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Controls on the calcium carbonate to carbon production ratio in *Emiliania huxleyi*: a comparison with modelling approaches

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Emiliania huxleyi has been widely studied as a model organism for the dependency of marine calcification and organic carbon production on environmental factors. Laboratory, mesocosm and field studies demonstrated carbon dioxide-related effects in *E. huxleyi* and other bloom-forming coccolithophore species. Also effects of light and temperature conditions and concentrations of nutrients and trace metals on biogenic calcification by coccolithophores have been observed. How different growth conditions taken together finally affect marine biogenic calcification and organic carbon production as well as the effect on the rain ratio is not known. Short-term and long-term effects on the strength of the calcium carbonate and organic carbon pump for example due to changing carbon dioxide concentrations, variation in light- and nutrient conditions related to changes in ocean stratification, and long-term variations in atmospheric zinc deposition may have to be taken into consideration.

Here we review the most important trends in calcification rates and in the calcite to organic carbon production ratio in *E. huxleyi* that have been found so far, and compare them with existing approaches used in ocean biogeochemistry models. Modelling approaches can be classified in terms of trends they can represent. Only the modelling approach of Tyrell and Taylor (A modelling study of *Emiliania huxleyi* in the NE Atlantic. Journal of Marine Systems, 9 (1995): 83-112) allows to regulate calcification and organic carbonate production by *E. huxleyi* separately. We propose an extension of this model to account for environmental effects in addition to light and macro-nutrient availability.