# Deciphering the phase shift of tropical $\delta^{18}O_{foram}$ and $Mg/Ca_{foram}$ signals: A salinity effect?

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Previous studies of coupled $\delta^{18}O_{foram}$ and Mg/Ca across glacial terminations have shown that the planktonic Mg/Ca signal leads the $\delta^{18}O_{foram}$ signal by several thousand years [1,2]. This implies that the tropical ocean warmed before the melting of Northern Hemisphere ice sheets during glacial terminations. Latter observation challenges the role of the North Atlantic as the pacemaker of glacial/interglacial transitions emphasising the tropical ocean as an important area triggering global climate change.

In order to test this hypothesis we apply a multi-proxy approach of coupled $\delta^{18}O$, Mg/Ca and $\delta^{44/40}Ca$ measurement on *G. sacculifer* in order to decouple the influence of sea surface temperatures (SST) and sea surface salinity (SSS). The sediment core (SO164-03-4) selected for this study is located in the Central Caribbean Sea providing sufficient foraminferal species for a variety of measurements of different proxies. Our results show that there is a phaseshift in the timing of the glacial/interglacial temperature transition between Mg/Ca and $\delta^{18}O$ signals, showing that the former leads the $\delta^{18}O$ signal by about 3-4 kyears. However, latter observation is not in support of an earlier warming of the tropical ocean. Rather, the phaseshift correspond to a local Caribbean SSS increase which most likely reflects temporal variations of the ITCZ causing relative changes of the precipitation/evaporation ratio at the site of sediment core SO164-03-4.

[1] Lea *et al*. (2000) *Science* **289**, 1719-1724. [2] Nürnberg *et al*. (2000) *Paleoceanography* **15** (1), 124-134

# Validation of line scan methods for quantitative analysis of banded iron formations by LA-ICP-MS

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Laser ablation inductively coupled mass spectrometry (LA-ICP-MS) is a generally accepted technique for high precision analyses of trace elements in solid matrices. With the high lateral resolution possible with this technique, LA-ICP-MS data can be used to construct trace element maps with minimal destruction of the sample. While multiple ablation points are typically used for this purpose, the positioning of the locations is very time consuming. Accuracy and precision of analytical results using multiple ablation locations are also affected by changes in ablation yield and elemental fractionation associated with increasing pit depth. Our previous work evaluated the use of multiple line scans to construct elemental maps of various geological samples, including a banded iron formation (BIF) that formed 3.4 Ga before present. Because all analyses can be conducted locally on the sample surface with micro scale resolution we were able to “visualize” trace element variations between the dominant silica and iron phases. The data provide unique insight into the partitioning of trace elements on a micron scale. Small-scale chemostratigraphic patterns within the elemental maps reveal interactions between the silica and iron phases which tracks shifts in silica and iron saturation of the water column from which the minerals precipitated. We are currently mapping additional samples from the same location and other locations to assess the consistency in trace element fractionation during BIF formation between the alternate silica and iron-rich layers.