

Interactive comment on “Major role of marine vegetation on the oceanic carbon cycle” by C. M. Duarte et al.

C. M. Duarte et al.

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Reply to Anonymous Reviewer #2:

Anonymous reviewer #2 raises important points that require specific changes in the manuscript, which will greatly improve the revised version. We discuss these changes below using the format "Reviewer #2" to indicate the comment we are to address; followed by our reply.

Reviewer #2: Macroalgae and (benthic vegetation on?) coral reefs are only used in the budget in Table 3, but are not included in Table 1+2, and I guess that this is because you assume that there is no carbon burial in these systems? This is very briefly mentioned in the introduction (p661, l 5-10). Could you comment further on this - e.g. when you present the calculations done for Table 1?

Reply: This is indeed correct. We now elaborate further in the text, as requested, and indicate that our estimates are conservative as some burial, albeit likely small, may

possibly occur in these habitats.

Reviewer #2: What do you mean by “in contrast with” in this sentence? Is this respiration higher or lower or do you refer to something else? The sentence is not clear.

Reply: We agree than the sentence is unclear. We referred to the contrast between macrophytes being responsible for an important share of the respiration of vegetated habitats and the coastal ocean, compared to a dominance of microbial respiration in the open ocean. We have clarified this sentence further.

Reviewer #2: How has the value 94% been derived? Is it based on some of the measured values from the studies in Table 1 - please clarify.

Reply: The benthic coastal NCP is calculated to be 2661 Tg C yr⁻¹ compared to C burial. However, we used the previously accepted estimate of 120 Tg C yr⁻¹, whereas we could also refer this calculation to the revised estimates of total coastal burial derived here of 238 Tg C yr⁻¹. Hence, C burial can, at most, account for the removal of 238 Tg C yr⁻¹ out of the excess 2661 Tg C yr⁻¹ produced in the benthic coastal ocean, which leaves about 91 % of the NCP to be exported to the open ocean. The text has been revised for clarity and to provide the calculations indicated above.

Reviewer #2: I find the conclusion in the second paragraph complex, as it combines area loss of marine vegetation and reduced sediment loading of the ocean into one figure of carbon burial (50%). The loss of marine vegetation includes both carbon burial in the coastal zone and carbon export to the ocean, whereas the lack of sediment load represents something that never reaches the ocean. Maybe the overall effect on the carbon cycling will be the same, but I find the constellations difficult.

Reply: We agree that the text was unclear and lead to a misinterpretation by the reviewer. On the one hand, habitats destruction has lead to an estimate loss of 25 % of the burial capacity of the undisturbed vegetated coastal habitats. On the other hand, we take reported estimates of reduced sediment delivery to the ocean to calculate that

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this must have removed burial capacity further. We have edited the text for clarity and precision.

Reviewer #2: I am not sure I understand this sentence. How can an error in the carbon estimates ever influence (accommodate) the atmosphere CO₂? Please clarify

Reply: We agree the sentence was unclear and have now rewritten the text to improve clarity. This refers to previous arguments as to the possible role of marine sediments as repositories for anthropogenic CO₂ (Berner 1992). The text now reads “However, this upwards revised estimate of organic carbon burial can only accommodate a small percent (< 20 %) of the anthropogenic carbon missing in current ocean and atmospheric inventories (Berner 1992).”

Reviewer #2: Technical comments: P 660, l 7 - spelling error: vegetated P 660, l 18 - NEP is not defined P 661, l 16 - spelling error: salt marshes P 664, l 22 - total sediment input 20000 Tg y⁻¹? P 666, l 6 - NCP is not defined P666, l 8 - insert to between “need be”, P 666, l 15 - NEP is not defined P 667, l 23 - is “conform” the right term here or should it be confirm? P 668, l 1 - spelling error: extent P 668, l 6 - spelling error: by Table 1 - note 1 and 2 is the same and can be combined

Reply: All of these technical comments have been corrected in the revised version of the manuscript.

Interactive comment on Biogeosciences Discussions, 1, 659, 2004.

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