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Biogeosciences Discussions

Interactive comment on "Evidence for methane production by marine algae (*Emiliana huxleyi*) and its implication for the methane paradox in oxic waters" *by* K. Lenhart et al.

Anonymous Referee #1

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Review of "Evidence for methane production by marine algae . . ." ms # bg-2015-628 by Lenhart et al, submitted to Biogeosci.

General comments

Despite there are several suggestions to explain the methane (CH4) production pathway in the oxic ocean, the accumulation of oceanic CH4 remains enigmatic. The idea that CH4 might be produced by phytoplankton (algae) is not a new one; however, detailed studies on this issue are still lacking. Lenhart et al. present a novel data set of CH4 production rates from a study with a E hux culture. The data and conclusions presented are of high interest for anyone dealing with the biogeochemistry of oceanic

CH4 cycle.

However, and very unfortunate, the authors try to over-emphasize the significance of their results. The ms needs to be focused on the main conclusion (i.e. E hux has the potential to produce and release CH4). Any further far-reaching speculations about the CH4 paradox are not justified by the results presented.

Therefore, I can recommend publication of the ms only after major revisions.

These are my points:

1) E hux plays an important role in the ocean, but of course it is only one of many algae species out there. Therefore the authors should avoid giving the impression that E hux is representative for all algae. Their phrases '. . . marine algae such as . . .' (p.20325, l. 21) or 'Since our results unambiguously show that algae are able to produce CH4 per se under oxic conditions . . .' (p.20344, l. 17/18) etc. have to be rephrased. This also applies to the title. To make it short, it is not acceptable to draw the conclusion that algae generally produce CH4.

2) Introduction: The oceanic source of CH4 is negligible compared to other natural and anthropogenic sources of atm. CH4 (see e.g. IPCC 2013). This is not mentioned in the introduction leaving the reader with the impression that the oceanic source is indeed significant for the global budget, which is not the case (see e.g. p.20326, l.25/26). Please modify the introduction and mention the oceanic source strength.

3) Introduction: The introduction needs a significant shortening and a focus of the main theme of the ms. There is a lot of information given which are not necessarily needed in the context of the ms. See e.g. paragraph about MPn as source of CH4 (see p.20328, l.5-19) and other parts of the introdcution.

4) Please avoid comparison with freshwater lakes) and terrestrial (plants) systems which are not comparable with the oceanic ecosystems at all; there are several places in the text where a comparison with results from lakes and terrestrial plants are pre-

sented. Please modify.

5) I am wondering about different interpretation of the conclusions from Bange and Uher (2005). On the one hand, I read that photochemical production is 'negligible under oxic conditions' (p.20328, l.3). On the hand the authors cite Bange and Uher (2005) as being in line with their findings of a chemical CH4 production found in their study which was conducted under oxic condition, I suppose. I think that this latter case is a misinterpretation of the results of Bange and Uher (2005). See also p.20342, l.25/26 where a photochemical CH4 formation is listed as a potential CH4 pathway in oxic surface waters. This is not correct; please modify.

6) The section 5.4 'Methane paradox in oxic waters reconsidered': This sections does not present any new results or conclusions and is way too much speculative. Therefore, it has to be omitted.

Minor comments

Section 2.3 Gas Chromatography: Why are CO2 and N2O mentioned? These measurements are not presented in the ms. Please correct.

p.20334, l.5: ppbv is not a concentration it is a mixing ratio. Please correct. See also p.20334, l.15.

p.20339, l.20: Schiebel et al. (2011) is missing in the ref list.

p.20340, l.9: I could not find any information how CH4 emissions (given in ng/gPOC/h) from the E hux culture have been converted to ng /gDW/h. Please explain.

Interactive comment on Biogeosciences Discuss., 12, 20323, 2015.