

## ***Interactive comment on “Dinocyst assemblage constraints oceanographic and atmospheric processes in the Eastern Equatorial Atlantic over the last 44 ka” by William Hardy et al.***

### **Anonymous Referee #2**

Received and published: 13 June 2016

In this study, Hardy and colleagues present a 44 ka time-series of Dinocyst assemblage carried out in a sediment core from the Congolese margin. The Dinocyst assemblage are used to explore changes in temperature and nutrient availability due to changes in up-welling and riverine runoff. The major objective of this study is to elucidate hydroclimate over the Congo Basin and oceanic conditions in the eastern equatorial Atlantic. I am not an expert of Dinocysts, but I am familiar with the paleoclimate records from and paleoclimate debate about this region. I think that this study is carefully written and contribute to the emerging discussion regarding the hydroclimate response of the Congo Basin. Below I am listing some major points that the author need to carefully address before their manuscript can be considered for publication in

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Biogeoscience.

## MAJOR POINTS:

I) 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 “B-Chron” (Parnell et al., 2008). A graph should be presented showing the age model (sediment depth versus age) and the uncertainty of the age model. 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.

II) 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. Especially the interpretation of the thermophile and low-salinity assemblages need a critical revisit.

III) 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 paleoclimate records from more southern locations relative to that of the cores described in this study.

IV) 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

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the authors' micro-paleontological approach is compared with and tested against the geochemical proxy records from the same region (see above reference)

V) 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.

VI) 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 (BiSiO<sub>2</sub>)"

Cited reference:

Blaauw, M., Christen, J.A., 2011. Flexible paleoclimate age-depth models using an autoregressive gamma process. *Bayesian Analysis* 6, 457-474

Parnell, A. C. et al. (2008). A flexible approach to assessing synchronicity of past events using Bayesian reconstructions of sedimentation history. *Quaternary Science Reviews*, 27(19-20), 1872–1885.

Weldeab, S. (2012), Timing and magnitude of equatorial Atlantic surface warming during the last glacial bipolar oscillation, *Climate of the Past* 8, 1705-1716.

Weldeab, S. (2012), Bipolar modulation of millennial-scale West African monsoon variability during the last glacial (75,000–25,000 years ago), *Quaternary Science Reviews*, 40(0), 21-29.

Weldeab, S., D. W. Lea, R. R. Schneider, and N. Andersen (2007), 155,000 years of West African monsoon and ocean thermal evolution, *Science*, 316(5829), 1303-1307.

Weldeab, S., D. W. Lea, R. R. Schneider, and N. Andersen (2007), Centennial scale climate instabilities in a wet early Holocene West African monsoon, *Geophysical Research Letters*, 34(24), L24702.

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