

Biogeosciences Discuss., referee comment RC1  
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## Comment on bg-2021-142

Anonymous Referee #1

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Referee comment on "Biological response to wind and terrestrial nitrate in the western and southern continental shelves of the Gulf of Mexico" by Javier González-Ramírez et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-142-RC1>, 2021

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### **Biological response to wind and terrestrial nitrate in the western and southern continental shelves of the Gulf of Mexico**

**Javier González-Ramírez et al.**

#### *General Comments*

In this work, the authors coupled the CROCO model to a biogeochemical model to describe the physical processes that influence the dynamics of phytoplanktonic primary production in the Gulf of Mexico. To correctly represent biological processes in coastal regions of the Gulf of Mexico, the authors implemented a biological boundary condition at the bottom. They ran two configurations of the coupled model: "rivers off" and "rivers on." The authors depicted the main underlying mechanisms (annual cycle of wind, nutrients contributions from rivers, among others) associated with the primary production dynamics in coastal regions and the deeper region of the Gulf of Mexico. The paper is interesting and deserves eventual publication on BG. However, before publication, there are some questions and clarifications that, in my opinion, have to be addressed.

#### *Introduction section*

1. L19. Authors defined the Gulf of Mexico as GoM, but in several parts of the text, they refer to the Gulf of Mexico as "gulf," which is not previously defined. The authors should use the term GoM instead of the "gulf," or they can clarify it in this way: Gulf of Mexico (GoM or gulf hereafter).
2. L20. Caption Figure 1: Change "The gray areas were ..." to "The areas within gray boxes were ..."
3. L26. Change "Gulf of Mexico" to "GoM"
4. L39-40. To help the reader, the authors should mention the main findings or conclusions reported by González-Ramírez and Parés-Sierra (2019).

#### *Model configuration section*

5. L73-74. In Figures 2 and 3, it seems the Grijalva-Usumacinta is one river, but in line 74, it seems they are two different rivers (Grijalva and Usumacinta). In addition to the complete time series in Figures 2 and 3, the authors could add another subplot in each figure showing the daily annual cycle.

6. Figure 3. Why is only the Grijalva-Usumacinta river shown? Correct the spelling for Usumacinta.

#### *Results section*

7. L80-87. Why do the authors only show one configuration of the model in Figure 4? Is "rivers off" or "rivers on"? Please add the difference between the model and observations. The authors should show the observations in the first row then the simulations.

8. L85-87. Please give more analysis or citations to support what you said in these lines?

9. There is no mention of Figure 5 in the manuscript. Please add both configurations of the model in Figure 5. Are the correlations statistically significant? What is the confidence interval for  $r$ ?

10. L118-124. The criterion used to locate the passage of anticyclonic eddies and identify the eddy type is not clear. If there are two types of eddies, please use a different color for each kind in Figure 6. Is the simulation shown in Figure 6 "river on" or "rivers off"? Why do the authors show only one configuration of the model? It is important to clarify this.

11. L128. To avoid confusion, please change: "... to the continental TAVE (Fig. 1, a) and BOC (Fig. 1, b) shelves." to "... to the continental TAVE and BOC shelves (see Fig. 1)."

12. L128-130. More analysis is needed to see the differences between both configurations of the model. Please add the mean, the standard deviation of chl for each simulation, and the correlation between simulated chl and the corresponding wind component in each region.

13. L138-140. Is the simulated surface chlorophyll concentration  $[c(t)]$  from the "rivers off" or "rivers on" configuration? The authors could mention this in the manuscript or the caption of Figure 8.

14. L152-154. To support this idea, add some references.

15. L174. Please correct the caption of Figure 10. There is no left or right in the top panel.

16. What is sigma in Figures 9 and 10?

17. L175-176. To support these lines, do the correlation between the simulated first principal component and wind anomalies; also, authors must compare those results with the model configuration "rivers off."

#### *Discussion section.*

18. L195-220. Please give more citations to support these paragraphs. If possible, discuss these findings with previous work for different regions in Mexico or the world; otherwise, the authors could highlight this novelty of their work.

19. Figures 11 and 12 are not mentioned in the manuscript.

20. Revise all the captions of figures with more details.

*Conclusions section.*

21. I believe the authors must show results (Coherence, EOFs, etcetera) from both model configurations, mainly in the TAVE and BOC regions. Since one conclusion of this work is that the nutrients provided by local rivers dominated the variation in the chlorophyll concentration over these regions.