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Interactive comment on “Response of bacterioplankton activity in an Arctic fjord system to elevated $p\text{CO}_2$: results from a mesocosm perturbation study” by J. Piontek et al.

Anonymous Referee #2

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Response of bacterioplankton activity in an Arctic fjord system to elevated $p\text{CO}_2$: results from a mesocosm perturbation study J. Piontek et al. MS No.: bg-2012-316

The effect of elevated seawater carbon dioxide (CO_2) and resulting ocean acidification on the activity of a natural bacterioplankton community was studied in mesocosms deployed in a Arctic fjord system. The study is part of larger project: the European Project on Ocean Acidification (EPOCA). A $p\text{CO}_2$ range of 175–1085 μatm resulting in a range of pH was applied and the bacterioplankton community response was studied in the mesocosms. In addition, they also determined direct responses of the bacterioplankton to pH changes. This paper focuses on bacterial growth and extracellular

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enzyme activity. Activities of extracellular enzymes in the mesocosms were directly related to both seawater pH and primary production and there was a close coupling of heterotrophic bacterial activity to phytoplankton productivity. Overall the study is timely and was done very well. The authors present an impressive data set. The manuscript is generally well written and I especially liked the discussion. I only have relatively limited comments and believe that the paper would be a fine manuscript for BGS after relatively minor changes.

When first looking at the figures in the paper, it was immediately clear that there were large differences between replicate treatments. They often seem to behave rather different in almost all parameters studied. The authors treat this variation well in the interpretation of the data, but the phenomena is not at all discussed, which seems a bit odd as it is so prominent. Is this common in mesocosm studies? The authors could try to discuss this in a couple of lines.

Primary production and bacterial numbers were also determined in this study. At least they are described in the methods section, but the actual data are not directly presented as in the figures. The bacteria numbers are for instance only used to calculate cell specific rates, but seem highly relevant for the paper. The comprehensiveness of the paper would be improved if they would be included, especially because both data are discussed in the text (eg. page 10478 line 22 and page 10481 line 23 for bacterial abundances (which are not seen in Fig 6, by the way?), and page 10491 line 15 for primary production). It is also rather confusing that it is mentioned that the primary production increased at higher CO₂ concentrations (without showing the data), but that the chlorophyll-a concentrations peak at intermediate CO₂ concentrations at the end of the experiment. I understand that these data are probably derived from other manuscripts in this special issue on the EPOCA experiment, but there are no references to these papers. So, either show these data in the figures or remove the method description and refer to the other papers where the data are presented.

The last two sentences of the abstract are very complex, vague and therefore difficult

to comprehend especially the last sentence. It is basically not clear what is stated here and the authors should rewrite these sentences completely making them much simpler and straight-forward.

The introduction is a bit long and may need some restructuring. The reader now has to wait until the third paragraph to learn about the effects of ocean acidification on bacterioplankton. As this is the primary focus of the paper, I would put the third paragraph first and reduce the general introduction to bacterioplankton (current paragraphs 1 and 2) to one paragraph.

References to figures are typically only given at the end of a paragraph where data are discussed. It would help if they would also be given in the beginning of a paragraph.

Other comments: Page 10470 line 3: 'are amplified in the Artic' Page 10470 line 25: 'largely determined by' due to two times affected Page 10471 line 12: this doesn't seem in agreement with the description in the introduction that states that it is mainly affected by Atlantic water. Please clarify. Page 10472 line 12: 'to determine enzyme kinetics' Page 10473 line 18: First describe how bacterial numbers were determine and than how cell specific rates were calculated. In addition, what is 'as precisely as possible' doing here (line 23), seems normal to measure something as good as possible. Page 10474 line 9: delete 'proton sensitive', is redundant. Page 10478 Line 24: I don't understand what 'or compensated' means here. Compensated for what? Page 10481 Line 5 and 8: BPP Page 10482 Line 21: 'To directly test the influence' Page 10484 Line 23: dimension? Probably 'magnitude' or similar or even better just delete. Page 10489 Line 17: It would be informative of the other effects were also described. Would put things into perspective.

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