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Interactive comment on “Effect of elevated CO₂ on organic matter pools and fluxes in a summer, post spring-bloom Baltic Sea plankton community” by A. J. Paul et al.

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Dear Editor, The MS entitled Effect of elevated CO₂ on organic matter pools and fluxes in a summer, post spring-bloom Baltic Sea plankton community by Paul et al. presents the evolution of organic matter and phytoplankton during a mesocosm experiment under different CO₂ treatments. The MS belongs to a Special Issue with promising very interesting results. However it is difficult to review a work that cites numerous MS with additional/complementary information that are in prep. (which have not even been submitted, and have not a title or authors list). Especially when the information in the non-available MS is used to support the main conclusions of the MS under review.

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Interactive Discussion

Discussion Paper

The MS is well written however there is missing information in Methods and in its present form the MS can not be properly evaluated. Major revision would be required prior to its acceptance.

Specific comments: 1- The MS states that no nutrients were added during the experiments. However in Fig. 4 several 15N_2 additions are shown. These additions are not mentioned elsewhere in the MS. This is a very important aspect that needs clarification. 2- In section 2.5.3. Methodology for POM sampling does not include pre-screening of water to remove zooplankton. How was this dealt with? 3- In general variables sampled and period of sampling is not clear. For example, $\text{PON}<10$ data are only shown from day 20 onwards and not in all MC, but nothing is mentioned in Methods. Also, zooplankton community was sampled and is not mentioned until half way into the Discussion. A clearer explanation of what was collected/analysed and when is needed, a summary table would be useful. 4- In section 3 and Figs. 6-7, M8 is selected as representative for all MC. Why? Please provide statistical data to support your choice. 5- Also in Results, there are several statements about similarities, increases and decreases but no statistical data are provided. Please specify if they are statistically significant or not. E.g. P6878, l.22; P6881, l.11; P6882, l.18. 6- P6881, l.5-10, given that a profound increase in zooplankton abundance occurred in Phase II (P6888) how do you explain the decrease/stable values in ammonium? 7- Section 3.6. l.28, 'in all MC up to 90% of POM was attributed to $\text{TPC}<10$ (data not shown)', looking at Fig.15 it seems that $\text{POM}<10$ was analysed not in all MC, and data of C:N in POM are shown only from day 20 onwards. Please clarify. 8- How do you explain that TPC total correlates with CO_2 but not $\text{TPC}<55$ or $\text{TPC}<10$ in Phase III? Also, given its importance why $\text{TPC}<10$ data are not shown? 9- Section 3.7. According to Fig. 16, cyanobacteria abundance was highest during both Phases II and III. Please rephrase. 10- Fig. 17. Given that your mass balance calculations give % of pigments $>100\%$ and $<0\%$ in some cases, how reliable are these calculations and their results? Also, why there is no $\text{Chl}>20$ data between days 35-40? 11- Discussion, it is very difficult to review this section. Not one but 7 papers in prep. are cited, that contain additional variables/information

C2468

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12, C2467–C2470, 2015

Interactive
Comment

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Interactive Discussion

Discussion Paper



that has not been mentioned before in the text. For example, in P6884 zooplankton is suggested to be partly responsible for an increase in POM during Phase I, however no sampling or assessment of zooplankton variables is mentioned in the text until P.6888 (4 pages later), when the authors cite a work in prep to state that zooplankton abundance increased in Phase II. The same occurs for the abundance of picoeukaryotes (P6883), bacterial activity (P6889), carbon fixation or respiration (P6890), etc. A full list of variables sampled during the experiment is needed in Methods, even if they are not presented in this MS, in particular those that are used to support the Discussion. 12- P6886, l.3-5, 'the correlation between temperature and organic matter pools will be discussed', however no statistical data are presented relating temperature with the mentioned variables in the following sections. Please add this information, e.g. P6888, l.27. 13- P6888, l.13, by 'non-chl containing organisms' do you mean non-autotrophic microplankton? Please specify. 14- Section 4.4., Zooplankton is suggested as grazer controlling the phytoplankton pool (P. 6890, l.16) and picophytoplankton 'must aggregate and be eaten by zooplankton in order to sink' (P6891, l.8-11), hence in a future scenario the authors hypothesize that organic matter is retained in the upper column and not exported downwards. My question is: how does microplankton grazers fit in your hypothesis? Have they been considered in the experiment or in Lischka et al. in prep.? 15- And diel migrant zooplankton? 16- Conclusions, first sentence states that 'fluctuations in temperature correlated well to Chl. ...' but no statistical data related to temperature are provided in Results or Discussion. 17- 'POM repackaging by zooplankton mediated sinking flux', see comment 14.

Technical corrections:

- P6868, l.26: According to Fig. 4, t5 should be t-5. - P6881, l.24. It is true that both POM and Chl were higher in Phase I than in II-III, but POM did not 'mirrored Chl' in Phase I. Please rephrase. - P6884, l. 25, to my knowledge, there is no need to state the year of a personal communication. - Fig. 9, M2 was discarded, remove its pH panel. - Fig. 10, panel a and b are equal. Move Baltic data to right Y axis in Fig.10a

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and delete panel b. - Fig. 14a and 15a are equal. I suggest removing panel 14a as in the text these data are more related to the other panels in Fig. 15 than to Fig.14. - Fig. 16, 'Baltic pigment concentrations are not shown because of different scale required'. Please use right Y axis to add those data. - Some MS in prep. are cited as (in prep) and others as (2015), please amend.

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12, C2467–C2470, 2015

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