

## ***Interactive comment on “Modeling ocean circulation and biogeochemical variability in the Gulf of Mexico” by Z. Xue et al.***

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The paper presents simulated nutrient budgets for the inner shelf of the Gulf of Mexico based on a multi-year run of a coupled physical-biogeochemical model. Observed or estimated river discharges and nutrient concentrations and reanalysis winds for the period 2004-2010 were used. The results are partitioned by season and for various sections of the shelf from Campeche Banks to the West Florida Shelf. As is usually the case, observations for model-data comparisons are numerous in some areas and non-existent in others. The model components used are the best available and reproduce the main features of seasonal patterns observed with some skill. It's hard to get excited by this paper as is it utilitarian - a tool. The model results are what they are. The fun and challenge will be to validate the model in those regions where few observations

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exist. Tables 1 & 2 contain the essence of this paper.

I have some thoughts for improvements, they are minor.

1) The use of "ton" as a unit of mass is problematic without a clear definition. It is used in the text and in figures. 2) Page 7793 Section 3., line 7, You say 0.5 and 0.9 – to me it looks like 0.7 and 0.95 3) Page 7795 Section 4.1, line 19, You say ~80% and reference Table 1. I get  $(4.63/6.53)=71\%$ . I must not know how to calculate the number correctly. Please provide an example calculation. 4) Page 7798 Section 4.2, lines 6-8 “Compared with the DIN, ...” I can't see this in Figure 12. 5) Page 7798 Section 4.2, lines 6-11 Discussions about surface water and deep water movements seems out of place when talking to Figure 12 which is depth-integrated results. 6) Page 7803 Section 4.2.4, line 1, “In summary, our calculations ...” The way this sentence starts makes it sound like lines 1-17 should be in Section 5 Summary and Conclusions. I think Lines 1-17 are really a new section, say “Section 4.2.5 Shelf-Wide Results”. 7) Figure 2. The shelf line and distance along it (0-4000 km) needs to be discussed in the text. It would be useful to mention in the text where the mouth of the Mississippi River is in terms of this distance. It would be useful to indicate this position on Figure 12 d. 8) Tables 1 and 2 need to be described in Section 4. Table 1 and Table 2 have exactly the same titles – but they contain different information. More description would be helpful to the reader, such as; the river input values are observed, the other values are from the simulation, and why input-loss doesn't balance. (For example shelf-wide, annual budget 142.88 input 141.97 loss)

Technical corrections

P 7786 Introduction line 17, and several other places “e.g. ” is missing a comma P 7790 Section 2.1, line 9 <http://www.esrl.noaa.gov/psd/> is the new URL P 7793 Section 3., lines 9-16 Fig 5 is not called out anywhere. Here is a good place. P 7797 Section 4.1, line 17, should be “nutrient, phytoplankton, and zooplankton” P 7797 Section 4.1, line 18, should be “76%, 50%, and 80%” P 7801 Section 4.3, line 12, I think “confirm” is

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the wrong word, "reproduce" is better. P 7803 Section 5, line 24., "sea surface height" – as was used in the abstract, not "sea-level". Figures 9 and 10. Captions should be "(d)" not "(4)". Figure 13. You are using "fall" in the caption "autumn" in the figures. Tables 1 and 2. In the caption at the bottom it should be "loss" not "lose".

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