

Interactive comment on “N and P as ultimate and proximate limiting nutrients in the northern Gulf of Mexico: Implications for hypoxia reduction strategies” by Katja Fennel and Arnaud Laurent

Anonymous Referee #2

Received and published: 8 March 2018

This manuscript reports the first systematic analysis of the effects of single and dual nutrient load reductions from a spatially explicit physical-biogeochemical model for the northern Gulf of Mexico (GoM). Their manuscript is the next important step in their modeling efforts in the GoM. The manuscript tackles an important question regarding nutrient reduction strategies, it is well written and their work reports important simulations regarding dual nutrient reductions. They come to several additional important conclusions about the behavior of the GoM ecosystem including that reductions are more effective at reducing the area of hypoxia than in reducing primary production, and that the Gulf of Mexico system is saturated with nitrogen.

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Some comments:

The US has not been able to make real nutrient reductions despite decades of voluntary controls. Since the GoM is N saturated, does that mean that it can't get worse as N loads continue to increase. Are we really at the maximum area given the current conditions and climate?

Pg 1, line 8 "Evidence of P . . . since then" is awkward.

Pg 3, line 11 One question regarding hypoxia is the legacy of a higher sediment respiratory demand following the build up of organic carbon stores in sediments with eutrophication (Turner et al. 2008) whereby repeated hypoxic events lead to an increased susceptibility of further hypoxia and accelerated eutrophication. I know one group in the GoM that believes that this process can not happen because of the physical conditions on the shelf would prevent the accumulation of organic matter stores. However, there are studies from the Baltic addressing the importance of the legacy of carbon and nutrients in the sediments. Could this be a factor in the GoM?

Pg 4, line 17 Revise to "as an additional"

Pg 7, "Sensitivity" – this is an interesting concept. . .

Turner and Rabalais have examined the role of Si in influencing diatom growth and hence the sedimentation of organic matter. Have you tried any simulation with dissolved silica?

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-470>, 2017.

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