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Biogeosciences Discussions

Interactive comment on "Mesozooplankton community development at elevated CO_2 concentrations: results from a mesocosm experiment in an Arctic fjord" *by* B. Niehoff et al.

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General comments

This paper had evaluated the effect of high CO2 on the zooplanktonic community for 6 weeks in the mesocosm established in Arctic fjord. The main found of this study was that the zooplankton plankton community structure is not affected by CO2 while some correlation between CO2 was observed in some individuals such as the ratio of cirripedia nauplii/cyprisis and number of bivalve significantly decrease with CO2. Though I think that evaluation of CO2 on zooplankton is extremely important issue and mesocosmic studies could be a strong experimental approach, I have several criticism

for this paper and at least from the present data analysis, I am not convinced for the authors conclusion.

Specific comments

Introduction

P. 11481 Line 10 Describe in more detail, such as till when is expected that pH will decrease by 0.5 units according to which scenario etc. P11481 L14 References should be added P. 11481 L 17 References should be added L. 11481 L. 20 Please add some words such as larvae or meroplankton etc for Echinodermata and Bivalve L. 11482 Line 24 What is the hypothesis or question of this study? Why authors studied the impact of CO2 on zooplankton community and what they expected to find? I think the authors should take more time to explain the basis of the meaning for evaluating the effect of CO2 on zooplankton community, provide some hypothesis and explain the basis of these hypothesis.

Methods

p. 11483 line 17 Several citation is the methods not in the reference list and several "in preparation" papers (e.g. Bellerby et al. 2012; Czerny et al 2012a, b; Riebesell et al. 2012) are cited which I do not recommend as readers and reviewers are not able to read and judge the accuracy of the methodology. p. 11483 line 19 What is the definition of t=0? p.11484 line line 10 Please give a table showing the seawater chemistry of each mesocosm and also the changing CO2 by time during the 6 week experiment p.11484 line 10 I expect that the CO2 concentration highly differ between day and night as the CO2 seems to be highly influenced by the phytoplankton photosynthesis. When (what time of the day) seawater alkalinity and DIC was evaluated and what was the diurnal change? p. 11484 line 19 What is the reason that pteropod was added in the mesocosm? This seems to be possibly cause strong artifact as authors aim is to see the effect of CO2 on natural zooplankton community structure. p. 11485 line 12 Sampling were done at day or night? Though sampling in the mesocosm were

conducted by vertical tow, I might expect that zooplankton could swim deeper than 12m principally at day time

Results

p. 11486 Figure 1. Why results are only shown for 30 days and not 42 days? The duration of the experiment was not 6 weeks (=42 days)? Figure 2. Though I understand that authors make big effort to evaluate the fjord sample, why they did not show the data for the day -7∼ day-5 (the day which the mesocosm were closed) which seems to be most important data to interpret the initial zooplankton composition in the mesocosm. Also please add methods of how the fjord samples were taken: how (mesh size of the net, vertical tow or not? What depth etc..) and when (day or night?) the fjord samples were taken? p. 11487 line 18 If most zooplankton are lived and just trapped rather than sink after dead, this is not organic carbon export. For discussing about carbon export or flux, authors should also show the zooplankton biomass in carbon base and also show the carbon flux of zooplankton and phytoplankton on the sediment trap separately. p. 11488 Fig. 5 It is very hard to distinguish the labels. Additionally please add any statistical results. Authors concluded that "there is no change on zooplankton community structure" however this conclusion is just base on "trend" and there is no any statistical result that they can prove that the community have not really changed during the experiment. Though I completely understand that in mesocosm study is very hard to have replicates, and using natural community is very hard to find any significant change in the highly heterogeneous community, but even so, since authors aim is to evaluate the effect of CO2 on zooplankton community structure this is a very critical point of this study. p. 11489 line 1, Fig. 7 The data "over entire experimental period" included data from which day to which day? Data for -2 (day before add CO2) or/and data between day -1 to 4 (day that CO2 was adjusted) are excluded? I have not been convinced from regression analysis data of ration of nauplii : cypris averaged data over entire experimental period that the development of naupli to cypris stage was influenced by CO2. First authors should also show if there are same trend in the

water sample, they also should show that at day-2 (before injecting CO2) there is no such trend (there is no trend that M3,7>M2>M4>M8,M1>M6>M5>M9) and they also should not integrate data for whole experimental period as the development is time dependent. Additionally the data seems to be highly influenced by the data of one day (day 16) which seems to be very "special" or the same trend of naupli:cypris is shown in all other days? p. 11490 line 9 Figure 8 Similar to the comment for figure 7, authors should first show that at time -2 (before injecting CO2) there is no such trend (there is no trend that M3,7>M2>M4>M8,M1>M6>M5>M9), but the relation between bivalve abundance and CO2 start to be observed and become clear after day 4 or later.

Discussion

Since the discussion is mainly based on the cirripedia nauplii/cyprisis and number of bivalve conclusion is hard to evaluate before revision. Additionally, I would like to evaluate the discussion after the hypothesis of the authors become clear.

Interactive comment on Biogeosciences Discuss., 9, 11479, 2012.