Review of Chang et al., ESSD submission

The submission by Chang et al. presents an up-to-date compilation of nitrogen loss rates (denitrification and anammox) across various coastal systems. This topic is particularly important for understanding the biogeochemical cycles in marine environments, especially in the context of increasing anthropogenic nitrogen inputs. The authors had an extensive literature review and employed rigorous quality control measures to ensure the reliability of the database. The manuscript highlights the spatial and temporal distribution of denitrification and anammox, as well as the factors that influence these processes. The authors briefly introduced the isotope paring technique (IPT) to quantify nitrogen loss rates, providing a robust methodological framework for future research. The database offers a valuable resource for the scientific community.

As a dataset paper, careful consideration must be given to the potential biases in the data, such as the overrepresentation of certain regions and the exclusion of studies that did not report environmental variables. Below, I provide my comments and suggestions to further improve the manuscript:

Firstly, the dataset can be expanded, particularly for those measured via slurry incubation. At present, only whole core incubation data is included, which may not be sufficient to fully capture the general phenomena in anammox and denitrification experiments. Slurry incubation can be useful especially in teasing combined environmental effects. And I don't think the authors are making a good argument to exclude slurry incubation data (line 69). This limitation may result in specific findings with little global significance, such as the increase in the proportion of anammox in March and the higher denitrification rates in sediments with high carbon-to-nitrogen (C/N) ratios. The authors should better examine the dataset to minimize the bias from specific study sites.

Secondly, the authors should conduct a thorough examination of the data and perform a more detailed analysis of sediment characteristics before undertaking correlation analyses. Some parameters may not be suitable for correlation analysis due to their complex interactions and potential confounding factors. For instance, the variation in the proportion of anammox may not be closely related to latitude, as suggested in the manuscript, but may instead be more closely associated with the physical and chemical properties of the sediments.

As this manuscript is about using coastal nitrogen loss datasets to infer environmental controls, I would hope the authors share their thoughts about linking existing modelling work to their dataset. Are observations consistent with model interpretations? How can future observations be better conducted?

Below are some minor issues:

Line 90: In fact, over the past decades, the modeling community has been working on quantifying the effects of environmental factors on sedimentary denitrification:

Middelburg et al., 1996

https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/96GB02562

Bohlen et al., 2012

https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2011GB004198

Li et al., 2024

https://bg.copernicus.org/articles/21/4361/2024/

The authors could provide a statement describing what's known and unknown to the community.

Line 125 – 127: Some coastal zones are inhabited by plants and animals; in some cases, whole core incubation would exclude the effect of benthic fauna or bioturbation, and the nutrient and oxygen availabilities in the core might not reflect in situ. It would be better to have an explanation about excluding these studies.

Line 134- 135: What "unit conversion techniques" were performed? Please explain.

Line 336 – 338: The authors could provide detailed explanation about investigating organic matter quantity and quality affecting sedimentary annamox. The current dataset is not supporting the idea.

Line 357 – 390: The discussion of the relationship between denitrification and anammox rates could be more concise and focused.

Section 4: This section is important and can be improved. Readers may want to know more about the potential applications of this database, and specific examples of how the data can be used in future studies.

Section 5: The conclusion could be more forward-looking, emphasizing the potential for future research and applications.

Figure 2: Figure titles are too complex, please enhance the clarity of the figure window labels and descriptions. The box plots show the median, interquartile range, and outliers for each latitudinal band and month.