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Biogeosciences Discussions

Interactive comment on "Resuspension and estuarine nutrient cycling: insights from the Neuse River Estuary" *by* D. R. Corbett

Anonymous Referee #2

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Review of:

"Resuspension and estuarine nutrient cycling: insights from the Neuse River Estuary"

by D.R. Corbett

Synopsis: The author(s) present moderately-high temporal resolution (6-7 weeks or ~9 samples / year) surface and pore water nutrient data set collected from 6 sites along the Neuse River Estuary. The author(s) use this data to evaluate how sediment resuspension events and associated advective porewater discharge contribute to the overall and transient nutrient load to the surface water. The collection and analytical protocols followed are highly tuned to address the questions pursued in this manuscript and are very well thought out. Overall, I think that the manuscript fits with the objectives

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of Biogeosciences and warrants publication. I have made a few general comments that I would like to see addressed if possible, but are more or less considerations rather than required revisions (i.e. if data is available). There are a number of technical corrections that I found and probably more exists. I would consider carefully re-read the manuscript before full publication.

Major Comments: 1) While this may be beyond the scope of the project, I think that it would be interesting to see if there is a relationship between salinity and the various nutrients and whether the estuary is a source or sink for the nutrient species (both pore water and surface water). One might expect to see a shift at some of the sites in the terminal electron acceptor (TEA) from NOx to SO4 during the summer stratification?

2) The author(s) work builds off the previous investigation of resuspension events by Giffin and Corbett 2003. The author(s) argue on page 2780, line 27 – page 2781, line 3 that the primary source of benthic fluxes are either sediment remobilization or bioturbation. I was curious if the author(s) considered the possibility of porewater flushing by hyporheic processes: bioirrigation or physical advective flushing (e.g. Huettel et al. 1998, GCA). Can the author discount these processes? One could imagine that at higher discharge rates (relatively uni-directional flow downstream), the surface water-porewater exchange would also increase; enhancing nutrient fluxes and also nitrification/oxidation. This may be a completely mute point but something they might should discount with a single statement.

3) Another consideration following up on comment 2 is that the author(s) argue on Page 2782, Lines 17-19 that the sediment resuspension event liberated the NH4+ to the water column during the resuspension event as the current velocity exceed the transport threshold for that sediment particle size. However, you might think that the while the current velocity prior to the resuspension event did not reach the transport threshold for the particle size, it could be sufficient to entrain and flush the porewaters to a depth of 2.2 cm. While the effect is the same, it is worth pointing out that additional physical processes may explain the release of nutrients to the water column without

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invoking complete sediment resuspension.

4) While I have a feeling that the permeability of the NRE sediments retards physical flushing as described in comment 2 and 3, the author(s) should acknowledge this process and their reason for discounting it.

Minor Comments: 1) Page 2768, Lines 4-7: consider combining and revising to a single sentence 2) Page 2770, Line 11: remove commas after ". . . transformations," and after ". . . etc.)," 3) Page 2770, Lines 16-18: consider → "Estuarine sediments and associated porewaters are exposed to complex biogeochemical and physical processes that influence sediment/porewater composition as well as material (e.g. nutrients) fluxes to the water column." 4) Page 2777, Line 19: In-text citation not consistent with full reference (i.e. Giffin and Corbett, 2003 not Giffin and Corbett, 2004). 5) Page 2781, Line 21: What are the non-Fickian approaches that the author(s) are referring to? 6) Page 2781, Line 25: what about current/wave-induced porewater irrigation/flushing. 7) Page 2782, Line 14: change "For campariative . . ." to "For comparative . . .". 8) If available, I would like to see salinity data presented for sites NR-1 to NR-6 various sites as either a table or as a graph (may be as a line plot on Fig. 3). 9) Same page, line 15: change "fram" to "frame" 10) Figure 4. Need to clarify which graph goes with which nutrient species.

Interactive comment on Biogeosciences Discuss., 7, 2767, 2010.