

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-60

Anonymous Referee #1

Referee comment on "Mediterranean seagrasses as carbon sinks: Methodological and regional differences" by Iris Eline Hendriks et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2021-60-RC1>, 2021

The manuscript by Escolano-Moltó et al. presents a synthesis of seagrass metabolic data from previously published work and/or datasets in the Mediterranean relative to two seagrass species (*Posidonia oceanica* and *Cymodocea nodosa*) using two methodologies (benthic chambers and multiparametric sensors). This is a very relevant topic in the current context of climate change in relation to carbon sequestration in coastal areas, and the work presented has a considerable amount of data and results that fit within the scope of Biogeosciences. While the seagrass metabolic data is not particularly novel, the comparisons among methods, species, and regions (Mediterranean basin) are very important. However, there is a major flaw in the statistical approach used and how this is used to pooling datasets. As presented in the manuscript, the ANOVA analysis is not considering the lack of independence in the data from the same season, site, or region and should be reviewed. Depth should also be considered as a covariate as it is most likely related to the metabolic rates due to the light availability. Increasing the accuracy in the statistics presented is essential for the interpretation of the results presented here, especially because datasets are pooled based on those analyses and then further analyses are done. Therefore, the results presented are built over potentially incorrect statistical analysis, and, right now, it is not possible to evaluate the accuracy of the entire set of results presented. If ANOVA assumptions cannot be met, consider using a different statistical approach (e.g. mixed models) and present the results accordingly. Especially critical is the pooling of datasets, if possible, this should be avoided and instead, grouping factors or separate analysis should be considered. Additionally, the main text structure needs revision (see specific comments below). In particular, there is a lot of information on the methods section that is missing in the Results (e.g. habitat traits measured, logistic regressions between abiotic and biotic parameters, pH data). Also, there are Results (including stats) presented in the Discussion section. Throughout the text, there are several typos and constant misuse of species names, which appear sometimes complete and others shortened, and many times italics are not used. I believe the work presents interesting data, and so, the analyses could be revised to improve the way results are presented and discussed in the manuscript. Hopefully, my suggestions help to improve the manuscript. All my comments are made with this purpose.

Abstract:

L14. I would recommend replacing “: “Through their metabolic activity, they ...” with “Seagrasses”. As it is written now, the statement neglects the fact that carbon stored in sediments can come from external sources and that the buffer of low pH can also occur due to other processes not related to the seagrass aerobic metabolism.

L15. This is a long sentence that could be re-written to increase clarity. For instance: In this study, we analyzed published and own (unpublished?) data on seagrass community metabolism to evaluate trends through time of these two species comparing two methodologies: benthic chambers and multiparametric sensors

L19. remove “with no significant results despite the clear visual trends.”

L21. Add a comma before whereas

L23. add “the” before highest or replace by higher

L23 - L24. write the complete species name in italics and remove the genus (i.e. *P. oceanica*, *C. nodosa*)

Introduction

General comment: The introduction is long, there is a lot of information and it is difficult to follow the flow of ideas. This is especially the case around the importance of seagrass aerobic metabolism related to (1) carbon burial in sediments and (2) buffering of low pH. Both processes are related to primary productivity, however, there are differences among them that right now are unclear in the text. I would recommend reviewing the text, try to shorten it, and present idea by idea avoiding redundancy and unnecessary information. The first paragraph in particular is hard to read and it is very long (L30 to L84). See detailed comments below:

L30. Please consider rewriting this sentence to increase the accuracy of the statement. For instance: Organic carbon buried in sediments underneath marine vegetation

L33. remove dot before the references.

L34. add "an" before intense.

L34. Remove "together with excess production". I believe the authors meant high productivity rates, but the word excess is a subjective assessment that can lead to confusion

L34. Remove "in seagrass meadows" because it is obvious

L35. Increased compare to what? Consider replacing "increased" by "high"

L35-L40. This statement is redundant with the one before ("high trapping capacity of allochthonous matter in seagrass meadows").

L40. Consider removing: "elements such as"

L39. this last sentence hangs alone in the text and it is difficult to understand what it refers to. Please review: "together with in situ production due to their primary production (Greiner et al., 2013)."

L43. The species names should always be in italics

L50. Unclear what it means "consistent estimates". Does it refer to methodology?

L56. Consider replacing "human processes" with "human activities"

L56. I believe this refers to the dynamics of the carbonate system but needs clarification.

L60. Two dots in a row, remove one

L85. Consider replacing "which are located in" to "from", as *C. nodosa* can also be found outside the Mediterranean.

L96. Consider replacing "as ranging" to "to range"

L102. Add space between "Mediterranean meadows"

L124. Consider replacing "by the use of" to "using"

L132. Consider replacing "large" with "larger"

L136. Remove "the" before "two" as there are more seagrass species in the Mediterranean

L139 Remove "including the two species in the Mediterranean Sea"

Methods

General comment: In the abstract, it says that part of the data analyzed in the study is its own data. But in the methods, it states that data is from published literature or published datasets. Does it mean the "own data" comes from previously published work? Is there any data collected in the field for the purpose of this study? All this needs clarification. Based on the information in the abstract I was hoping to see an assessment of how seagrass metabolism has changed through the years (authors have data since 1982) as a function of changes in the CO₂ atmospheric concentrations "In this study we analyse the metabolism synthesized from published data on seagrass community metabolism and from own results to evaluate trends through time". If possible, it would be really interesting to include this.

