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Interactive comment on “Radiocarbon isotopic evidence for assimilation of atmospheric CO₂ by the seagrass *Zostera marina*” by K. Watanabe and T. Kuwae

Anonymous Referee #2

Received and published: 19 June 2015

General Comments This paper uses a novel approach to evaluate seagrass utilization of atmospheric carbon as a photosynthetic substrate. Assimilation of atmospheric CO₂ (C_{air}) was demonstrated by measuring the radiocarbon isotopic signature of DIC and *Z. marina*, and a two-model source mixing model was used to determine the relative contribution of C_{air} to assimilated seagrass carbon. I agree that atmospheric C uptake is likely, given that hydrated leaf surfaces during exposure can facilitate the diffusive flux of CO₂. While I support publication, there are a number of shortcomings that need to be addressed. Namely, I find it interesting that exposure time was not included in the presented data, given its presumably strong influence on the relative contribution of C_{air}. Furthermore, additional information needs to be provided in regards to the

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statistical analysis.

Introduction

P7600 Line 25: Should acknowledge that HCO_3^- is also a viable carbon source, along with transport mechanisms associated with its use.

Methods

P7602 Line 12: Why the difference in sites between the DIC sampling stations and the Z. marina stations?

P7602 Line 15: How was this determined?

P7602 Line 15: State number of independent samples per station both for DIC samples and seagrass biomass.

P7602 Line 21: Any epiphyte loading on the seagrass leaf surface?

Results / Discussion

P7604 Line 14: Please clarify where 46% C_{air} contribution comes from? This value seems rather high. While carbon fixation clearly occurs during emersion, prior work has suggested reduced maximal photosynthetic rates during air exposure (Clavier 2011), particularly in cases of desiccation (Leuschner et al 1998). Furthermore, Fig 1b. displays rather high within station variation on the relative contribution of C_{air} , to what might you attribute such variation?

P7605 Line 10: Citations statements are primarily derived from interspecific distinctions. Given that you're comparing the same species, how might salinity gradients influence resultant δC_{13} values? What about terrestrially derived sources of isotopically light δC_{13} from the decomposition of organic matter.

P7605 Line 12: Without detailed data from laboratory incubation, I find these conclusions difficult to make given the reasons that you have already described in regards to

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C13 isotope analysis. There appears to be many relevant citations missing from the references. I suggest the authors incorporate additional studies, and provide a more comprehensive discussion of this topic.

Interactive comment on Biogeosciences Discuss., 12, 7599, 2015.

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