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Biogeosciences Discussions

Interactive comment on "Geomorphic influences on the contribution of vegetation to soil C accumulation and accretion in *Spartina alterniflora* marshes" *by* Tracy Elsey-Quirk and Viktoria Unger

Anonymous Referee #2

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The authors conducted a study to investigate the impact of environmental conditions across marshes on biomass, belowground production, sediment accretion, organic/mineral accumulation. The scientific questions addressed by the ms fall within the scope of BG. The authors examined different belowground processes, and related them to each other and biogeochemical processes. The study will present some interesting results for the studies of saltmarsh sediment acrretion and carbon sequestration after careful revision. General comments This study used many data from paralleled studies, such as Unger et al., (2016) and Boyd et al., 2017. To avoid confusion, you need to clearly show which data come from paralleled studies. Data analyses need to be checked and refined. Tidal range and mean water level are calculated from mean

low water and mean high water, organic/mineral accumulation rate is calculated from sediment accretion rate. You can not do correlation or regression analysis between the variables and those variables they are calculated from. The significant difference should be labelled alphabet-sequentially. Specific comments Abstract Line 7: add of after rates. Line 14: add permil after 7-40. 1. Introduction Line 29-31: you need to add references to support your statement, such as Ouyang et al. (2017). Line 59-61: I suggest you add some references here, such as Haslett et al. (2003). Line 66: add of after range Line 99-100: The allochthonous source of labile C may also include C input from riverine sources where marshes are near rivers or delta. see Craft (2007) 2. Methods Line 162: remove the after each. Line 184: what's the diameter of coarse roots and rhizomes used in your study? Line 196-204: from your results, I understand you quantified belowground biomass to both 50cm depth and the maximum of Cs-137 profile. Please clarify this point clearly here. Line 214: Some mineral material may be lost during from high temperatures of LOI analysis. Have you done acid treatment to remove inorganic carbon before LOI analysis? Line 207: Please specify the month of start and end periods. Line 208-10: The justification of longer periods for accretion estimation may also lie in the fact that organic matter accretion lags behind belowground ingrowth as it takes some time for the newly grown roots to decompose. Line 225-7: Have you conducted the homogeneity test before ANOVA or MANOVA? 3 Results Table 1: add the statistical method you used in comparison of the variables. Please check the label of 'Mean high water'; you have ab, bc, d, cd, a, ab but it is weird that there is no c. Some other variables also have the same problem, such as 'tidal range' and 'long-term mineral sedimentation rate' . Normally, the labels should be a, ab, b, bc, c..... You also need to check flooding events and duration of floods. For example, IB has 24 flooding events but 324h (per month or year?) of flooding time while MR has 455 flooding events but 7h of flooding time. Table 2: I suggest you remove tidal range and MWL in the correlation analysis, or you keep them and remove MHW and MLW, and modify your results in '3.1'. Tidal range is the difference between MHW and MLW, while MWL is the mean of MHW and MLW. You cannot correlate MHW or MLW with tidal range

and MWL just like you will not correlate the area of a circle with the diameter (A=d2/4) since this is common sense. Figure 3: why you do not show organic matter accumulation rate for IB? Line 294-6: you analyzed decay constant (Figure 3 and 4) rather than decay rates, and need to keep consistency in context. Line 309: were related or were not related? The sentence means they are related since you used 'neither' and 'nor'. Line 298-9: the last sentence is unnecessary if these variables are excluded in the stepwise regression analysis. Figure 5 caption: the dependent variables in your regression analysis should not be organic/mineral accumulation rates, of which the unit is g/(m2.yr). The accumulation rates in Table 1 are the correct term. You need to revise '3.2.3' accordingly. Table 4: why don't you use the data from all the sites to conduct the analysis of labile/refractory C density∼belowground biomass? Figure 7: significant outliers are found in the relationship live belowground coarse biomass∼MHW. Why do you say mineral sedimentation rates correspond to average rates over the last 50 years? The time dated using Cs-137 relates to nuclear events (e.g.1963). Since sediment accretion rates vary from site to site and even position to position within the same site, the dating time at 50cm depth may not all be 50 years. Figure 8: a typo in the caption. It should be Table 3 instead of Table 2. Figure 9: No relationships between belowground biomass and (organic, refractory, labile) C accumulation/accretion are shown for Delaware Bay. Are all the relationships insignificant? Have you considered to examine the relationship between C accumulation rate (as a whole, rather than organic, refractory, labile) and belowground biomass? Discussion Line 402: you need to be specific about decay. It is decay constant. Line 403: add mineral before sedimentation rate. Line 404: add coarse before belowground biomass. Line 405: replace little with insignificant as you can not consider the insignificant relationship in the linear regression analysis as little influence. Maybe environmental parameters co-vary with other factors, and explain some variance in multiple regression analyses. Line 420: I only found you examined the relationship between biomass and MHW. Where do you analyze the influence of elevation on biomass? Line 432-3: tidal range is not comparable based on your results. One is labelled bc and the other is ab. Line 446: the

explained variance is 58% rather than 62%. Line 454: it is decay constants rather than decay rates which you did not estimate in your results. You need to modify other parts of the ms accordingly. Line 484-7: There' are no direct linkage between CO2 emissions and decay rates although decay contribute to CO2 emissions, since other sources also contribute to CO2 emissions such as crab burrows. Line 538-9: the factors relate to surface accretion are organic matter inventory and mineral sediment inventory. Line 551: Some sites have fine biomass lower than MR site such as RC. Line 553-4: you only show the influence of belowground biomass on specific components of C accumulation rates (organic, refractory, labile), and your discussion here and hereafter should be more specific.

References Boyd, B., Sommerfield, C.K., and Elsey-Quirk, T.: Hydrogeomorphic influences on salt marsh sediment accumulation 610 and accretion in two estuaries of the U.S. Mid-Atlantic coast. Mar. Geol., 383, 132-145, 2017. Unger, V., Elsey-Quirk, T., Sommerfield, C. and Velinsky, D. J.: Stability of organic C accumulating in Spartina 805 alterniflora-dominated marshes of the mid-Atlantic U.S.A. Estuar. Coastal Shelf Sci. 182: 179-189, 2016. Ouyang, X., Lee, S. Y., Connolly, R.M. (2017) The role of root decomposition in global mangrove and saltmarsh carbon budgets. Earth-Science Reviews.166: 53-63. Haslett, S. K., Cundy, A. B., Davies, C. F. C., Powell, E. S., & Croudace, I. W. (2003). Salt marsh sedimentation over the past c. 120 years along the west Cotentin coast of Normandy (France): relationship to sea-level rise and sediment supply. Journal of coastal research, 609-620. Craft, Christopher. "Freshwater input structures soil properties, vertical accretion, and nutrient accumulation of Georgia and US tidal marshes." Limnology and oceanography 52.3 (2007): 1220-1230.

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