Replies on referee comments on *Van de Broek et al. (2016), The importance of an estuarine salinity gradient on soil organic carbon stocks of tidal marshes, Biogeosciences Discuss., doi: 10.5194/bg-2016-285*

Referee #2 (M. Schwartz)

1. The authors have presented a comprehensive assessment of both depositional and preservation factors influencing the accumulation of soil/sedimentary organic carbon across an estuarine salinity gradient. Their analysis of contributions from changes in surface vegetation type (e.g., C3 vs. C4 plants) and geochemical influence of OC decomposition rates at different salinity regimes provides a useful framework for assessing how forecast sea level rise could affect organic carbon storage in estuaries experiencing saltwater intrusion. Their examination of spatial variability in both OC supply and decomposition rates is robust and spans the estuarine salinity gradient.

We greatly thank dr. Schwartz for reviewing our manuscript and for his constructive comments.

2. Notable absent is data for (or an estimate of) sediment accretion rates at each of the three estuarine zones sampled.

This data is available in Temmerman et al. (2004, figure 8) and is added to section 2.1 (Study sites). For the period 1955 – 2002, the following average annual sediment accumulation rates are reported:

- Saltmarsh: about 0.75 and 0.5 cm yr^{-1} for low and high marshes resp.
- Brackish marsh: about 1 – 2 and 0.5 – 1 cm yr^{-1} for low and high marshes resp.
- Freshwater marsh: about 1 - 2 and 1 cm yr^{-1} for low and high marshes resp.

3. How will sea level rise and saltwater intrusion affect the location of the estuarine turbidity maximum and resulting allochthonous OC deposition?

In section 4.4 (Discussion – Implications of sea level rise for estuarine soil organic carbon stocks) we state the maximum turbidity zone is predicted to shift more inland as a consequence of sea level rise. This will indeed effect which portion of the estuary receives a significant input of allochthonous (terrestrial) organic carbon, as this will also shift more upstream. We added to this section that as a consequence of the upstream migration of the maximum turbidity zone, terrestrial organic matter can travel less far downstream in the estuary. As a consequence, tidal marshes which are now located at the downstream end of the MTZ will receive less stable terrestrial OC in the future, which will decrease their potential to sequester OC, as in addition also the sedimentation rates will decrease as a result of the shifting location of the MTZ.

References

Temmerman, S., Govers, G., Wartel, S. and Meire, P.: Modelling estuarine variations in tidal marsh sedimentation: response to changing sea level and suspended sediment concentrations, Mar. Geol., 212(1–4), 1–19, doi:10.1016/j.margeo.2004.10.021, 2004.