# Barium peaks at glacial terminations in sediments of the equatorial Atlantic Ocean – relics of deglacial productivity pulses?

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Distinct solid phase peaks of barium were revealed at glacial terminations in sediment cores recovered from the oligotrophic settings in the western and eastern equatorial Atlantic Ocean, Ceará and Sierra Leone Rises, respectively. These Ba spikes are unrelated to any other potential productivity proxy – as e.g. organic carbon, calcium carbonate or opal. Moreover they coincide with minima in organic carbon contents (Fig. 1). Similar discrepancies between Ba and other palaeo-productivity indicators at glacial-interglacial transitions have also been documented by other authors in deposits of the northwest African margin, the Zaire (Congo) Fan, the Angola Margin and the Ontong Java Plateau in the Pacific Ocean.

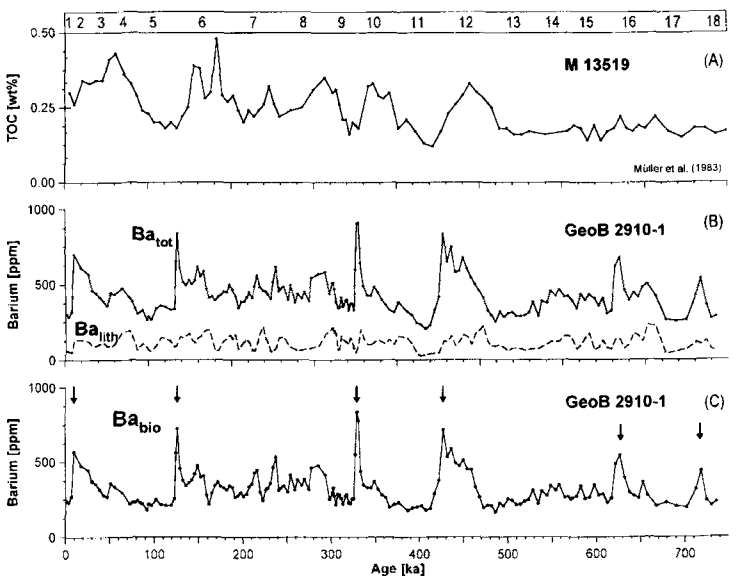


FIG. 1. Concentrations of total ($Ba_{tot}$), lithogenic ($Ba_{lith}$) and biogenic barium ($Ba_{bio}$) for gravity core GeoB 2910 recovered from the Sierra Leone Rise. The biogenic barium fraction was estimated from the solid phase Al-content assuming a mean detrital Ba/Al ratio of 0.0045 for the terrigenous component. For comparison, the organic carbon concentrations of the adjacent core M 13519 from the Sierra Leone Rise published by Müller *et al.* (1983) are illustrated here as well. Note that the distinct maxima in biogenic barium at glacial/interglacial transitions coincide with minima in organic carbon contents.

The arrangement of the solid phase peaks of Ba, Mn and Fe along glacial termination I (oxygen isotope boundary 6/5) is very similar to the distribution of these elements in oxidized sapropel sections in the eastern Mediterranean as described by Van Os *et al.* (1991). Furthermore, finely distributed framboidal pyrite was detected in gravity cores taken from adjacent sampling sites in the equatorial Atlantic Ocean which is evidence that sulphate reduction must have occurred in these cores, at least in microenvironments. From these findings we assume that the sediment intervals deposited during the transition from glacial to interglacial times must have experienced a similar early diagenetic overprinting as the cyclic sapropel/pelagic sediment units in the eastern Mediterranean.

For the formation of the distinct Ba maxima at glacial terminations we suggest that there must have been a productivity pulse during the glacial-interglacial transition which led to local sulphate reduction within this organic carbon-enriched sediment layer. Subsequently, the likely initiation of a downward progressing oxidation front – with oxygen diffusing down into the previously oxygen-depleted sediment intervals – caused the oxidation of degradable organic matter present as well as of pyrite and/or iron monosulphides which formed due to sulphate reduction. The increase in porewater sulphate concentrations resulting from the oxidation of the iron sulphides caused local supersaturation and precipitation of barite. This more or less simultaneous oxidation of labile organic carbon as well as of iron sulphides within the examined sediment intervals explains the observed inverse correlation between Ba and organic carbon. We conclude that the Ba spikes do not exactly define the productivity pulses but should rather be taken as an integrated signal of past productivity over a broader sediment interval because some degree of diagenetic relocation of Ba due to nonsteady-state diagenetic processes is likely to have occurred.

## References

Müller, P.J., Erlenkeuser, H. and von Grafenstein, R. (1983) In: J. Thiede and E. Suess (Eds.), *Coastal Upwelling, Part B*, 365–98, Plenum Press, New York.