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Biogeosciences Discussions

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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This is an interesting paper that discusses the effect of temperature on degradation rates in coastal marshes and how this influences capability of marshes to withstand enhanced sea level rise. The apparent current consensus is that peaty coastal marshes are generally resilient to global change as an increase CO2 levels and higher temperatures will enhance primary production, which in turn will increase peat formation enough to cope with enhanced sea level rise. However, the authors rightfully argue that higher temperatures will also increase litter degradation rates and show that this

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will have a major impact on the sediment accretion rate as it offsets the effects on increased plant productivity in many systems. The paper is very well written and should primarily be seen as a thought-provoking discussion paper on the effects of global change on coastal wetlands.

The degradation experiment presented in the paper is relatively limited and in itself doesn't add much the general understanding litter degradation in coastal marshes as similar work has been done already for a long time. There are also some issues that need to be clarified (see below). However, the authors primarily use the experiment to illustrate the well-known effect of temperature on degradation rates (12% per oC or a Q10 of about 2) and how this may influence carbon cycling at coastal marshes and their resilience to global change.

There are some issues with the degradation experiment. As it is an in-situ litter bag study, one can not assume that the effects seen are primarily due to temperature. Although the authors state that 'the mean daily temperature .... best explains the increase in degradation rate' (p711, l10), they should more clearly and extensively discuss why they do not consider other environmental variables. For instance, there was also a strong decrease in litter moisture content with temperature (fig 1), which may have influenced litter degradation either directly (decrease in rate due to water stress) or because oxygen conditions improved in the litter layer (increase in rate). In addition, bacterial and fungal biovolumes were also followed throughout the experiment. The authors simply state that biovolume did not increase with temperature, but this is not what is shown by the actual data in fig 2b. There seems to be a bimodal response with first an increase in biovolume with increasing temperature followed by a decrease at higher temperatures. Could the observed drop in biomass at higher temperatures be caused by water stress? Please discuss. Finally, there is no error estimate given for the 12% increase in degradation rate per oC, whereas the variability in the data in fig 2a suggests that it may be substantial.

The authors should stress that the work is primarily applicable to peaty marshes as for

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instance found on US east coast. In many parts of the world, marsh sediment levels are mainly dictated by the deposition of inorganic sediment and to a much lesser extend by organic carbon cycling. This is only indicated rather indirectly.

Other comments: P708, L23: 'also bury organic carbon' P712, L23: the word 'initial' is puzzling here. Surely they can not suggest that this is one of the first studies on the effect of temperature on litter degradation. Or do they mean preliminary or short term?

Interactive comment on Biogeosciences Discuss., 8, 707, 2011.