

# ***Interactive comment on “Sediment characteristics as an important factor for revealing carbon storage in *Zostera marina* meadows: a comparison of four European areas” by Martin Dahl et al.***

## **Anonymous Referee #1**

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### General comments:

This study provides information on organic carbon at four European sites dominated by *Zostera*. It finds that sites vary among each other in carbon content and that sediment characteristics are an important factor influencing carbon content. However, the four sites chosen vary greatly among each other, comparing one location to another may not be adequate. Perhaps if more sites were added it would improve the analysis; this is an issue that was not addressed in the discussion. At some of the sites *Ruppia* was present and at others *Cymodocea*, how the variation in species presence may be

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confounding findings was not adequately discussed. The determination of grain size was carried out using three methods, dry sieving with and without removal of organic carbon and through a hydrometer. It is not clear how much the use of these three different methods affects the comparability of the samples, but it certainly can have an unwanted effect and should be avoided. The Serrano et al 2016 recent paper on mud content in seagrass meadows that analyses a great number of locations was not discussed, it should have been as well as other literature in greater detail.

#### Specific Comments:

Methods, Study sites. The sites appear to be chosen bc they are the “edge zones of the *Z. marina* distribution in Europe”, not sure what the justification for this is? From the description of the sites, next to labs, it seems this was a sampling of convenience not one designed to address specific questions. One site with presence of *Ruppia*, another with *Cymodocea* which is not addressed in the discussion. . .

P6L119-120.”The sediment samples were cleaned from roots and rhizomes, larger shells and benthic organisms prior of drying and dried in the same way as the biomass.” Correct English, separate into two sentences and provide the details of the drying method used.

P6L123-1234. The method of acidification needs to be explained with more detail. Also, were the samples homogenized in any way prior to Corg determination?

P7L135. “and the sediment of each sieve was weighed to determine the weight of the separate fractions” modify to “Sediment in each fraction was weighed separately”. How much total sediment was dry sieved?

P7L136-137. Why was organic carbon only removed prior to grain size determination in some samples (referring to those with high Corg, define what “high” is). There is also the potential loss of fine material from the acidification and washing process. Grain size at two regions were measured using a completely different method, instead

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of dry sieving a hydrometer was used. Organic matter in the sample can lead to an overestimation of fine particles how are the treated and untreated samples comparable? How are samples in which grain size was determined using three methodologies comparable? It would appear this is a major flaw in a key point for the study.

Methods, Stats. Why was a PCA used and not an MDS and Permanova? Include the program that was used.

Results. P9. Sometimes Corg is reported, sometimes g C cm<sup>-2</sup>, is this one total carbon or should it also be g Corg cm<sup>-2</sup>?

P9 and elsewhere. Instead of using the specific site names it is probably better to indicate what they represent, lower or upper thermal limit for the species? east to west sites? etc. . .

P10203-204. Why was mean grain size tested against sediment particles <0.074 mm (%)? they both represent grain size descriptions. . .

Discussion. When comparing with other studies the statistical methods used should be noted and compared as well. Here, nested ANOVAS were used, while other studies use regressions or linear mixed effects models and the statistical findings can vary depending on which models are used. Were the findings using ANOVA replicated using simple regression of linear mixed effects models?

P13L 278 "In areas without these sediment properties" what does that mean? areas of coarser sediment? larger grain sizes?

Why is this manuscript not comparing the findings to a much larger analysed done recently by Serrano et al 2016? (Serrano, Oscar, et al. "Can mud (silt and clay) concentration be used to predict soil organic carbon content within seagrass ecosystems." Biogeosci Discuss 2016 (2016): 1-24.).

Fig. 3. Put both the vegetated and unvegetated into one same graph of each site to be able to compare (different colours or black and grey can be used to differentiate them),

they all have different x axis so comparison is not straightforward.

Fig. 4. can be deleted

Technical comments:

Introduction: P3L49. “Dense meadows have the ability to stabilize the sediment, (and thereby preventing it from eroding)”

P3L49-51. Separate into three separate sentences.

P4L74. “coarser stone-sand bottoms to finer silt and clay sediment” shouldn’t it be coarser?

P7L132-133. Should be “each section was analyzed separately”

P7L140. “to be analysed with hydrometer” should be “. . .with a hydrometer (make and model)” P10L186-189. This section needs to be improved as far as clarity and can be separated into 2-3 sentences.

P12L224. “west coast where 15 times” should be “was”. Also for P13L 277, it occurs several times in the manuscript.

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