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Interactive comment on "High denitrification and anaerobic ammonium oxidation contributes to net nitrogen loss in a seagrass ecosystem in the central Red Sea" *by* Neus Garcias-Bonet et al.

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General comments:

RC1: This manuscript presents the results of a field study comparing nitrogen (N) removal (denitrification, anammox) and fixation rates in a seagrass meadow sediments and adjacent bare sediments. The authors found that N removal exceeded N2 fixation in vegetated and bare sediments and that sediment OM and water temperature were important drivers of N processing rates. The manuscript is generally well written and provides valuable insight into N-cycling in seagrass beds. The inclusion of previously published N-cycling rates in the discussion provides useful context for the results.

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AC1: We thank the reviewer for this comment.

Specific comments:

RC 2: As mentioned by the other referees, the discussion should mention the limitations of the acetylene reduction method for measuring N2 fixation.

AC 2: We will include the limitation of the ARA in the reviewed manuscript.

We propose the inclusion of this text in the discussion section: "Despite the common use of the Acetylene Reduction Assay to measure N2 fixation, it has some methodological limitations that need to be considered. Acetylene is known to induce changes in the microbial community composition in marine sediments, especially in sulfur- and sulfate-reducing bacterial groups (Fulweiler et al 2015). The effect of acetylene is species specific, and, therefore, the N2 fixation rates reported here might be under- or over- estimated and need to be carefully interpreted."

RC 3: One of the strong points of the study is the in-depth measurements of N-cycling rates. However, because there were so many comparisons, presenting these measurements can be difficult. Results section 3.2 ("Denitrification, anammox and N2 fixation rates") is dense and difficult to follow. I would suggest breaking this section into subsections, either by experimental variable (i.e. effect of a) vegetation, b) sediment depth, c) OM, d) temperature on denitrification/ anammox) or process rate (i.e. a) denitrification, b) anammox, c) fixation in vegetated vs. unvegetated sediments, at different depths, relationship with OM and temperature). It would be helpful to readers to do a separate results section for plant material N2 fixation rates as well.

AC 3: We thank the reviewer for this suggestion and in a newer version of the manuscript we will restructure the results section 3.2 including subsections to improve the flow of the text.

RC 4: In some cases there are references to significant interactions with no description of what is occurring (e.g. L347-351) beyond references to the figures, which do not

indicate statistical differences. Were these interactions ecologically meaningful? If not, it might be better to report these results in a supplemental table to keep the results streamlined.

AC 4: We thank the reviewer for this comment as we realized that our message was not clear enough. In a newer version of the manuscript, we will improve clarity and readability of the result section.

RC 5: Lines 450-450 of the discussion the authors argue that OM quality is an important driver of N2 fixation but do not present it in the context of their system. Are you arguing that E. acoroides in vegetated sediments and algal biomass in unvegetated sediments are providing labile OM sources to N2 fixers?

AC 5: We thank the reviewer for this comment and we will improve our discussion on the effect of OM on rates. We argued that a possible explanation for the different annual patterns in denitrification/anammox and N fixation, besides the effect of temperature, might be as well a change in the lability of OM along the year as it has been described in other works. We will improve the clarity of the discussion regarding this point.

RC 6: In the introduction (L99-107), consider stating objectives rather than what was measured to help readers better process the results.

AC 6: We will clearly state the objectives of the study following the reviewer's comment.

RC 7: L184: Include the equations in the text.

AC 7: In a newer version of the manuscript, we will include the equations in the methods section following the reviewer' suggestion.

Technical corrections:

RC 8: L76: should be: Salt et al. (2017) L176: How much is a few? Do you have an actual detection limit? L210, 226: should be: "We ran" L322: "were large" -They really weren't large compared to denitrification, and this qualitative description is not

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appropriate for a results section.

AC 8: We thank the reviewer for pointing out these typos and minor mistakes and we will amend the text accordingly.

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