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Interactive comment on "Radiocarbon isotopic evidence for assimilation of atmospheric CO_2 by the seagrass *Zostera marina*" *by* K. Watanabe and T. Kuwae

Anonymous Referee #3

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This study applied radiocarbon analysis to attempt to quantify the uptake of atmospheric carbon dioxide by seagrasses occurring in very shallow water in a coastal lagoon on the eastern coast of Hokkaido, Japan. The study inadequately introduces the location (there is not even a location figure) and does not explore the oceanographic setting. As below, oceanographic variation in Δ14C of the DIC, and seasonal oceanic forcing of this coastal lagoon, are another explanation for the differences in Δ14C in seagrass leaves in addition to the atmospheric CO2 use hypothesized by the authors and the terrestrial influence raised by another reviewer. Even given strong confidence in Δ14C as an adequate tracer of atmospheric CO2 use in this particular system, it is unclear how applicable the technique could be to other systems that have seagrass

systems in water deeper than 10s of cms and where a seasonal and spatial gradient in Δ14C-DIC is highly likely.

Major comments

1. P7604 L22-24: The comments about surface water Δ14C-DIC seem like they could be a fairly significant over-simplification: what about the seasonal role of currents with markedly different Δ14C, e.g. to the south the dynamics of the Oyashio and Tsurugu Warm Current (Kuroshio) can lead to variation in Δ14C-DIC in surface waters that covers the range of values observed in this study. The potential role of seasonal variability in Δ14C-DIC needs to be better explored – for instance could oceanic intrusion perhaps explain the Δ14C variations in seagrass leaves independent of the hypothesized utilization of atmospheric CO2?

2. Another major issue in the context of the potential seasonal variation in Δ14C of the DIC in an oceanographic context (as above) is the leaf turnover time: what is the turnover time of the leaf carbon, i.e. what season does the tissue sampling reflect, and does this change spatially into the lagoon?

3. A location map is needed, showing the sampling sites and the location of the bay in relation to the open ocean etc. All of this is very important for the readers' interpretation, especially given the possible seasonal influence of ocean current dynamics on Δ14C of the DIC as above.

Minor comments

4. Abstract; P7604 L14: What does the 46 % refer to if the mean is 22 %?

5. P7600 L20: Second "their" seems superfluous.

6. P7601 L4-5: If the diffusion rate of CO2 is lower in water, how does a water layer promote CO2 uptake? A layer of water would seem to reduce uptake by limiting diffusion.

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7. P7602 L10: The use of “dispensed” here is strange.

8. P7605 L1-2: The application of the technique here, and certainly other areas of the Pacific, depends on much more thorough understanding of Δ14C dynamics in response to oceanic forcing.

9. P7606 L2-4: It could also be argued that a more thorough oceanographic context is required to adequately interpret tracers like Δ14C in this context.

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