

## ***Interactive comment on “Temporal biomass dynamics of an Arctic plankton bloom in response to increasing levels of atmospheric carbon dioxide” by K. G. Schulz et al.***

### **Anonymous Referee #1**

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Reviews on manuscript “Temporal biomass dynamics of an Arctic plankton bloom in response to increasing levels of atmospheric carbon dioxide” by Schulz et al.

General comments This manuscript mainly reports the biological dynamics in CO<sub>2</sub> enriched mesocosms, which is a highly recognized approach to elucidate ecological effects of ocean acidification. I think it deserves being published in BG after revision with due consideration for the following comments, especially about the energy inputs into the mesocosms.

1 what is the rationale for adding 100, 20 and 70 individuals of pteropods at day 4, 5 and 6?

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2. the estimation of seawater volume with salinity increases should be further explained using an equation (an example)

3 for nutrient addition, 50  $\mu$ m filtered seawater might have contained phytoplanktons of different amounts for each addition or mesocosm. How was this overcome to avoid the unexpected effects?

4. “POC filters were treated with fuming HCl in a desiccator for 2h before drying and analysis”, is this exposure to HCl fume long enough? 5. Phase II and Phase III apparently showed differential impacts of elevated CO<sub>2</sub> on biomass density in terms of chl.a. As discussed, the authors attributed this mainly to different responses of different groups, such as *Micromonas*-like phylotypes, to elevated CO<sub>2</sub>. Integrative or holistic analysis, including the chemical (nutrients and pH), physical (energy inputs to the systems) and biological (grazing). Given the fact most of the phytoplankton species investigated so far operate CCMs, focusing on *Micromonas* alone seems unfair. 6. Accumulated energy inputs (roughly estimated from the data in Fig. 4) into the mesocosms, over Phase II and III, seemed differ a lot (by up to 30%?? higher in Phase II), such a tremendous amount of energy input should have acted with CO<sub>2</sub> and nutrients that changed over time, leading to differential impacts on chl. contents per volume of seawater or POC contents. The total energy inputs of Phase II and III should be given and discussed. Interactions of light energy with CO<sub>2</sub> and nutrients might be the key reason responsible for the community structure change and primary production.

7. It is a nice approach to compare dynamics in the fjord and that of the mesocosms. I believe that temperature is identical inside and outside the mesocosms, but I feel hard to be persuaded in the direction that light or energy input is identical. In view of the low transparency of the material (polyethylene??) used for the mesocosms, daily or phase-integrated light energy inputs to the mesocosms must be much lower than that in the fjord. Since it is easily be estimated using the light attenuation factor and transparency of the bags, how vertical profiling of light or total energy input would differ inside from that outside the mesocosms should be provided. Technically, it is impossible to provide

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the same energy input out and inside of the mesocosms due to the milky color of the bags, but it is important not to ignore the influence of energy inputs.

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