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Biogeosciences Discussions

Interactive comment on "Alkenone-based temperature patterns along the eastern South Pacific Coastal Ocean: the effect of upwelling and advection on the sedimentary alkenone unsaturation-index ($\frac{K'}{37}$)" *by* J. A. Placencia et al.

Anonymous Referee #1

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This paper presents sediment- derived alkenone- based SST's from the Peru Chile coast. This is an area of complex seasonal changes in both coastal currents, and large variations in nutrients both temporally and aerially as a result of upwelling dynamics. The authors strive to test the influence of nutrients as a non-thermal factor on alkenone unsaturation, and so, a quantifiable influence on the temperature response of Uk-37 under varying nutrient regimes. Parameterizing non-thermal effects on uk-37, as the paper strives to do, is of great interest to the community. Unfortunately, the documentation of the results and the treatment of the data in the discussion over reaches what

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can be derived from this data set. In addition, the paper suffers other flaws in regards to inadequate figures, and the lack of incorporation of important concepts from prior work on growth constraints on alkenone producers. For example: An informed treatment of seasonality and depth of growth from water column work and sediment traps would have greatly informed the analysis and interpretation of the data. The figures are inadequate, a map of the complex study location with the currents and topography (which from such an extensive part of the discussion) AND the documentation of where the samples actually come from in this complex region should, at a minimum be included. The manuscript requires significant and major revision before should be accepted for publication.

I include my major suggestions for revision below:

As written, the initial treatment of the data is a presentation of the correlation coefficients of linear regressions against winter, summer and mean annual SST. This is presented without any attending data (or figures) that place the data in context. The goodness of fit of the UK-37 derived SSTs to any of these is an exercise in mathematics, and is not wholly relevant without an understanding of when and where the plankton grew. There is ample evidence that incorporating the seasonality of ACTUAL growth in any interpretation of goodness of fit is more important than using simple statistical fit in interpreting accuracy of alkenone SST [Prahl et al., 1993; Prahl et al., 2010; Sikes et al., 1997]. Export production is well documented to be at a minimum in the winter. Also essential in analyzing any sediment data set in a complex regions is an understanding of possible inter-annual differences in the production [Müller and Fischer, 2001]. This is an important factor when the sedimentation rates is not known in the cores from which the analyses are based. The essential point here is that there is a disconnect from the relationships the authors are trying to draw from their sedimentary data which has an unknown time range with surface water conditions – temperature, nutrients, thermocline depth that will change with season and interannually. If the top centimeter represents 100 years – how relevant are the UK37 values to the data they

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are trying to make correlations with? These can have changed hugely over such time frames. This is an essential issue that the authors must address to establish the validity of the correlations and conclusions they have in the paper.

The essential assumption made on page 552 is that maSST and nutrients are the same interannually – the data set they are using is from one year. This is could be a very biased time sliced. How representative is 96-97 of the multi-year picture?

In the treatment of the correlations there is insufficient (vitually no) treatment of the possibility that a substantial portion of the production of the alkenones may be occurring deep in the mixed layer (or at the thermocline) [Prahl et al., 2001; Prahl et al., 1993; Sikes et al., 2005] and or seasonality of growth [Popp et al., 2006; Thomsen et al., 1998]

The authors give little acknowledgement, nor sufficiently draw on a vast body of alkenone literature from surface waters and sediment traps that would greatly inform this paper. Relevant papers that have been published on the subject should be included. In addition to the papers already cited the following are also relevant here: [Herbert et al., 1998; Sicre et al., 2002; Ternois et al., 1996; Ternois et al., 1997] .

Figures and tables.

Need here are a map figure showing the placement of samples relative to the filaments in coastal jets and upwelling referred to in the discussion.

A table of the actual core depths and locations would be helpful.

References that will be useful in the rewrite and resubmission : References

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Interactive comment on Biogeosciences Discuss., 7, 545, 2010.