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Biogeosciences Discussions

Interactive comment on "Acidification increases microbial polysaccharide degradation in the ocean" *by* J. Piontek et al.

Anonymous Referee #2

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This experimental study examines the effect of pH decreased in seawater (simulating ocean acidification) on microbial polysaccharide degradation. Alpha- and beta-glucosidase activity measurements as well as neutral and acid sugars from phytoplankton-derived polysaccharide quantification have been performed in two kinds of experiments (culture experiments and field-assays) at both present-day (PD) and future-ocean (FO) pH conditions. Loss of total polysaccharides was significantly higher at lowered pH than in reference incubations (PD treatments). In the same time, glucosidase activities were significantly higher at FO than at PD treatments. Results suggest that a faster bacterial turnover of polysaccharides at lowered ocean pH has the potential to affect the cycling of organic carbon in the future ocean.

General comments: The idea of such study is very interesting and especially the idea

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to determine ocean acidification on microbial organic matter degradation. This study represents one of the first's data focusing on moderate pH changes on heterotrophic marine bacterioplankton. I have appreciated both analyses of glucosidase activity and chemical analyses, even if it is difficult to really appreciate results of glucosidase activity without know how the final concentration and time-incubation have been chosen. Moreover, the experimental design remains unclear or not enough detailed. The choice of measured only glucosidase activity is maybe limiting face to your discussion a little bit speculative. Prokaryotic hetereotrophic production, respiration, prokaryotic structure measurements might be very useful.

Specific comments:

P11380 Lines 9-11. "Degradation of polysaccharides was followed under present-day pH and under seawater pH expected for the future ocean". I suggest adding some information about the pH expected for the future ocean.

P11381 – 11382. About experimental designs described in Material Methods: - For CultExp I and II: Are the cultures of Emiliania huxleyi made under axenic conditions? If yes, no problem. If not, how to identify the part of bacteria coming from the culture to the natural bacterial assemblage. - Always for CultExp I and II: You have used several concentrations of nitrate (50 vs 30 μM) and phosphate (3 vs 1 μM) and several illumination conditions (200 vs 300 μmol photons m-2 s-1): explain why we did that.

P11381 Lines 28-29. Please add the same units than line 16 (i-e μM).

P11383 Line 22. Authors have used 1 μM as a final concentration for ectoenzymatic measurements. Could you justify this choice? Is it the saturation concentration for your experiment? Have you tested it? If yes precise that. If not, it is difficult to compare your different results. Why authors have incubated 3-5 hours? Are the authors tested with time series experiment? In general for such ectoenzymatic analyses time series at different concentrations are performed in order to determine both incubation time and saturated concentration!

BGD

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P11384 line 2. Same remark than before.

P11385 line 28. Change "was calculated four the four. . ." by " was calculated for the four. . ."

P11386 lines 26-27. Authors referred to Grossart et al. (2006), another study studying the effect of ocean acidification on heterotrophic marine bacterioplankton. However, authors did not compare with this study. Why? Your paper will benefit to compare both results.

P11387 lines27-29 - P11388 lines 1-2. Authors claim that the most significant effects of acidification can be expected for the degradation of POM in the twilight zone. I think that this is very interesting but it is not well understandable as it is written. Please better explain that.

P11390 lines 2-4. "Also the accelerated degradation of dissolved polysaccharides can reduce the carbon removal from the surface ocean, since a considerable fraction of organic matter is exported in dissolved form during mixing events (Carlson et al., 1994)." This is in unclear. Please better explain.

Figure 1. CultExpII was not performed in replicate so there are no error bars but why there are not error bars for FieldAssayI performed in triplicate (p11382 line15).

Figure 2. No error bars are given for some glucosidase activity. Why? Any replicate?

Interactive comment on Biogeosciences Discuss., 6, 11377, 2009.