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Biogeosciences Discussions

Interactive comment on "Effects of CO_2-induced changes in seawater carbonate chemistry speciation on *Coccolithus braarudii*: a conceptual model of coccolithophorid sensitivities" *by* S. A. Krug et al.

Anonymous Referee #2

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Methods Section

Why wasn't pressure filtration also used for TA measurements? Wouldn't one expect the loss of CO2 during vacuum filtration to effect the pH?

How long were the incubations?

Were POC and PIC and cell number measured at both the beginning and end of each experimental period?

Results Section

What exactly do the units pg C cell-1 d-1 mean in Figure 1a and 1b? Does this mean the change in C uptake divided by the change in cell number over the experimental period (days); i.e., Δcarbon/Δcells(Δdays); or does it mean the change in C uptake divided by the average of the total number of cells during the experimental period; i.e., Δcarbon/<total cells>(Δdays); or does it mean the total particulate C in the flask divided by the total number of cells in the flask at the end of the experimental period; i.e. Ctotal/(cells total)(Δdays)?

Results and Discussion

POC: Because of the way the data is presented, it is difficult to compare the rate of carbon uptake with the rate of cell multiplication. Is ΔCorganic/ΔCells fairly constant over the experimental TA range (after allowing for any change in cell size)? Corganic should equal the difference Cphotosynthesis – Crespiration? Under conditions of slowing or no growth, shouldn't Cphotosynthesis decrease faster than Crespiration? How do rates of respiration and photosynthesis compare in Coccolithus? Does slower carbon fixation under some experimental conditions really indicate a direct effect on the photosynthesis machinery (e. g., under saturation of the enzymes or receptors), or do the experimental conditions effect growth rate by another mechanism which in turn effects photosynthetic efficiency (by for example up or down regulating rubisco expression)? This is not an important distinction from the standpoint of the ability of the organism to draw down DIC, but it is relevant to conclusions in the paper which seem to indicate that the experimental conditions are directly effecting the photosynthetic apparatus.

PIC: How can one interpret the data on inorganic carbon uptake during the experimental period without knowing the change in PIC relative to the change in cell number; i.e., ΔPIC/Δcells? Does PIC/ cell change with experimental conditions – more than can be explained by any changes in cell size? Since the cells grow (divide) slower when the medium composition is displaced from the optimal composition, ΔPIC/cell/day should decrease, but PIC/cell (and ΔPIC/Δcells) may remain constant over the range of experimental conditions tested. In the limit of no cell growth there should be no ΔPIC/cell

since the coccospheres would be complete – unless the cells are producing multilayered coccospheres or shedding coccoliths into the medium. Do the authors have any information as to whether the cells continue to produce coccoliths once a single layered coccosphere is complete? Is there any microscopic data indicating incomplete coccospheres or undermineralized coccoliths in Coccolithus braarudii grown under suboptimal conditions of TA or DIC? As above these may not be an important considerations from the stand point of the organism's ability to precipitate CaCO3, but it is relevant to the conclusions in the paper which seem to indicate that the experimental conditions are directly effecting precipitation of CaCO3 in the coccolith-forming vesicle when in actuality the rate of formation of the coccolith-producing apparatus (vesicle, base-plate, transporters, and enzymes) is probably slowed.

Interactive comment on Biogeosciences Discuss., 7, 8763, 2010.