The manuscript titled " A continual learning-based multilayer perceptron for improved reconstruction of three-dimensional nitrate concentration" presents a model to estimate the three-dimensional nitrate concentration in the Pan-European Ocean. Overall, this study is interesting, and the research and reconstruction data could contribute to a deeper understanding of regional ocean nutrient dynamics. The manuscript demonstrates good levels of research significance, innovation, and expression. However, before accept this work, there are some concerns need to be addressed.

Major Comments:

1. Sections 2.1: The study area is divided into two parts: MED and NEA. The observations in NEA are sparse. What is the rationale for selecting this region? How can the model's performance be ensured to remain stable in this area?
2. In Figure 6, the coupling of the continuous learning model improves overall performance. However, in terms of spatial distribution, errors increase at the locations of a few observation points. How should this phenomenon be understood, and is there potential for improvement? An additional discussion of the model's strengths and weaknesses is needed.
3. The simulated nitrate distribution pattern in Figure 6e appears somewhat unusual. How was the performance comparison of this widely used three-dimensional nitrate data product implemented here?
4. Regarding the interannual variation trend in Figure 11 and the abnormal increase after 2022, are there any studies or data that support similar conclusions? Caution is required when evaluating and interpreting these phenomena.
5. The feature importance calculated through SHAP includes both positive and negative values. The manuscript evaluates these values based on absolute values, which may overlook the sign of the contributions. Consider whether a deeper assessment of feature contributions using the positive and negative relationships of SHAP is possible.

Minor Comments:

1. The data processing steps and validation methods need more detailed explanation, such as interpolation for missing values and the division of the test set.
2. The manuscript's descriptions should be consistent, such as "Figure" or "Fig," and "pan-Europe" or "Pan-Europe."
3. The titles of Figures 6 and 7 are not sufficiently clear and would benefit from refinement and reorganization.