

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

Anonymous Referee #3

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This manuscript could provide for a timely and important discussion on the subject of the relative effect of increases in organic matter decomposition rates as a function of increases in soil temperature under climate change on elevation trajectories of tidal marshes. However, it is not clear exactly how this manuscript is moving this discussion forward. The positive relationship between organic matter decomposition rates and temperature is well established across disciplines. If the purpose of the authors is to point out that this relationship is not being recognized in some of the discourse on organic matter and marsh elevation change, well, that is a valid criticism but a fairly

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obvious one and should not require this research to suggest (as is done on lines 7-10, page 714). Similarly, it probably isn't appropriate to consider it a 'paradigm' if a few researchers did indeed neglect to consider the role of the temperature/decomposition relationship on marsh elevation trajectories in response to climate change (line 25, p. 710).

If the authors are attempting to quantify the relative forcing of temperature on marsh productivity versus decomposition, that is an important task, but it doesn't seem that the authors have enough data to accomplish this. It seems that the focus of this paper is that their data show that the effect of temperature on decomposition will offset elevation gains associate with climate change (as the title implies). However, their data is relatively limited, primarily in that it only covers one site and time period. These data are probably not adequate to provide a general summary of this relationship or the variability of this relationship across marsh conditions. It may be more valuable to provide a general discussion on this relationship, using their data as a case study. This would require reworking the manuscript to highlight the literature review components of the paper. For example, the paragraph beginning on line 23 of page 712 could be expanded considerably. In the current draft, many of the more in-depth points of discussion are given as assumptions of the study or as references to other studies. Many of these assumptions and references could make for an enlightening discussion if given more attention. As another example, the sentence on lines 25-28 (p. 712) could be expanded to provide a detailed discussion and literature review on how the temperature/decomposition relationship would differ across variations in soil water content (and redox status), nutrients, and carbon availability/recalcitrance.

Other comments - The decay rates of fresh material are not likely to match the decay rates of soil organic matter (peat) in a variety of states of decomposition, which should be clarified. More importantly, the effects of temperature on peat and root decomposition may differ from the effects on fresh material decomposition, which has important implications for the interpretations of these data. - The redox status of the soils was

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not described and may have varied considerably due to the fluctuations in water content. Depending on the porosity, it seems that at least the last two sampling dates were likely aerobic, which could dramatically increase decomposition rates and would be confounded with temperature effects observed.

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