

Brest, 1st of July 2016

Dear editor and reviewers,

We have corrected the manuscript taking into account the reviewer's suggestions and we have included all modifications in the revised manuscript. Below you will find our detailed responses to each of the reviewer's comments.

We therefore hope to have satisfied the reviewers. For the reader convenience, all our responses are in red in the following text, and all the corrections made to the manuscript are also highlighted in red in the revised version.

Furthermore, the quality of the English has been improved throughout the manuscript.

Sincerely yours,

William Hardy and co-authors

Responses to Reviewer 1

The axes of both Ti/Ca diagrams are drafted in pale grey, which is barely visible on the electronic version, much less on the printed copy. They should be changed to black.

We checked it and all lines of diagrams are drawn in black. We use Adobe Illustrator and it does not find any lines in pale grey. This is probably a visual default resulting from the exportation.

It is a very colorful figure but some colors are inadequate: pale blue, pinkish, yellow and lime green over a white background are not legible. Please use more contrasted colors.

We fixed it.

*The taxon cyst of *Polykrikos schwartzii* is considered here as “hypersaline”, despite the fact that Marret and Zonneveld (2003, p. 91) illustrate it as ranging between salinities of ~33 and ~36.5, with maximum abundances around 34.5-35. I do not consider this as “hypersaline”. Also, the time period when *P. schwartzii* is abundant corresponds with the consistent presence of freshwater algae (figure 6), although in low concentrations. Could the authors elaborate on that?*

This was indeed a mistake that we fixed.

Same comment as for figure 4 regarding the choice of colours.

Also fixed.

Responses to Reviewer 2

“Age model: I think it is critical that the authors perform a rigorous error analysis of their age model. I recommend age model uncertainty analysis for every data point using their tie-points and Bayesian statistical error analysis using softwares like “Bacon” (Blaauw and Christen, 2011) or “BChron” (Parnell et al., 2008)”

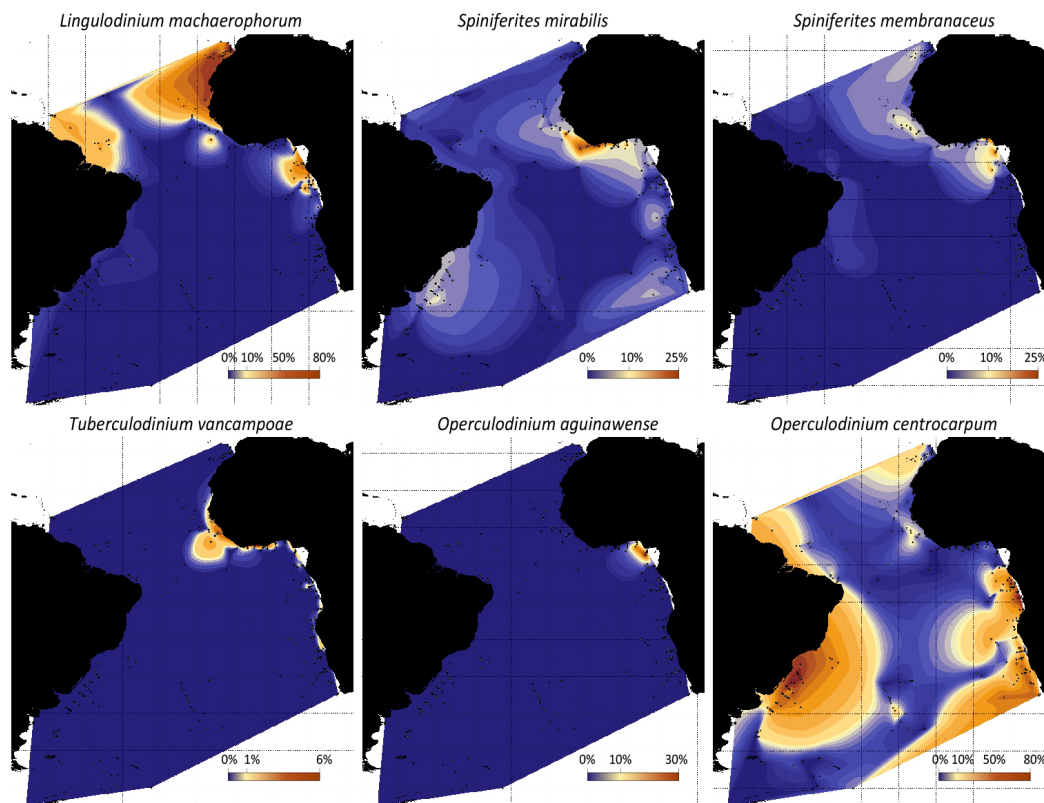
We have plotted the 2σ range error in grayscale envelop around mean calibrated ages. The grey band plotted on the Age - Depth figure (first version) only corresponds to the ^{14}C error.

