

Detailed responses to reviewer 3 (reviewer comments are included in black, responses in blue font)

Overview

The manuscript presents a modelling study of the effects of nutrient limitation on deoxygenation in the East China Sea shelf. The manuscript is well composed, and results are clearly presented using meaningful figures. In particular, the conceptual scheme presented in Fig. 11 well resume the main results of the manuscript. Thus, my suggestion is to publish the manuscript after minor revisions (listed hereafter).

Comment:

1. L75. Consider changing “simulations with and without P” in “simulations with and without P limitation”.

Response: Done.

Comment:

2. L79. I suggest specifying that the scenario simulations are all made with reduction of nutrient loads.

Response: We modified the sentence as follows:

“... by conducting scenario simulations with reduced nutrient loads from the Changjiang”

Comment:

3. L91-102. Even if references are provided, maybe some additional details on the simulation would be helpful for the reader. For instance, are the circulation and the biogeochemical model coupled online or offline? Since the simulation results can be in principle affected by any nutrient inputs, information about treatment of nutrient fluxes at boundaries and at surface could be of interest for the reader.

Response: The detailed model description is available in Zhang et al (2020) but we will add additional relevant information to the Method section.

Comment:

4. L106-108. My suggestion is to somehow revert how the noPlim simulation is introduced by firstly clarifying that the objective is to have a simulation without P limitation, and then by specifying that this has been implemented disabling P in the biogeochemical model.

Response: We modified the text as follows:

“The “baseline” simulation, as described above, is identical to Zhang et al. (2020). To assess the effect P limitation, the baseline is compared to a simulation without P limitation (“noPlim”), that is implemented by disabling P in the biological model but otherwise keeping everything identical to the “baseline” simulation.”

Comment:

5. L110. Maybe the final sentence of the paragraph (“Otherwise [...] simulation”) can be removed if the previous suggestion 4 will be accepted by the Authors. Sub-section 3.1 is inserted in the Results section. However, since riverine input is a forcing of the simulations, I am wondering if it would be more appropriate to move 3.1 in section 2 (Methods).

Response: See response to Comment 4 above. Regarding section 3.1, we provide some high-level analysis of the river forcing and therefore feel that it is more appropriate to keep it in the Results section.

Comment:

6. L130-135. Validation is made considering observations limited to the surface layer. I recognize that validation can be made only with available data and that the main aim of the manuscript is not the validation of the model, however the Authors could introduce in the Discussion some comments about the implications of the use of a relatively limited dataset or the expected impact of additional observations.

Response: We will provide some discussion of the model uncertainties in the revised manuscript (see also response to Comment 4 by Reviewer 1).

Comment:

7. Figure S1. If I am not wrong this figure shows the same results of Fig. 2 of Zhang et al. 2020. I think that it should be somehow highlighted that this material has been already published elsewhere.

Response: Figure S1 is similar to Figure 2 in Zhang et al (2020) except that here we plot the average simulated surface conditions over the cruise time range whereas Zhang et al (2020) use mid cruise condition so the two figures are somewhat different. However, we noticed that there was an error in the captions of Figure 3 and S1, which was corrected as follows:

“Simulated XX corresponds to the average conditions during the cruise.”

where XX is either NO₃ (Figure S1) or PO₄ (Figure 3).

Comment:

8. L191-192. Since only regions 2, 4 and 5 are shown in Fig. 7, I suggest removing the “e.g.” used into the brackets: “more concentrated in the smallest area (zone 2) and more diffuse in the larger areas (zones 4 and 5).”

Response: Done.

Comment:

9. L75. Consider changing “simulations with and without P” in “simulations with and without P limitation”.

Response: Done.

Comment:

10. L231. Maybe it would be clearer “The N+P and N-only reduction strategies” instead of “The 2 strategies”.

Response: Done.

Comment:

11. Figure 6. Even if one can guess that the increasing numbers on the horizontal axis are the distance along the CE-JI line, it should be better to specify this aspect in the figure or in the caption.

Response: This information was added in the caption as follows:

“The x-axis is in kilometers from the CE along the CE-JI line”.

Comment:

12. Figure 7. I think that it could be useful to specify that the change is related to P limitation.

Response: Done.