

Biogeosciences Discuss., author comment AC2
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Reply on RC1

Rey Harvey Suello et al.

Author comment on "Mangrove sediment organic carbon storage and sources in relation to forest age and position along a deltaic salinity gradient" by Rey Harvey Suello et al.,
Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-159-AC2>, 2021

We thank you for your positive and constructive review. We will make a series of changes to the manuscript based on your comments and suggestions. To address your main comment, we fully agree on the importance of conducting a sensitivity analysis for our model calculations. Based on our results, indeed, the $\delta^{13}\text{C}$ signatures of different plant materials varied but not significantly (we will provide these data as supplementary information in our revised manuscript). Nevertheless, we still performed a one-factor-at-a-time (OAT) sensitivity analysis using different plant $\delta^{13}\text{C}$ endmembers (roots, leaves, branches, live, senescent, and surface litter) and observed no significant changes in the behavior of our mixing models after linear regression (we will also provide the results of our sensitivity analysis as supplementary information in our revised manuscript). For this reason, we decided to show results in the main paper obtained when using the averages of our vegetation data as input parameter values for our model.

We provided the itemized responses below for your specific comments in the pdf file with line numbers to indicate their location in the manuscript.

- Line 66: Are any of these studies providing a comparison with salt marshes, seagrasses and peatlands? I doubt that mangroves have much higher C stocks than other peat-forming ecosystems. Please provide data for these other ecosystems to support this claim.

RESPONSE: Yes, the referenced studies provide such comparisons.

- Line 80-83: Many mangroves also form peats. Peat formation does not rely on sedimentation.

RESPONSE: Agreed. We will specify peat-formation as one of the main carbon preservation mechanisms of mangroves' autochthonous organic materials. We will add this to lines 74-76 where we explain the autochthonous contribution of SOC by local vegetation.

- Line 130: How about calling it a case study?

RESPONSE: We will add the text in italics: "...along an estuarine land-to-sea gradient and between old and young mangrove forest sites, *for a specific case study* in the Guayas Delta, Ecuador." We note that this is indeed a case study, but we discuss and interpret the

results against the international literature, so that the conclusions from our study are certainly of interest to the international scientific community, and not only of case-specific interest.

- Line 326-328: Did you compare results based on belowground vs. aboveground biomass $\delta^{13}C$? compare: Mueller et al. 2019 (Marine Ecology Progress Series) providing allochthonous SOC estimates based on different plant ^{13}C endmembers.

RESPONSE: The estimated contributions of the autochthonous carbon input were calculated using the averages of below- and aboveground biomass. The main goal of the estimation is to present the relative contribution of the 2 main types of sources of organic carbon namely the allochthonous and autochthonous sources. We will indeed also show how this may vary when only one type of autochthonous input (above- or belowground biomass) is considered in the estimation and this will be added as supplementary information. In this respect, as already mentioned before in response to a similar comment, we performed a model sensitivity analysis using different plant $\delta^{13}C$ endmembers (roots, leaves, branches, live, senescent, and surface litter) and observed no significant changes in the behavior of our mixing models after linear regression. For this reason, we do not expect considerable differences in the mixing model results when using above- or below-ground average values for the plant $\delta^{13}C$ endmembers. We will also include results of these calculations in the revised manuscript (in online supplementary information).

- Line 417: This is unclear. More stabilization to minerals should lead to greater SOC stocks.

RESPONSE: We wrote 'mineral-associated carbon' to refer to minerogenic/inorganic carbon which doesn't contribute to the organic carbon stocks.

- Line 424-425: There is no evidence for this because you did not measure organic matter preservation, decomposition or carbon sequestration (i.e. SOC stocks * accretion rate). You may want to emphasize that low SOC stocks do not imply low SOC sequestration rates in fast accreting systems.

RESPONSE: Thank you for this comment. We agree with the point you are making. Indeed, decomposition and carbon sequestration rates are direct evidence of preservation of organic carbon. Since these weren't included in our study, the statement made should be viewed as a suggestion on the possible limited preservation of autochthonously-derived carbon based on the estimation of relative contributions of both allochthonous and autochthonous carbon in the sampled mangrove sediments.

Further, we also made the point in the manuscript that we did not measure sediment accretion and SOC accretion rates on lines 484-487. We will further emphasize that indeed low SOC stocks do not imply low SOC sequestration rates in fast accreting systems.