“When discussing the onset or termination of an event, the median age of onset/termination of event and the uncertainty of the median age point should be provided.”

We have included in the text the 2σ range for climate events, corresponding to the maximal range we calculate from our chronology, itself mainly based on radiocarbon dates and especially for the onset of the Last Deglaciation and the Holocene.

“The authors describe changes in assemblages or species that would suggest an un “atypical” climate changes that includes warm and wet conditions during the LGM and coldest reconstructed temperature of the record during the late Holocene. In indeed, these inferences are in contradiction with several (mostly geochemical) observations. I suggest therefore, a critical discussion about the robustness and weakness of the interpretation of the assemblage changes”

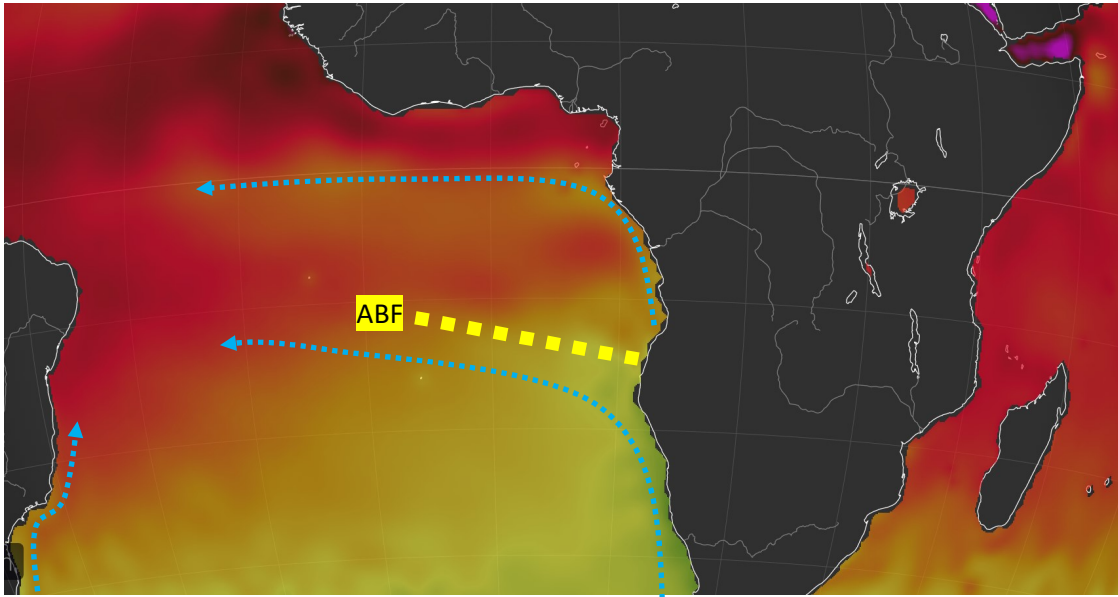
Paleoecological interpretations in our study area are largely based on the modern dinocyst atlas (Zonneveld et al., 2013). In the revised manuscript, the ecology of main species discussed for the LGM atypical signature is highlighted thanks to maps highlighting the present-day distribution of taxa percentages in modern sediments: new Figure 6 inserted in the manuscript. Also, in order to be clearer, we have added a more critical discussion regarding dinocyst species and in particular for the thermophile ones that indeed lacked some present-day ecological information.



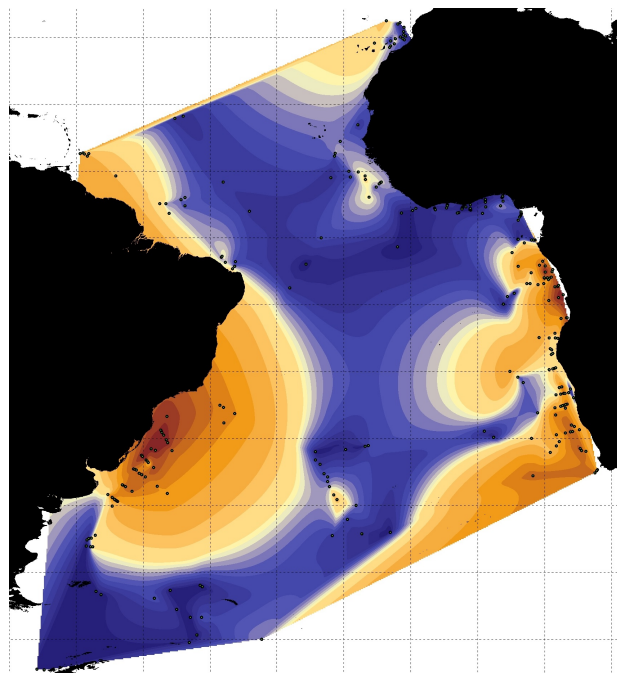
New Figure 6: Present-day distribution of selected dinocyst taxa among major ones discussed in the paper. Percentages from 277 sites are extracted from the modern dinocyst atlas (Marret et al., 2008; Zonneveld et al., 2013).

