We are very grateful for this comment from the community and will consider the numerous suggestions a revised version of our manuscript.

In the following, we respond to the remarks. Remarks are shown in blue and our response in black italic.

The manuscript “Transformative processes in the Oder Lagoon as seen from a model perspective” presents and validates a new model setup for the Oder Lagoon in Northern Germany. Further it assesses the nutrient retention in the Lagoon and thus adds to our understanding of the supply of nutrients from the Oder River to the Baltic Sea. The role of coastal zones as nutrient filters is an important and often overlooked topic, and especially the large nutrient flow from the Oder is important for the eutrophication of the Baltic Sea.

I suggest accept after minor revisions

Major comments:

I suggest removing the part on resolution (section 3.4). While interesting, I find that the role of resolution does not quiet fit with the general scope of the paper, and that the topic deserves further elaboration in a different study.

Absolutely, also in line with the RCs, we decided to remove 3.4 and postpone it for an upcoming study.

I suggest adding a figure/table on the seasonal variability of the different nutrient fractions (e.g. DIN, DON, PON) delivered to the Baltic Sea. From Figure 4, it looks like both DIN and DIP are very low in summer, suggesting a large seasonal variability in the fractions delivered to the Baltic. From a management point of view, the bioavailability of the nutrient supply is very important, especially if the bioavailability of the nutrients is very low during summer.

We are going to present the riverine forcing in more detail in a revised version (see our reply to the RCs).We thank for the suggestion to present DIP, DIN and POM separately. Indeed, the bioavailability of POM and DOM is an uncertainty in the model forcing. Since no reliable information on bioavailability for the Oder River is available, we do not account for this in this study. However, this point is worse to discuss.

Discussion: Some thoughts about the relevance of the study for management of nutrients would be interesting. If targets are already reached, how were these targets defined, and did enough knowledge even exist regarding supply of nutrients from the Oder to the Baltic Sea? Are the targets too low if they were already reached?

The final decision about targets is a political one. The process of defining targets for rivers, coastal waters, and the open sea occurred separately. Therefore, reaching targets for a river system is not necessarily sufficient to achieve the targets for coastal waters. We believe that these targets need to be harmonized.

Add section about nutrient cycling in the lagoon in the conclusion. The complete lack of this seems odd as it is the main focus of the manuscript.

We will revise the section structure.

Minor comments:

Title: I would suggest adding the word “nutrients”

We will elaborate this suggestion.

L9: “Relative” nitrogen decreases

L25: What does “pollution” refer to

We need to clarify that we focus on nutrients.

L47: Skogen et al., 2024 and 2021 have discussions on models versus observations.

We will consider these additional references.

L55: Also, it adds error to biogeochemical models of the Baltic Sea

L58: high”ly” resolved

L60: I would remove this

Yes, see our previous comment.

Figure 1a: A km-scale would improve understanding. Also the a thicker line at the coastlines would make the plot easier to see

Will be done for Fig. 1a

L98: What was the spin-up time for water and sediment, how were the variables initialized. Do you have any knowledge on realistic sediment concentrations?

We started with an initialization from a Baltic Sea model with 1n.m. horizontal resolution. The spin-up for the Oder Lagoon model was 10 years. Sediment concentrations with a spatial coverage are to our knowledge not available.

Figure 2 and 4: If the plots were made wider, the variability would be easier to see

Regarding to the RCs, we will extend the validation which includes revised figures.

L114: Is this due to lack of observations during peak times? Some discussion on the number of observations per year would be nice. It is very difficult to see from the plots how well the seasonal cycle is covered.

Usually, one observation per month is available. We will show it in the revised manuscript.

Figure 5: It took me a while to understand the difference between the figures. The title of b could be changed to something like “Mean duration of anoxic periods”

Will be done for more clarity.

L198: What are the consequences of underestimation of DIP in summer, for productivity and the nitrogen cycle, including nutrient retention.

We will investigate it in detail in an upcoming study. In recent years, these peaks became quite rare. It appears that these peaks are a relic from former eutrophication.

L249ff: To me the "," and "." In the numbering is confusing. European convention would be 1000 = 1.000,0 right? Not sure if the journal wants it differently, otherwise I would suggest not using comma to mark thousand.

We will check it with the journal's requirements and remove commas if applicable.