

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

**Anonymous Referee #3**

Received and published: 21 January 2009

This study presents an impressive high-resolution record of 6 coccolithophore species counts along a core from the Santa Barbara Basin that covers almost the entire 20<sup>th</sup> century. Changes in relative abundances of these species are proposed as proxies of ENSO and PDO oscillations. This paper also speculates that the long-term trend of the weight and size of three coccolithophore species could reflect changes in calcification either as a result of SST or CO<sub>2</sub> increase. This is an interesting paper but some part of the discussion need to be better argued. In its present form, the manuscript needs major revisions prior decision for its publication to Biogeosciences.

Page 3: paragraph 3: “This study uses relative abundances of sedimentary coccoliths

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to constrain.... “reconstruct” would be more appropriated.

Page 3

## 2.1 age model

line 5: should use “higher” rather than “superior”.

How was the core sampled every millimeter? Could the author provide a description of the sampling technic used.

When working at this sample step resolution, the question that immediately arises is “what can be the effect of post-deposition processes like bioturbation?”.

The water depth of the core site is missing.

Page 4

*G. oceanica* was selected for matching the two cores records to derive core B age model. Why this species? Do the authors get the same fit when using the other species?

Line 4: what is meant by “satisfactory” correlation. The author must provide determination coefficients for the 1934-2004 and 1914-1934 time-series.

Line 8: should refer to figure 2C instead of 2B.

Line 9: in the sediment trap study of De Bernardi et al. 2005, high abundances of *G. oceanica* were found for El Niño event one single event: the 1997/1998 El Niño event. This should be precisely stated in the manuscript.

Further adjustment of *F. profunda* to instrumental summer SSTs should also be plotted as a separated figure to show the final correlation.

How does the depth/age graph look like after these two fits?

Figure 3 is called after figure 4, in the text.

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Page 6: second paragraph should rather start by “Counts of *E. huxleyi*...”

Page 7: did Beaufort (2005) evaluate the effect of dissolution on the weight? If so, the authors should briefly describe its effect in the morphometry section.

Page 8 Point Arguello should be indicated in figure 1

Line 6 to 13: CC is maximum between spring and fall resulting in cold and moderately high nutrient waters favorable to *G. mullerae*. Next sentence states: we observed high abundances in *G. mullerae* from November to April, i.e. fall to spring.

There seems to be a contradiction here...

I assume that “CC is maximum from fall to spring” is the correct statement....

Last sentence of this paragraph: “we observe highest abundances of *G. ericsonii* during summer when upwelling is active and the SST stays relatively warm”!

Upwellings bring cold waters to the surface, this sentence does not make sense to me. The authors should rephrase it and provide T numbers rather than refer to cold and warm T?

Line 22: typo error.

This section should discuss how ENSO is impacting on the hydrology (SSTs) at a seasonal time scale, and subsequently on the species distribution.

Section 4.3.

The paper discusses long-term trends i.e. SST increase with size and weight for three species. However, figure 5 also shows higher frequency variability that is not discussed in the manuscript.

What would be the effect of high OC fluxes on the dissolution of calcite in the sediment? Other parameters could influence the size/weight of the cell like Fe inputs (as observed for diatoms) which are higher during ENSO years, or the carbonate ion concentration

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(different in upwelled waters than non-upwelled surface waters). This section deserves a better assessment of the environmental variables that can potentially influence the morphometry of the cells.

Figure 1: I suggest to split it into 2 figures showing SSTs for ENSO and non-ENSO years to see how the surface hydrology is affected.

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