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Evidence for long term cooling and short punctuated climate events at the Aptian-Albian boundary in the sub-tropical Atlantic (Mazagan Plateau, DSDP Dite 545)

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The mid Cretaceous 'greenhouse' reflects a period of global warmth during the Mesozoic, associated with increased sea surface temperatures and the onset of Ocean Anoxic Events. However, recent biostratigraphic and sedimentological studies imply that significant interludes of global cooling may have occurred during the Late Aptian-Early Albian (∼112.5Ma). Evidence of cooling from ice rafted debris and the formation of glendonites in high latitude sites accompanies distinct stable isotope and calcareous nannofossil data from both high and low latitude environments, leading to the proposal of a Late Aptian 'cold snap' by Mutterlose et al., (2009)[a]. Yet there is little quantitative sea surface temperature data to confirm and constrain this 'cold snap' event, which is currently defined by variations in calcareous nannofossil abundances in high and low latitude sites during the Aptian-Albian transition.

Here we present the first high resolution geochemical ($\delta^{13}C_{carb}$ and sea surface temperature measurements based on TEX_{86}) and calcareous nannofossil record to define the long term cooling of the north Atlantic (< 5 ˚C) prior to, and throughout, the Upper Aptian 'cold snap'. The Mazagan Plateau cooling record is characterised by a long term positive isotope excursion (1‰ to 2.5‰; 1.5 Ma) alongside decreasing sea surface temperatures from ∼32.5˚C to ∼27.5˚C. This trend is accompanied by a dramatic decrease in the abundances of both *Nannoconus* spp. and planktic foraminifera in cooling surface waters; and a significant parallel increase in cold water *Repagulum parvidentatum*. Superimposed on this long term cooling record are several short term carbon isotope and sea surface temperature excursions culminating in a proposed hyperthermal event prior to OAE 1b. These events represent short (50-150 ka) periods of successive warming or cooling in the north Atlantic, indicating climate variability prior to the Aptian-Albian boundary 'cold snap'.

We propose that these events, which also mark a clear turning point in Mesozoic marine diversity towards abundant modern diatoms and coccolithophores, may have been triggered by the early opening of the Equatorial Atlantic and Pacific gateways. This major event would allow the exchange of cold intermediate- and surface waters from higher latitudes with the low latitude N. Atlantic at the Mazagan Plateau Site, with major consequences for surface water circulation, stratification and productivity, as observed in this study.

[a] Mutterlose, J., *et al.*, (2008). N. Jahrb. Geol.Palaontol Abh, 252, 217-255.