

***Interactive comment on “Coccolithophore  
response to climate and surface hydrography in  
Santa Barbara Basin, California, AD 1917–2004”  
by M. Grelaud et al.***

**M. Grelaud et al.**

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We thank Paul Halloran for his constructive criticism that helped to improve the manuscript substantially.

1- I found this a very stimulating and interesting manuscript, and beyond being encouraged by the apparent agreement with the sedimentary results published by Iglesias-Rodriguez and Halloran et al. (2008), feel that this is an ideal way to investigate the consequences of anthropogenic (and otherwise) change on marine ecosystems and carbon cycling. I would like to make a couple of minor points regarding the description of the carbonate system, and suggest the possible addition of confidence intervals upon the linear regressions presented in figure 5. Although I don't imagine

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that this statistical analysis would change the story, I feel it would be of interest for the reader.

Answer: intervals of confidence at 95%, for the linear regressions, have been reported on figure 5A and 5B.

2- Regarding the discussion of the calcification response to, and influence on, the carbonate system I would like to highlight the sentence starting on line 25 of page 4143, which in my reading implies that there is DIC production as a result of pH reduction in the culture medium. I understand and agree with the point that the authors are making, that manipulating cultures by adding CO<sub>2</sub> increases [DIC], but to avoid confusion would suggest a slight change in the wording to make clear that, in contrast to manipulation by CO<sub>2</sub> addition, by adding acid there is no change in total [DIC], only a change in the speciation of the individual components making up that total DIC concentration.

Answer: the sentence has been reworded as follow in the revised manuscript: "A controlled decrease in pH by adding acid changed the balance of individual dissolved inorganic carbon (DIC) chemical species but did not change the total DIC concentration. In contrast, the lowering of pH by CO<sub>2</sub> injection (Riebesell et al., 2000; Zondervan et al., 2001) enhances the production of bicarbonate HCO<sub>3</sub><sup>-</sup>, which is the chemical DIC species used for calcification in coccolithophores (Buitenhuis et al., 1999; Anning et al., 1996)"

3- Additionally, regarding lines 16 to 19 on page 4144, I think it would be valuable to point out that rather than removing CO<sub>2</sub> from the surface ocean, additional calcification (without a concomitant increase in organic carbon production) would actually increase the surface water CO<sub>2</sub> concentration, if caused by ocean acidification, acting as a positive feedback on CO<sub>2</sub>. My reading of the manuscript gave the opposite impression.

Answer: these two last sentences appear to be ambiguous, we prefer then to remove it and argue that the increase of coccolithophores calcite mass is linked to modern oceanic changes in SBB surface waters.

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## References:

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Riebesell, U., Zondervan, I., Rost, B., Tortell, P. D., Zeebe, R. E., and Morel, F. M. M.: Reduced calcification of marine plankton in response to increased atmospheric CO<sub>2</sub>, *Nature*, 407, 364-367, 2000.

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