

## ***Interactive comment on “Effect of CO<sub>2</sub> enrichment on bacterial production and respiration and on bacterial carbon metabolism in Arctic waters” by C. Motegi et al.***

**Anonymous Referee #2**

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General

This manuscript presents results from the large coastal mesocosm experiment in Svalbard 2010 in which pCO<sub>2</sub> and pH were manipulated and a phytoplankton bloom triggered by addition of nutrients in order to examine the impact of ocean acidification (OA) on planktonic communities. As part of a larger study, here the results concerning the bacteria and bacterial production are presented. There have been several studies in the past on this topic and it seems obvious that the effects of higher pCO<sub>2</sub> are mainly acting on primary production (generally a stimulation) and by this more indirectly on bacteria. Whether there are also direct effects is difficult to deduce from complex com-

C6946

munities in mesocosm experiments. The authors point out correctly in the introduction that there is already a large variability in documented effects of higher pCO<sub>2</sub> on natural bacterial communities. However, this is obviously related to the phytoplankton community and the planktonic trophic interactions which occur in those mesocosms, and which depend on various factors, particularly how the phytoplankton is affected by increased pCO<sub>2</sub>, control by grazers, nutrient limitation etc. Therefore it needs a detailed view on these factors if we really want to learn something new, that might also be generalised, how increased pCO<sub>2</sub> affects the bacterioplankton.

From the data presented in the ms it is not possible to deduce what was going on in the mesocosms. Even the relationship to the development in phytoplankton is not shown, nor the impact of grazers on bacterial development. Altogether the pattern in BP is astonishingly similar between all mesocosms (Fig. 1A), already indicating that the impact of pCO<sub>2</sub> cannot be significant (considering that also other factors such as phytoplankton biomass and bacterial grazing differ between the treatments). This might be already a major message of the paper! I do not think that it makes sense to interpret positive or negative correlations of BP with pCO<sub>2</sub> for selected time points if the main, directly driving factors are not shown. This gives the (probably wrong) impression that pCO<sub>2</sub> is directly acting on BP. In this study I miss mainly the following aspects:

- Clear hypothesis on the effects of increased pCO<sub>2</sub> on bacteria that are being tested in the experiment
- An illustration how bacterial development is related to the development in phytoplankton (biomass and primary production) and preferably also to bacterial loss processes (if available)
- A discussion which is focussed on the results shown and not referring to data not accessible to the reader of this article

In general, I think too few background data from the mesocosm experiment are shown to be able to interpret what is happening at the bacterial side. Probably the authors expect

C6947

that one has to consult the other publications resulting from this mesocosm experiment (on phytoplankton, viruses etc.). But this is not what I expect from a research paper, which has to be informative also by its own. I think it is not a problem to repeat some of the major data here, which are essential to understand the bacterial development (all factors contributing to bottom-up and top-down control), even if they are already published. I do not provide many detailed comments at this stage and wait until a revision is available in which the essential background data are shown.

#### Specific comments

Introduction p.15215, l. 1-2: I think there are 100s of studies that examined diverse environmental conditions on bacterial activities! Be more specific! Results Fig.1: give an explanation for the variability shown in the plots Fig. 4: axes and figure legends are hard to read

Discussion p.15221: I cannot follow these speculations on the role of viral lysis as no data are shown. Or do the authors expect that all other papers on the mesocosm experiments have to be consulted? Conclusion: From the data shown I cannot follow the authors conclusion that "changes in pCO<sub>2</sub> potentially influence bacterial production and growth balance. . ."

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