

Interactive comment on “Coastal hypoxia responses to remediation” by W. M. Kemp et al.

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Received and published: 27 October 2009

Reply to “Coastal hypoxia responses to remediation” by W. M. Kemp et al. Referee #2
Anonymous

(1) This paper reviews theory and data relating variations in hypoxia to changes in anthropogenic loading for nutrients and organic matter. After an enumeration of the physical and biological processes (external and internal) responsible for hypoxia/anoxia, theoretical trajectories of hypoxia as a function of nutrient input are discussed. This is followed by an extensive enumeration of case studies. Rivers and estuaries were the first to suffer severely from these phenomena, but, due to extensive efforts to reduce loadings, are well underway at restoring towards more oligotrophic conditions. Next comes a review of some systems where anoxia/hypoxia is still problematic, and increasing. There are very few remarks to be made on this paper, except that it is quite

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lengthy,

We are gratified that the reviewer was generally happy with our manuscript. It is true that this review is relatively long; however, it was an ambitious undertaking. We wanted this paper to be relatively comprehensive and decided that it needed to include background information that introduced the topic, explained physical and ecological controls on hypoxia, and developed a substantial sequence of case studies that reported time-series trends in hypoxia in relation to changes (including decreases) in nutrient loading and other physical drivers and ecological processes.

(2) and at the end, I would have liked to see a more comprehensive discussion of the data in view of the theoretical concepts explained before.

This is an excellent point that was also noted by another reviewer. In the revised manuscript we have edited the narrative to improve the linkage between Section 4 (theory) and Sections 5 and 6 (case studies).

(3) There is a tendency to overly emphasize organic pollution (“p 6894, line 10: estuaries and tidal rivers that are heavily loaded with large inputs of labile organic material”, similar p. [6]895 line 25). Mainly in some well-mixed estuarine systems, the chemical and bacterial oxidation of reduced substances other than OM can also play an important role. In the Scheldt for instance, extreme hypoxia/anoxia has been caused both by organic pollution and high ammonia inputs, at times most of the oxygen demand made up by nitrification. (Page 5, Line 139, Page 6, Line 183)

We agree that in some instances, NH₄ oxidation can result in a considerable fraction of the total O₂ consumption. In the original ms, we addressed this point in Section 5 where we discuss the Scheldt example; in the revised ms, however, we have edited this part of Section 2 to reference this mechanism of direct impact of NH₄ on O₂ conditions.

(4) Some strange reasoning (p 6899-line15):“The fraction of organic matter deposited on the sediments tends to increase with organic matter deposition rate, . . .” (Page 9,

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Line 277)

We agree with the reviewer that the wording of this sentence was confusing. In the revised ms, we have revised the sentence to read as follows. “The fraction of organic matter input that is buried in marine sediments tends to increase with higher rates of deposition, possibly because elevated rates of organic input fuel oxygen depletion, which in turn retards decomposition (Middelburg and Levin 2009).”

Interactive comment on Biogeosciences Discuss., 6, 6889, 2009.

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