

Interactive comment on “Key biogeochemical factors affecting soil carbon storage in *Posidonia* meadows” by O. Serrano et al.

Anonymous Referee #1

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The manuscript by Serrano et al. describes the trends in organic carbon stocks, burial rates, and origin across a depth gradient in a seagrass (*Posidonia sinuosa*) bed. Overall, it is a well presented and concise study with a clear focus and I agree with the general interpretation of the data. The main message of the manuscript is that organic carbon stocks and burial rates vary across the depth gradient in a systematic matter (and hints at underlying mechanisms, such as productivity/density and sediment grain size) – and points out that such variability should ideally be taken into account when upscaling large datasets on OC stocks or burial in seagrass beds to global levels; while the data from this study are insufficient to allow us to do so, it is a valuable point that might stimulate further work in this direction.

I have provided a list of minor comments and suggestions below – these mainly relate

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to some aspects of presenting the data, and I would recommend to include a discussion of how certain analytical aspects might have an influence on some of the data. The novelty of the data compared to earlier work by some of the authors (Serrano et al 2014, Global Biogeochemical Cycles) should also be stressed.

-A question of semantics – but the manuscript uses a combination of “soils” and “sediments” to refer to the substrate in these seagrass beds or to processes (e.g., sediment accumulation). Considering these are subtidal marine ecosystems, I would be strongly in favour of using the term “sediments” consistently – while it may be a case of preference I feel the use of “sediments” is much more widely accepted in the seagrass/marine community, and in any case there should be consistency throughout the manuscript.
-Reference is made to plant biomass and productivity data at the same site – while I have not checked if the actual depths of the individual sampling sites match, it would be good to make more direct use of these data to support some of the conclusions summarized in Figure 6.
-The acidification procedure deserves some discussion, as the procedure used may result in partial loss of soluble organic C due to the centrifugation and rinsing steps. There is quite a bit of literature discussing/comparing different acidification methods for sediments (fumigation versus in situ acidification in silver cups versus acid treatment + rinsing) and it would be good to at least refer to this and caution that %OC data might be a slight underestimate.
-page 18920, line 9-10: “were they were found”: were found
-The differences/similarities with a similar study at the same site (Serrano et al. 2014, GBC) should be clarified. They are from the same depth gradient – but are they different sites, different sampling periods? This should be mentioned explicitly. Also, differences in some of the results should be mentioned, e.g. the OC accumulation rates appear to be much higher in the current ms for the 2 and 4 meter depth sites than in the Serrano et al. (2014) paper – these are aspects that need to be elaborated on.
-Tables 1 and 3: report $\delta^{13}\text{C}$ data with one decimal only, given the analytical uncertainty on measurements.