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Interactive comment on “Rapid reorganization in ocean biogeochemistry off Peru towards the end of the Little Ice Age” by D. Gutiérrez et al.

Anonymous Referee #1

Received and published: 4 November 2008

This study used paleoceanographic proxy from two laminated sedimentary records (12°S and 14°S) to show a rapid reorganization in ocean biogeochemistry off the Peru margin after the Little Ice Age (LIA). The authors presented evidence that this reorganization was associated to a rapid expansion of nutrient-rich and oxygen depleted subsurface waters that enhanced the total productivity. They claimed that the shift was likely driven by a northward migration of the Intertropical Convergence Zone (ITZC) and the South Pacific High (SPH) to their present-day locations, coupled with a strengthening of Walker Circulation, towards the end of the LIA.

The paleo evidence is quite interesting with clear changes in both records along the Peruvian continental shelf. However, they present a lot of data but not all of them are well discussed and relevant to the main story. The manuscript has some problems in

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the structure and organization that should be resolved before publishing.

1) The title is focused in a reorganization of the coastal ocean after the LIA. Therefore, the paper needs to spend more time in the introduction (i.e. time frame, why it is important, causes, triggers) and discussion about the LIA. The authors should explain clearly why the ITCZ was located to the south of its present-day position. And also state how this might have affected coastal ocean biogeochemistry and oceanographic conditions as far south as 14°S before the return to their "recent" condition.

2) The text is well written but I had some problems to follow the story. The authors focused on the paleoceanographic aspects and the possible climate scenarios in the Eastern South Pacific, giving emphasis to the LIA and the regime shifts afterwards. In paleostudies, general practice is to talk from the past to present, and not the other way around, and that seemed not well conceived in the paper.

For example, considering both points mentioned above, is evident that all the proxies are showing a change after 1820 at both sites. However, a clear final summary statement about the LIA has missing after the description of all the proxies. In fact, they do that in the last 2 paragraphs of the Section 3.2. without a summary about the LIA. Moreover, they interpreted the data "during and after the 1820 shift" and then very vaguely described a gradual change during the fourteenth to fifteenth century. They were clearly going from the present to the past. The same applied to Section 3.3.. In the first paragraph the authors tried to explain what occurred during the LIA, in the second they hypothesized what happened after and then in the third they returned to explain a climate scenario during the LIA.

The authors could improve the structure and organization of the paper by defining clearly from the beginning all the parts (transitions and/or changes) of the record that they intended to discuss, and being straight to the point. The first time that they mentioned and discussed "the transition in 1820 until 1850" was by the end of the Section 3.3. (i.e. not in the results).

BGD

5, S2186–S2188, 2008

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3) A major part of the Concluding remarks section appeared more like a discussion section. The first conclusion is based fully in the d15N record and its link with Dansgaard-Oeschger events. What happened with the rest of the record?. In the beginning of the second paragraph they discussed a final statement based on warming and cooling. Reconstructed sea surface temperatures were not shown by the records. The conclusions should be based on their main results. It is difficult to relate the abstract to the concluding remarks.

SPECIFIC COMMENTS

- a) The proxies that the authors grouped as recording oxygenation, sediment redox conditions and productivity should include more references from paleostudies. For example, d15N has been used in paleostudies as an indicator of loss of nitrogen and nutrient utilization.
- b) If the present nucleus of the Peruvian anchovy is 6 to 12°S. Why they were present during the whole record and even showed likely higher abundance after the 1850 in Pisco (14°S) than in Callao (12°S) (Fig 6 c, h, l).
- c) The authors show in Figure 5 winds and precipitation. Why not show atmospheric pressure to see the variability of the South Pacific High (SPH) strength?. The SPH is the main forcing of winds and rain along the eastern south Pacific and point of discussion of the paper.

Interactive comment on Biogeosciences Discuss., 5, 3919, 2008.

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