

Comments to the authors

The authors satisfactorily addressed most of my concerns. The new version of the manuscript features a different way of calculating EXr taking into account more parameters (i.e. the four modelled parameters rather than just DIC). The new figures are insightful, the manuscript has significantly improved in quality and once published will make a valuable contribution to the field. I only have a few minor suggestions/edits to improve the overall readability and clarity of the text.

One of the key and most novel results of the paper is that a relevant fraction of the NCP of macroalgae is exported to the offshore site (via DOC), and that a portion of that is refractory (Ln 25, 27). This significant result is “buried” towards the end of the results (e.g. Ln 277) and discussion (e.g. Ln 344) sections. Flipping the structure of the results and discussion (talking first about the most novel results and its implications for the CO₂ sequestration of macroalgae) could give it more of a punch. This is just a suggestion up to the authors discretion.

Ln. 14. Evidence that macroalgae-derived carbon is locked away from the atmosphere for very long periods of time (decades-centuries) is still contentious, so I don't think the word “sequestration” is appropriate here. Perhaps carbon assimilation?

Ln. 17. Add “the” before “productive”

Ln. 18. Define here (a few words in a parenthesis would work) what a lateral carbon flow is, as a readers not familiar with that concept may not know what you are referring too.

Ln. 108. The field bag experiments were conducted during one day both in February and March right? This should be clear in the text.

Ln. 113. Should be [of the] “study macroalgal bed” instead of “macroalgae”

Ln. 153. I don't understand the first negative sign, shouldn't it just be $\Delta\text{DIC} - 0.5 \cdot \Delta\text{Talk}$? Also, for Ins. 153-157 you have a variable expressed in $\mu\text{mol C} \cdot \text{L}^{-1} \cdot \text{h}^{-1}$, so the equation should account for volume of the bag right? (i.e. divided by TB not just T). Finally, consider expressing your equations as $\frac{1}{2}\Delta\text{Talk}$ or $\frac{1}{2}\Delta\text{Talk}$ (same for other terms) as it is more clear what term of the equation is divided by what number

Ln. 121. Starting stating the aims of the paragraph will improve readability. Could try something like “To examine the degradation rates of macroalgal DOC, DOC samples were obtained ...” . Also make it clear that you are interested in measuring microbial-driven DOC degradation.

Ln. 203. replace “from the results” for “from changes in DIC, TALK, and DOC measured in the field bag experiments”

Ln. 214. Cite here some factors (examples) that may be driving EXr so the reader gets a better idea of what that term EXr represents. Could wind-driven water exchange be one of them?

Ln. 241. Consider changing the sentence to state that, on average, DOC was higher in the macroalgal bed during both sampling times, but differences between the bed and offshore site were only significant in March.

Ln 249. State that NCC was positive during both months ($\sim 11\text{-}21 \text{ mmol C m}^{-2} \text{ d}^{-1}$) and that “the average carbon fluxes due to NCC were one to two orders of magnitude lower than those derived from NCP”

Ln. 257. State somewhere in the paragraph that there was less decrease in March.

Ln. 258. Link this sentence with the first one in Ln 259 by inserting “suggesting that” at the end of Ln 258.

Ln. 265. Something along the lines of “the RMSEs for the best-fitting models considering water exchange (mean: February, 0.55; March, 0.86) were lower than those assuming water exchange was zero (mean: February, 3.85; March, 3.13; Table 2)” might make the sentence a bit more clear.

Ln 267. Replace “changed little” for “saw little to no improvement”

Ln 268. Are 39 and 43 the percentage relative to EX (i.e. what percentage of EX is due to EXr), or just its total value? As far as I gather from Ln 268, it refers to its total value and that means that EXr was the main driver of EX right? If so, make it clear in the text.

Ln. 322. Perhaps it would be more interesting for comparison’s sake to convert Randall et al. 2019 estimates to carbon values assuming a photosynthetic quotient of 1?

Ln. 332. I don’t understand how the relative growth rates ($\% \text{ d}^{-1}$) values were obtained if the field bag experiments were conducted only during one day. Please clarify.

Ln. 351-353. Collate in just one sentence.

Ln. 372. Should be “30-day”

Ln. 375. Start sentence with “Recalcitrant macroalgae compounds such as phlorotannins vary ...”

Ln. 382. Add “microbial” before “degradation” to make clear that you only measured microbial-driven degradation of DOC under controlled conditions. Add a sentence somewhere in the paragraph stating that other factors (e.g. photochemical degradation) not measured in the study could also be important in driving DOC degradation. Also, change “should be overestimated” for “are potentially overestimates”.

Ln. 396 Pessarrodona et al. 2018 and Pedersen et al. 2019 did not explicitly consider/measure POC export from macroalgal beds (rather POC production or release), so perhaps consider removing them.

Ln 400. Main pathway of macroalgal DOC sequestration is thought to be export below the mixed layer (rather than “deep sea”)

Ln. 402. Perhaps saying that “the maximum residence time of dissolved mater in the study’s oceanographic basin is approximately between 100-200 (depending on the season)” would make a stronger case for the potential export of your macroalgal RDOC outside the Seto Inland Sea.

Ln. 421. Delete “to the surrounding water”

Figure 2. This is a great Figure!

Figure 3. Perhaps labelling February and March on top of the left and right columns respectively could help with readability.

Figure 4. The relationships have an R^2 of 1, but the plots show some deviance of the predicted relationship (i.e. data points away from the regression line) in March for instance. The R^2 seems a bit high for empirical data?

Figure 7. The sentence “The carbon flows due solely [...]” should go after the first sentence in the caption to inform the reader what the parentheses mean.

Table S2. Add “measured” in front of “in the surface”