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Biogeosciences Discussions

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Interactive Comment

Interactive comment on "A mathematical modelling of bloom of the coccolithophore *Emiliania huxleyi* in a mesocosm experiment" *by* P. Joassin et al.

P. Joassin et al.

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Dear reviewer,

We do thank you for the time you spent to read our manuscript. Your comments will indubitably help us to improve our work. Here below, you will find our answer to your comments.

Reviewer:”I would like to comment on the cellular organic and inorganic contents in Emiliania huxleyi used in this modelling study”

We agree with your remark concerning the value we used for the organic carbon content of an Ehux cell, which is indeed three times higher than values reported in some

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Interactive Discussion

Discussion Paper

models involving coccolithophores. The value we used was not taken from literature but calculated from the experimental data, using indeed the daily measurements of Ehux cells enumeration and the concentration of POC. We should recall that the model has been developed to represent and study the impact of pCO2 on the Ehux primary production and calcification in the particular environment of a mesocosm experiment. In order to offer relevant conclusions on the interaction between pCO2 and calcification, the model had to take into account any aspects of the Ehux imputable to mesocosm conditions. This requirement motivates the addition of marginal processes like the representation of an enhanced mortality due to viral lysis or to derive certain Ehux biological parameters directly from the mesocosms experimental data sets, as it was done for the Ehux organic content. Actually, the procedure applied for that calculation was not the simple ratio between POC and Ehux cells enumeration. As you said, a direct ratio would be erroneous due to side-steps caused by the other sources of POC, mainly detritus and species other than Ehux (a slight bloom of Micromonas is indeed observed around day 5). The value we used for the organic carbon content of Ehux was obtained using the ratio of time-derivate POC and time-derivate Ehux enumeration, i.e. (d[POC]/dt)/(d[Ehux]/dt)

In this formulation, the ratio is not affected by the POC stock but by its evolution regarding the evolution of Ehux enumeration. Moreover, this ratio has been considered only between days 12 and 16. That time window is located after Micromonas bloom and before the strong production of TEP. Within that time window, the increase of POC concentration is largely dominated by the Ehux bloom. Results given for the ratio (d[POC]/dt)/(d[Ehux]/dt) are quasi similar for the three mesocosm (nr.4, 5, 6) of actual pCO2 conditions:

dPOC/dt 17.872 mmolC/(m^3.day)

dEhux/dt 660E7 cell/(m^3.day)

dPOC/dEhux 2.70E-09 mmolC/cell

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These results remain independent to the variability between these mesocosms affecting the intensity of the Micromonas bloom or the initial stock of detritus matter. The final value adopted is the mean between the three mesocosms and should reflect the biological reality of Ehux in the particular conditions of the considered mesocosm experiment.

The inorganic carbon content of an Ehux cell regarding its organic carbon content is based on the value 0.61 which comes from literature source (Paasche 2002). Following the same source, the maximal number of coccoliths per cell was fixed to 15. The value of the organic carbon content per one Ehux cell is however the calculated value of 2.72 10-9 mmolCorg/cell. This brings the high value of 1.1 10-10 mmolPIC per coccolith. We have clarified the choice of these ratios in the text of the manuscript.

Interactive comment on Biogeosciences Discuss., 5, 787, 2008.

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