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

Anonymous Referee #1

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The present manuscript deals with the effect of ocean acidification on microbial polysaccharide degradation in the ocean. I very much like the idea of the study but I have some substantial critics regarding the experimental design and the interpretation of the obtained results. 1. From the experimental design it is not clear how many parallels have been used for CultExp I? It remains unclear whether the incubation bottles have been permanently mixed for sampling. If not, how do the authors account for the loss of polysaccharides (and POM) due to aggregation and subsequent sedimentation? 2. Field Assay II has been performed in duplicate incubations. I doubt that duplicates are sufficient for a reliable statistical analysis... 3. Dialysis of polysaccharides in dialysis chambers may lead to loss of polysaccharides due to bacterial degradation during dialysis. How did you test for such losses? 4. In situ incubation times for the MUF assays seem to be quite long (3-5 hrs) and in combination with rather high sub-

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strate concentrations 1 μM they may have led to de novo synthesis of glucosidases. Did you measure saturation curves a priori? 5. Why didn't the authors measure bacterial production directly to test whether the observed differences in glucosidase activity will affect bacterial production or even growth? 6. Higher enzyme activities were not induced by differences in bacterial cell abundances, in my opinion this could be an indication for aggregation which would result in higher cell-specific enzyme activities. 7. P11387, lines 4-5: Higher rates of extracellular glucosidases significantly accelerated the degradation of polysaccharides at lower seawater pH (Figs. 1-3). This statement is not really supported by the given data. Figure 1 shows results of different experiments using different experimental approaches, e.g. why did the authors use different methods to change pCO_2 ?, why are there no error bars for CulExpII and Field AssayI? POC loss has not been calculated for Field AssayI?, how did you determine the % loss of the three different parameters (that is not clear from the Mat&Met)? Chemostats are usually quite different from batch cultures... Acidification in Field Assay I may have led to precipitation of organic matter, could that explain the low POC value given in table 1? 8. Why did you not plot increase in glucosidase activities vs. loss in polysaccharides? I am still wondering whether loss of polysaccharides increases with aggregation (any indication?)... 9. P 11388, lines12-14: An increased C-supply may be insignificant when other nutrients such as N and P are limiting. At the end of a phytoplankton bloom C is usually not the limiting bacterial substrate! You should have measured bacterial production directly... It would have been also interesting to measure protease activities since they would increase not only C- but also N-supply... 10. I wonder whether the incubation may have resulted in changes in bacterial community structure. It has been previously shown that ocean acidification may change composition and also the transcriptome of bacterial communities. I miss a link to such literature. 11. The discussion remains rather speculative since the authors did not measure bacterial production, respiration and sedimentation (or at least do not give data). It would have been much better to directly measure these parameters! 12. All experiments have been short term experiments. Since bacteria can rapidly adapt to changes in environmental parame-

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ters one would need to run longer experiments... At least the point of physiological adaptation needs to be discussed.

Additional comments: figure 1 is rather confusing. figure 2: In my opinion the data should not be summarized. figure 4: Graphs are highly hypothetical since no respiration, BPP and export has been measured in the present study. The effects of increased glucosidase activity due to ocean acidification may be compensated by higher polysaccharide production and N and P limitation which would result in accumulation of POC and subsequent C-export...

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