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Biogeosciences Discussions

Interactive comment on "Effects of CO_2 on particle size distribution and phytoplankton abundance during a mesocosm bloom experiment (PeECE II)" *by* A. Engel et al.

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I understand better now the sampling procedure and experimental set-up. I agree that interpretation of the data is restricted to the upper water column and that changes in particle size distribution could be affected by differential settlement. However, I disagree with the assertion that as the set-up was the same for all mesocosms, changes in particle size distribution and phytoplankton abundance within the upper mixed water-column can be attributed to the CO2 treatment. It is true in a sense, but the question is not to know whether the observed changes can be attributed to the CO2 treatments or not, but rather to know if the observed changes reflect what is happening in the whole

water column as a result of the pCO2 manipulations. In other words, the fact that the experimental set-up was the same for all treatments does not imply that processes affecting the size distribution (e.g. coagulation efficiency, density of aggregates) were the same between treatments. Considering the differences in sedimentation processes between treatments as opposed to differential sedimentation. I am not sure that the dominance of small particles ($<$10 μm) is an argument supporting for the non-settling (or low settling) of these particles, since the observed particle size distribution is the result of various processes, including differential sedimentation, and thus, is not the initial condition. While the results clearly show a difference between, past treatment, on one side, and present and future treatments on the other side, in my opinion the fact that the particle size distribution is shaped by unknown processes that may greatly vary between treatments renders conclusions about the effect of CO2 on particle size distribution and phytoplankton abundance rather speculative if only based on differences between the standing stock of particles. Finally, the results presented in the paper published this month in Nature by Riebesell et al. (2007) show that export processes of POC are affected by variations of pCO2 within previous experiments using the same experimental set-up (PeECE III). This is somehow contradictory with the assumption that the size distributions are unaffected by difference in sedimentation processes from one mesocosm to the other. Actually, the four-fold increase in TEP concentration reported when pCO2 increased from present to future conditions during PeECE III (Riebesell et al. 2007) suggests that sedimentation processes between mesocosms may vary drastically, at least between these two treatments. Although sedimentation processes between present and future treatments may vary drastically due to the observed TEP increase during PeECE III, the results presented here for PeECE II show almost no difference of the particle size distribution between these two treatments. In my opinion, this suggests that the observed particle size distributions result from complex interactions leading to the export of particles out of the upper mixed layer; export that may not occur within the same proportion of each size class according to the treatment. Did the concentration of TEP vary according to the pCO2 treatment during PeECE II as it did

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during PeECE III?

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