Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-154-RC2, 2018

Biogeosciences Discussions

Interactive comment on "Negligible isotopic fractionation of nitrogen within temperate *Zostera* spp. meadows" *by* Douglas G. Russell et al.

Anonymous Referee #2

Received and published: 11 June 2018

Manuscript number: BG 2018-154

"Negligible isotopic fractionation of nitrogen within temperate Zostera spp. meadows."

General comments:

There are several key publications in the area that the authors did not mention in the introduction. Therefore, it is not very convincing and is not giving an overall view to the readers. For example, Papadimitriou et al. (2006) have already reported δ15N in Zostera noltii meadows and δ15N in porewater ammonium with a conclusion that reflected each other. So the "no studies" at line 9, page 1 does not appear justified. Also, the "previous studiES" at line 13, page 1 showing a fractionation of 2‰ of N fractionation during OM mineralization could not be only related to the SINGLE study on

sapropels. The authors are invited to consult Lehmann et al. (2002); Rooze and Meile (2016) where a full description of the N fractionation process during OM mineralization was provided in either marine/lacustrine environments. Therefore, the "uncertainty" mentioned at line 14 is also not justified. These two examples justified the main problems of this manuscript which are the lack of literature documentation leading to the excessive confirmation of confidence (i.e., "no studies" at line 9 page 1, line 17 page 2). The authors are therefore invited to revise the introduction and provide further details on how and why N isotopes are fractionated by geochemical but also biological processes. This lack of a good literature review is also imputable to the quality of the discussion which is not novel and convincing.

Specific comments:

-Section 2.2, 2.3 and elsewhere, the authors are invited to mention the number of samples/replicate collected and number of observation each time a statistical test has been done.

-Which reference materials were used in sections 2.3 to 2.5?

-Page 6 line 11: Again, the authors are invited to revise the "no studies" as it is not quite true.

-The section 4.1 is very hard to follow. The aim of this section is, so far as I understand, is to attribute a reason for the 1.6 ‰ shift in average between seagrass root and porewater. With the approach used and the way the data are shown by the authors, the difficulty is obvious to find a single reason explaining this shift. In fact, the literature shows clearly the vertical gradient of ammonia in porewater, and the bio-irrigation amplifies the heterogeneity of diagenetic reactions. Therefore, a single sample of a broad sediment depth (20 cm) could not be explanatory for the change in N and N isotope for each seagrass root. The correlation in Fig 4 may be enhanced if the authors correct porewater ammonia concentration by the sediment porosity which may give a better idea of the whole N pool, accessible to the plants. However, the section 5.2.2. in Pa-

padimitriou et al. (2006) has very well discussed the N isotope composition in Z. noltii leaves and porewater ammonia. The authors are therefore recommended to shorten and clarify the current section 4.1..

-Similarly, the section 4.2. shows that key publications in the area are missed. Contradictory to what mentioned, there are several work and models on C, N, and their isotopes during mineralization, e.g., (Lehmann et al., 2002; Bouillon et al., 2012; Rooze and Meile, 2016).

-Finally, what is interesting in this study is the correlation between seagrass root, sediment N, and porewater ammonia. Correlations in Fig 3a and 3b show a very similar slope (0.786 vs. 0.773), that means plotting seagrass roots vs. sediment may give a slope of 1. That may lead to a more straightforward conclusion that seagrass roots take the same N isotope signature than sediments rather than trying to explain roots vs. porewater and sediment vs. porewater.

Technical comments:

-Page 5, line 32: The subtraction sign is not a good idea to use in the text as it is confusing with a simple hyphen or a minus, one alternative is using a big delta and having “porewater-seagrass” in subscript.

Reference:

Bouillon S., Connolly R. M. and Gillikin D. P. (2012) Use of Stable Isotopes to Understand Food Webs and Ecosystem Functioning in Estuaries., Elsevier Inc.

Lehmann M., Bernasconi S., Barbieri A. and McKenzie J. (2002) Preservation of organic matter and alteration of its carbon and nitrogen isotope composition during simulated and in situ early sedimentary diagenesis. Geochim. Cosmochim. Acta 66, 3573–3584.

Papadimitriou S., Kennedy H., Rodrigues R. M. N. V., Kennedy D. P. and Heaton T. H. E. (2006) Using variation in the chemical and stable isotopic composition of Zostera

noltii to assess nutrient dynamics in a temperate seagrass meadow. Org. Geochem. 37, 1343–1358.

Rooze J. and Meile C. (2016) The effect of redox conditions and bioirrigation on nitrogen isotope fractionation in marine sediments. Geochim. Cosmochim. Acta 184, 227–239.

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