Biogeosciences Discuss., 9, C1551–C1553, 2012
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Biogeosciences Discussions

Interactive comment on "Simulating the effects of phosphorus limitation in the Mississippi and Atchafalaya River plumes" *by* A. Laurent et al.

Anonymous Referee #1

Received and published: 29 May 2012

If the focus of the model is to simulate P limitation where high productivity and hypoxia occur on the Louisiana-Texas shelf, the selection of boxes to demonstrate potential variability do not fit well with areas of known higher productivity and areas of hypoxia. The Miss Delta box includes areas of >50 m depth where hypoxia seldom occurs. The Miss Intermediate box is appropriate but extends too far offshore, >50 m unlikely to have hypoxia. Also this box is often transposed with language "west of Terrebonne Bay" as an alternate term or a subset of the box. The Atch Delta and the Atch Intermediate are appropriate but could be extended further offshore. The Far Field actually contains area that is sometimes hypoxic, and in 4 of the 7 years that are simulated.

Not clear why this is called the Texas-Louisiana shelf, when 3 boxes where hypoxia is most likely to occur are in Louisiana shelf waters, and the Far Field is in Texas waters.

Suggest Louisiana-Texas shelf.

A major problem with this paper is the assumption that waters are either limiting by N or P for production of phytoplankton, when it is obvious from multiple studies that dual N+P limitation is often the case, especially across a salinity gradient, and sometimes even silicate. The simplification of either one or the other, along with boxes that cross a wide range of salinity, productivity, depth, and likely occurrence of hypoxia begs the question as to what is being simulated that might be of relevance to productivity or hypoxia.

The available data go from Sylvan et al, Dortch and Whitledge, Smith and Hitchcock and Quigg et al. then slowly drops off all but Sylvan et al., which is a quite limited representation of the shelf. The data for 2002 are dropped because the authors assume methodological differences, but the models by Wang and Justic and Justic and Wang use the 2002 data in a coupled physical (FVCOM) and eutrophication model to accurately simulate an annual cycle of stratification and hypoxia on the shelf.

The authors too quickly dismiss the use of total P and total N for the N:P ratio in screening for potentioal N or P limitation. There are several authors, Maestrini et al. (1984a, b) Hecky and Kilham (1988), Klapwijk et al. (1988), Dodds (2003, 2006) and Lewis et al. (2009) concerning the usefulness of the inorganic chemical ratios to define P or N limitation. Maestrini 1984 Phytoplankton as indicators of sea water quality: bioassay approaches and protocols. In: Shubert LE (ed) Algae as ecological indicators. Academic Press Maestrini 1984 Test algae as indicators of sea water quality: prospects. In: Shubert LE (ed) Algae as ecological indicators. Academic Press Lewis WM (2012) Environ Sci Tech 45:10300–10305 Klapwijk (1988). Hydrobiologia 188-190:189-199 Dodds WK (2006) Front Ecol Environ 4:211-217

Do not agree that the simulated surface chlorophyll are as good in agreement with satellite observations as stated. Simulations are off for the two delta boxes, most likely because of complications in conversion of SeaWiFS data to chlorolphyll in Coastal Type

II waters that are turbid. Also, as stated earlier the boxes cover large areas some of which are high in chlorophyll and others that are not.

There seems to be poor coherence between the simulated P and N limitations in Fig 6 with the observed. And there are no data for the Atchafalaya intermediate area and the Far Field with which to compare.

Interactive comment on Biogeosciences Discuss., 9, 5625, 2012.