

Interactive comment on “Enhanced decomposition offsets enhanced productivity and soil carbon accumulation in coastal wetlands responding to climate change” by M. L. Kirwan and L. K. Blum

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Kirwan and Blum are making an important contribution to our ability to predict the future of tidal salt marshes. Consideration of the impacts of increased temperatures on both salt marsh plant production and organic matter decomposition is key to predict marsh sustainability and potential for carbon storage. Conclusions seem appropriate if regionally qualified, but confirmation of veracity of results requires much more information on methods used in the study - this is why I suggested "major revision".

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The work by Kirwan and Blum suggests that additional studies should be undertaken to sort out some of the factors that they have briefly mentioned. For instance, to what extent would temperature of tidal floodwaters affect decomposition and productivity rates? These considerations would be particularly important on cold water bodies, such as the Bay of Fundy and St. Lawrence River estuary. Might we expect a difference with variation in tidal ranges which would pose differences in flooding frequencies?

Authors and readers should recognize that the expression of global climate change is regionally variable (Christensen et al., 2007). Global climate models project that along the Virginia coast, the level of warming may be similar during summer and winter. However, on the northern northwest Atlantic the greatest changes are expected to be increased winter temperatures. It would be interesting to determine how such variability affects the balance between productivity and decay.

We probably need to use this research as a model for additional studies that consider regional differences in species. For instance, should we expect the same response with *Spartina patens*, a grass which dominates marshes of New England and eastern Canada, or *Atriplex portuloides*, which is common in western Europe?

Literature Cited Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.-T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr and P. Whetton, 2007: Regional Climate Projections. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Additional comments on the manuscript

More information is needed about the methods

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1. Litter bags a)What were the litter bags made from ? b)What is the mesh size, what were the dimensions of the bags? c)If litter bags were in contact with the sediment surface could fine-grained minerals get through the mesh? If so, how was it removed?

2. Temperature (authors bring up the possible effect of tidal floodwaters cooling soils in other studies) a)How was daily temperature measured? b)Was it monitored for all deployment sites? c)What was the water temperature and salinity of the flood water?

3. Field deployment Differences in elevation and period of deployment would mean differences in frequency of tidal flooding of litter bags, thus differences in litter temperature. a)Where in the marsh were bags placed? b)Were all deployment sites at the same elevation? c)How frequently were bags flooded in each of the deployments?

4. Lab processing a)"Roughly" half of the contents of each litter bag - were the post-incubation litter bag contents first weighed and results from the split samples normalized to the mass of the entire sample? b)I don't understand how mass loss from a litter bag is determined by combusting the remaining sample in a muffle furnace - this seems to be just one step in the process and more explanation is needed here. c)Fungal and bacterial volume assessment need more explanation. For instance: 1)How were fungal hyphae and bacteria removed from the incubated litter? The supporting reference (Hobbie et al.) utilized filtered water samples.) 2)Is there support for the application of the method to fungal hyphae? (Hobbie et al. make no mention of fungus.)

In the introduction and discussion (pg 713) authors use results from CO₂ enrichment experiments in their arguments. However, is it appropriate to assume that results from CO₂ enrichment of C-3 species can be extrapolated to C-4 species, which are more efficient in uptake of CO₂? Discussion of CO₂ fertilization might be relevant if the manuscript addressed competition between C-3 and C-4 species, but it does not seem to.

technical editing pg 709 In 11 C3 marshes = marshes dominated by C3 vegetation; also note variable ways C3 is written In 25 and elsewhere - I don't think the conclusion that

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marshes may survive faster rates of sea level rise merits use of the term "paradigm". pg 710 In 14 "Bags were buried in contact with the sediment surface, but underneath any accumulated plant litter." Do authors mean "buried beneath plant litter and in contact with the sediment surface"? pg 714 In 714 mean annual GLOBAL temperature

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