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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.

Anonymous Referee #2

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The authors investigate the effects of the different CO2 conditions on phytoplankton cell size and abundance in a mesocosm study. Results indicate that CO2 conditions produce changes in surface:volume ratios, size distributions and mean cell volume.

The introductory paragraph on CO2 and CCMs was not as helpful as I would like in guiding the reader through the literature and expected results from this study. Specifically, the possible importance of HCO3- uptake was mentioned only briefly and the CO2 information was insufficiently tailored to this study.

The size distribution of particles counted with the Coulter counter may change during the experiments according to the treatment (Fig 3) but the analysis is not convincing. It

is not clear why more use is not made of the Flow cytometry data in determining size metrics since detritus will not affect these measurements.

It seems likely that 2 mL is not a large enough of a sample to detect the larger phytoplankton cells – limiting the comments you can make about phytoplankton size structure in response to CO2.

The shading on Fig 3 makes the lines difficult to see and seems to be quite unnecessary. It might be helpful to include the replicates as thin lines and the mean as a single thick line. If your goal is to compare the distributions of cell sizes rather than the absolute numbers, you might also want to normalize the area under each curve in this figure, at least within a panel.

Mean cell size and changes in mean cell size are reported (text and Fig 4), but Fig 3 makes it clear that the size distribution is not even unimodal, so the mean is a poor choice for statistic to describe the distribution. You need to explain why this is interesting. In Fig 4 it appears that only on day 7 is there a difference in median size among the treatments, although it is very difficult to be certain. (On page 4111, line 6 you report a difference on day 4, although this is hard to see on the figure. You also need to explain what the standard deviation (of what exactly?) has to do with the significance of a difference in medians. The median is not as easy to analyze as the mean; you might want to examine the mean of log diameter for this reason.) How is sd computed for the median in figure 4 (this is not the right statistic)?

Although there is a change in cell size over time within treatments, this change is very small (3.3 to 4.1 μm in diameter) and is likely a consequence of changes in community composition shown much more clearly in Fig 3 and Fig 6.

The data in this paper are potentially interesting but magnitude of the size effects appear to be so small as to not merit the analysis at the community or ecosystem level.

Minor comments

BGD

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The results for carbonate chemistry (methods section 2.2) were difficult to find. What was the temperature?

The text on some of the figures was too small. (Figures 1, 2, 3, 6.)

Why is Fig 2 a bar chart? A scatter plot would be much easier to read. Why do you juxtapose the Coulter counter and flow cytometry counts, when the range of cell sizes measured is non-overlapping and the results of Fig 3 make it likely that the trends will be different? I did not find this figure helpful.

Is the number concentration 5260 +- 9500 (p4110, line 6) reported with the correct error? What do these errors (here and elsewhere in the text) represent? A standard error of the mean or a 95% CI on the mean? All of the cell abundances (in the bloom?) reported on page 4110, lines 6-7 are smaller than the initial value in line 3, apparently indicating negative growth.

On Fig 5 you should indicate the treatment for each data point (as in Fig 4).

Define large and small in the caption to Fig 6 so that the reader can compare these bars to data in other figures.

Some sentences were hard to understand (e.g., p4109, line 27-28; p4113, lines 5-6).

Eq 2 is not well written; the pis cancel, the 6 should be in the numerator and the ii symbol on the sum is undefined. Why is this statistic a sensible thing to calculate? Won't it be strongly influenced by changes in size distribution (i.e. most strongly affected by changes in abundance of the largest cells)?

Confirm your Coulter Counter has a 120 micron orifice tube – is it not 100?

Typo in Chl-a section - dublicate

Interactive comment on Biogeosciences Discuss., 4, 4101, 2007.