"The authors need also to provide a more nuanced discussion about the mechanisms that control that the Benguela advection over their core location. In Figure 7, it is suggested that the Benguela advection was severely weakened during 4-5 ka and 7-15 ka BP. How does these interpretations compare with paleclimate records from more southern locations relative to that of the cores described in this study."

In order to discuss the link between *Operculodinium centrocarpum* abundances and the influence of the Benguela Current over our study area, as mentioned in Zonneveld et al. (2013), a map of the actual geographical distribution of this species has been produced (cf. new Figure 6). Today, this species lives in the Benguela upwelling system and along the Angolan and Congolese margin until the equator (new Figure 6). The presence of *O. centrocarpum* north of the Angola-Benguela Front has been interpreted in the manuscript as the northward advection of cold waters during the austral winter, migrating westward around 1°S. This is illustrated below with satellite SST data of austral winter (green: 16°C, brown : above 27 °C) and the present-day abundances of *O. centrocarpum* percentages.



Map of mean July SST in South Atlantic Ocean. Blue arrows display the major northward cold currents and yellow dashed line represents the Angola-Benguela Front.



cf. new Figure 6: Present-day distribution of selected dinocyst taxa among major ones discussed in the paper. Percentages from 277 sites are extracted from the modern dinocyst atlas (Marret et al., 2008; Zonneveld et al., 2013).

Present-day occurrences of this dinocyst species appear to be consistent with the winter pattern of the Eastern South Subtropical Gyre (Benguela Current, South Atlantic Current and southern South Equatorial Current), but also with the Brazilian margin through the Falkland Current. This species then appears to be greatly correlated with northward cold currents.

We did not find any publications relative to the paleo-intensity of the Benguela Current. Modern surveys exist but are rather based on ENSO or Aguilhas Current monitoring. However, planktonic sediment traps allow discussing the actual relationship between dinocyst assemblages and current sea-surface conditions (Holzwarth et al., 2000; Zonneveld et al., 2001), showing that *O. centrocarpum* is the dominant species under the Benguela Current influence.

Paleo reconstructions mainly concern latitudinal shifts of the Angola-Benguela Front (Jansen et al., 1996; Uliana et al., 2002). We thus have added the Jansen et al. (1996) reconstructions in new Figure 8.

Concerning dinocyst-based studies in southern locations, there is GeoB 1016 core published by Dupont and Behling (2006), but the resolution is low regarding our chronological interval. There is finally the GeoB1023 core (Shi et al., 1998), a high resolution study carried out in the Benguela Upwelling System. Shi et al. (1998) did not discuss the Benguela Current activity (neither *O. centrocarpum* abundances). We can however extract *O. centrocarpum* abundances from this study and add this data in new Figure 8 to make regional comparisons.

"A significant part of the Congo Basin is located north of the equator and, therefore, it is a part of the West African monsoon system. I highly encourage the authors to graphically compare their time-series of thermophile and low salinity assemblage/species with the highly resolved runoff and SST records from the Gulf of Guinea (Weldeab et al, 2007a-b, Weldeab et al., 2012a, Weldeab et al., 2012b). It is important that C2 BGD Interactive comment Printer-friendly version Discussion paper the authors' micro-paleontological approach is compared with and tested against the geochemical proxy records from the same region (see above reference)"

We totally agree and we have added the Ba/Ca signal in Figure 6.

There are several references cited in the main text but no listed in the reference list. It mismatch can avoided by using one of the several citation software and a careful checking.

We fixed it.

Wordings: there are several wordings (admitted, thanks to, climateuring, mitigation, tierce) that the authors need to replace with more appropriated words/phrases. Please change: "Weldeab et al" instead "Syee Weldeab et al.. "biogenic opal" instead "Biogenic Silica (BiSiO2)"

We fixed it.

REFERENCES OF PAPERS CITED IN THIS LETTER

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