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Interactive comment on "Can mud (silt and clay) concentration be used to predict soil organic carbon content within seagrass ecosystems?" *by* O. Serrano et al.

Anonymous Referee #1

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Serrano et al review General Comments: This manuscript reports the organic matter content of seagrass sediments as a function of mud content and type of seagrass, focusing on whether percent mud offers predictive value for organic matter content. They find that sediments hosting longer-lived species, with greater below-ground biomass, accumulate organic matter to levels beyond that predicted by, and not well correlated to, mud content. The paper will thus be a useful report for "blue carbon" strategists in relating carbon accumulation to types of seagrass meadows, and fits the mission of BGD. To be useful, however, some clarifications are needed.

Specific Comments: 1. The relationship between organic matter and minerals is usually best seen with clay-sized fractions, rather than at the 63μm cutoff used here.

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Discussion paper

Phrased another way, a correlation coefficient between organic matter and weight fraction of fine-grained sediment would be expected to improve as the latter parameter uses finer sized cutoffs. The main point of this paper derives from the significance of correlations, and use of finer-grained cutoffs might have led to higher significance levels than those which led to the manuscript's conclusions.

2. Cores were collected to depths ranging from 10-475 cm. Because below-ground biomass likely does not extend as deeply as carbon storage, it would be useful to report any depth relationships found. Because the authors allude frequently to the "blue carbon" justifications for their study, they should alert readers to these depth implications for two issues.

First, upper soil horizons of terrestrial soils – where discrete organic detritus persists - commonly show organic matter concentrations above those levels explained by finer-grained mineral association (e.g., Gami et al. 2009, Geoderma, 153:304, and Mayer and Xing 2001, SSSA 65:250). Thus, does enhanced carbon storage of certain seagrasses species extend to depths below the zone of living or recently dead biomass?

Second, if tests of the predictive value of mud content were made at 0-10 cm only or 100-110 cm only, would the conclusion in lines 181, 189-190 and elsewhere still apply? While the authors may not have sufficient data for as thorough an analysis as was done for entire cores, the manuscript would benefit greatly from any insights based on subsets of the data.

3. The blue carbon rationale of this manuscript also calls for some perspective on how much of the carbon sequestered is due to seagrass. Likely the organic matter associated with minerals would be buried wherever the minerals accumulate in the absence of seagrass meadows. It is the organic matter that is not associated with the fine-grained minerals – roughly the residual carbon levels in meadows above the regression line of the bare sediment – that represents the amount that is additionally sequestered due to seagrass. Estimates of organic carbon partitioned into these two

pools is made possible by the mud content parameter.

4. The authors give some attention to the roles of below-ground biomass and the lability of detritus of different size, but these points could use expansion. For example, papers such as Harrison and Mann (1975, L&O 20:924) showed loss rates dependence on detritus size. Also, Ember et al (1987, MEPS 36:33, especially their Figure 2) found that short form Spartina sediments showed elevated OC and del-13C values relative to tall form Spartina sediments; that finding does not seem consistent with the authors' argument that larger seagrasses lead to more seagrass carbon accumulation.

5. The figures would benefit from letters to indicate individual plots (A, B, etc.).

In the figure captions the authors use the term "intermittent" circles. On the manuscript I received there is no visual difference between the two types of red circles on individual plots, so other than by deduction it's not clear what is meant by "intermittent". Further, many of these "circles" are actually ellipses.

The terms "mud Corg saturation" and "low/high seagrass input" are confusing. Saturation of mud most likely explains the linear trend as seen in the Bare Sediment organic carbon vs. mud content regression line; the points above this line represent samples that are above this saturation level, but the authors have labeled them as "mud-Corg saturation".

The "circled" "mud-Corg saturation" points for the Halodule plots do not seem to include exactly the same subset of samples for the left and right plots. The "circled" "High seagrass input" data points in the two Amphibolis plots also are clearly not all the same samples, so why do they have the same label?

6. Line 160. Insert "variance in" between "the" and "trends".

7. Line 169. What is a "poor but slightly significant correlation"?

8. Line 195. A better way of phrasing this idea would be something like "providing more surface area and hence binding sites for Corg per weight of mineral". Also, I

don't understand intent of the phrase "increasing the available. . .for Corg aggregates" in line 196.

9. The sentence in lines 201-204 is confusing – the points above this regression are not well-explained by the regression.

10. Line 202. Are the authors claiming that the three data points with del-13C of -25 (Figure 1, upper right plot) are the same as the data points with highest OC in the Figure 1, upper left plot? That could be true for only the sample with 6.6% OC, but the other two points must be close to the regression line. Thus these latter two terrestrially influenced samples are close to saturation – i.e. predicted by grain size.

11. Line 210. "obviating" would be a better word than "ending".

In summary, the manuscript is concerned primarily with the predictability of organic matter content by mud content, and seeks further insight into controls on organic matter by separating out some variables. Its main point of better predictive value in bare sediment and short-lived seagrass meadow sediment, but not in longer-lived seagrass meadows, is reasonably well made. The manuscript becomes confusing, however, in the explanations of different organic matter sources and amounts making up the total organic loading.

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