L146. Site description: The way is written suggests that field data was specifically collected for this study (see comment above). If this is not the case, consider re-writing this part avoiding the use of terms like "sampling campaigns" or "sampling sites" and/or specifying that all this information comes from previous work. Furthermore, there is a high level of detail on the site description that (in my opinion) is unnecessary for a scientific paper. In case it is necessary for discussion, consider moving that info (such as the different status of protection of each site: SPA, Birds directive, ZEPA, LIC, ZEPIM, etc.) to the discussion section.

L156. Add space after "Souda,"

Fig 1. Add north arrow and latitude and longitude degrees in the axes. Missing reference for GEBCO 2020 in the reference section.

L188. Add "traits" after "habitat"

L183. Data analysis: Please add the accuracy (\pm SD) of the multiparametric sensors for each of the parameters used, especially for DO and pH. This is crucial for further interpretation.

L187 - L189. Need to add methods for the habitat data.

Table 1. Not sure what is the date format required by Biogeosciences but consider using MM/DD/YYYY.

L211. Salinity is unitless. Remove units here and in Table 1

L223-L225. In the k and k660 calculations, what is the effect of the higher salinity found on each of the sites?

L277. How were the 12 publications selected? Is this the total number of published works for *P.oceanica* and *C.nodosa* in the Mediterranean? If not, it will really help to include more data from seasons and regions understudied (for instance: studies with spring, fall, or winter data from the Eastern basin).

L278. Add space before 12

L281. "In this work we add benthic chambers data to the body of literature," suggests that field data was collected, but no other explanation is given. See the comments above about clarifying this.

L282-L285. I believe this sentence corresponds to a data analysis section, not to data compilation. Please add information on how the ANOVA assumptions were tested, especially the lack of independence from the time series data and data from the same site/season/region when comparing metabolic rates. Was any random factor considered? If not, the statistical analysis for the comparison of metabolic rates should be reviewed. For all statistical analyses done, please add information on how the residuals looked and if those met the assumptions of the correspondent analysis.

L284. Are density and shoots the same measurement? How were all these parameters measured? See the comment above about the need to add methods for the habitat data.

Table 2. Two decimals are enough for temperature, salinity, and depth. Also, remove units in salinity. Consider adding here or in the text the characteristics of the chambers (i.e. flexibility and material).

Results:

General comment: There are methods written in the Results section. It would be better to move that to the methods section. I have serious doubts about the use of non-significant results in one-way ANOVAs to pooling datasets in data that is (for what I can see in the methods section) not independent. The results on habitat traits and abiotic parameters used (pH for instance) and many of the logistic regressions (temperature, shoot density, etc.) are missing and should be added. Finally, I would suggest, in order to gain clarity, to summarize section 3.1 in a Table and keep consistency on the use of written numbers.

L295-L298. All this info can be removed or moved to the Methods section. If the data is available, please add the correspondent link.

L310. In the stats analysis, please provide more details: degrees of freedom, F-values, Sum or Mean of Squares for ANOVA, etc. This information can go in a Table into supplementary materials.

L310. See my general comment above about merging datasets based on simple one-way ANOVAs.

L321. See my general comment above about merging datasets based on simple one-way ANOVAs.

L328. Replace "didn't" by "did not"

L330-L333. If possible, I would suggest moving the methods and results related to temperature from the appendix to the main manuscript. The finding of temperature not affecting metabolic parameters in the Western basin is very relevant to the work done and is very interesting.

L329. Remove capital letter from "Addition"

L331. Replace "none" with "any"

L346. I would suggest removing "and act as carbon sinks" as this was not studied.

L365. Replace "didn't" by "did not"

L369. "Except for the summer" hangs alone and it is difficult to know what it means.

L373. See my general comment above about merging datasets based on simple one-way ANOVAs.

L375. Keep consistency on the number of decimals used for each parameter.

Discussion

General comment: There are results (I believe from the logistic regressions) written in the Discussion section that should be moved to the Results. Also, it would help the readers to have a first paragraph on the discussion with the take-home message.

L413. Replace "didn't" by "did not"

L417. This statement about the 10m distance among seagrass meadows is very confusing. From Table 1, only two sites presented both species. Please clarify what do you mean here.

L423. Replace "didn't" by "did not"

L430. I would suggest removing "and act as carbon sinks".

L432. Keep consistency in the use of acronyms.

L439. These results are not presented anywhere.

L440 – L447. These results need to be presented in the Results section

L441. Add space after comma, and remove dot before comma

L446. The results of the biotic parameters related to metabolism are really surprising and it would be interesting to discuss them further.

L454 Replace "wasn't" by "was not"

L455. See my comment in methods about the bibliographic research. Does this mean that no benthic chambers have ever been used in *C. nodosa* in the Eastern basin? If this is the case, the results presented in this work are even more important and this should be

highlighted as one of the outcomes.

L458. Replace dot by comma

L459. Avoid repeating results in the discussion section.

L471. Please cite the correspondent literature.

L486. Remove dot after column

L515. Replace "didn't" by "did not"

L518. Remove "a" before "more"

L544. Remove "prevention"

Appendices

Appendix B is really scattered and the results of the higher GPP with depth seem to be driven by only 1 depth (15m). Is this only driven by one site?

Appendix D. remove capital letter from oceanica.

References

Please review the italics for species names, names of co-authors (i.e. Marbé), and journal names (i.e. *1foldr Import 2019-10-08 Batch 5*.)