  $d_{15}N$  excursion at 13 ka occurs in the Younger Dryas chronozone given the uncertainties associated with your age model. Also, in the C and N increase seen in the first meter of sediments, could it be the signature of syn-sedimentary degradation of organic matter?

Discussion: Paragraph 5.1: please clarify the sentence "This implies that the degree of addition processes, most likely the  $N_2$ -fixation, varied in concert with the intensity of denitrification underneath." by mentioning the key results inferred in Deutsch et al. (2007) cited just after. It would prepare the reader to get the mechanism presented in paragraph 5.4.

Figure 1: why not expanding the panels b and c to the latitude where the core was collected? You should try also to plot at depth the cores you deal with later, with appro-

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priate markers and colors, so that an easy comparison will help the reader checking where the downcode records come from. It's really uneasy to figure out where the cores mentioned are given the figure caption.

Figure 2: one radiocarbon date seems to be missing on panel A. Please provide the calibration equation used.

Figure 5: please enlarge the map and use colors on the map

Other details:

-choose between ODZ and OMZ (OMZ is more used)

-in general, there are many english mistakes. A native english speaker should get a read over the manuscript.

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