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THE LAST 4.5KY ON THE SOUTHWEST EQUATORIAL ATLANTIC

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1. INTRODUCTION

The analysis of foraminifera and geochemistry for the paleoceanographic and paleoclimatic history of carbonate-dominated sedimentation of the continental slope of N-NE Brazil reveals climate tendencies for the Mid-Late Holocene. Arz et al. (1999) define the region as sensitive to the historical record of thermohaline circulation, and define Holocene sedimentation rates of 24.4 to 5.5 cm / kyr near the study area. Climate change from the Mid-Holocene is represented by changes in the ocean heat transport that took place during the Little Ice Age at high northern latitudes, with possible additional implications for climates of the Southern Hemisphere (Wanner et al., 2008). Short term temperature records from the southern tropics and subtropics are very sparse, with the highest interests on Last Glacial Maximum heat transfer to Northern Hemisphere and on the Mid-Holocene Optimum (9-6 kyr BP) (Joussaume et al. 1999; Otto-Bliesner, 1999, Liu et al., 2003). This work aims to identify foraminiferal and geochemical signatures of sedimentary process and climatic events over the Northern Brazilian slope for the last 4.5kyr.

2. STUDY AREA

Over the continent the climate was dry around 4.5kyr, with rainfall increasing towards the present (eg, Behling, 1995; Behling and Pillar, 2007). Precipitation increment has been interpreted as reflecting an intensification of the northward moving winter westerlies (Markgraf et al., 1992). Currently the climate is classified as tropical semi-arid = 500-800mm.a-1 (Koppen BS) on the coast of Ceara with control of the ITCZ on rainfall. The position of the ITCZ in turn is controlled by the intensity of ENSO-SOI.
The hydrography is dominated by the Northward oceanic flow of the North Brazil Current (NBC). However, the NBC does not have the same behavior throughout the year. From

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February to May it flows continuously along the northern coast of Brazil toward the Gulf of Mexico, while for the rest of the year, NBC turns toward the east, where it joins the Northern Ecuador Counter-Current (NECC). The main deep currents in the region are the South Atlantic Central Water (SACW), below which is the Antarctic Intermediate Water (AIW) which moves from south toward the equator, and below this is the North Atlantic Deep Water (NADW) that flows from north toward the Equator.

2.1 Materials and Methods

The Multi core GS07-150 17/2 MCA was collected during UoB Cruise GS07-150 on the R/V G.O. SARS retrieved from a water depth of 1000m from the slope off northeastern Brazilian margin at the coordinates 04°12.986S/ 37°04.518W.
The core recovered 21cm of yellow-brown clay-carbonate sediment, which was sampled at the ship and sliced on high resolution (0.5cm). It presented middle-light grey clay at the bottom, while the top (~10 cm) is composed of foraminiferal ooze (brown carbonate sediment). The sediment of the core bottom (~ 5-6 cm) presented a foraminiferal rich clay facies. From 21-13 cm there were plenty of millimeter size fragments of vascular debris and at 13 cm a large piece of wood was found.
At the laboratory 1cm³ of sediment was washed through 150 µm mesh sieve for planktonic foraminiferal analysis. After dry each sample was split to facilitate the picking of 300 individual identified on species level.
The chronostratigraphy of the core was based on four (AMS) 14C radiocarbon dates performed at the NSF Arizona AMS Laboratory, on carbonate foraminiferal test samples (>250µm). The 14C datings were calibrated in years before present (BP) using Calib 6.0 software with the curve 09 standard and corrected for a marine reservoir effect of 400 yr and a $\Delta R = 8 \pm 17$ 14C years on the confidence interval of 2σ (Angulo et al. (2005). (Fig. 1).

3. RESULTS AND DISCUSSION

Variation of paleotemperature was observed through Paleoanalog and at the core bottom a high sea level based on the absolute abundance of planktonic foraminifera fauna (Fig. 2). The foraminiferal assemblages appear correlative with rapid Holocene climate changes that are of worldwide significance (Leorri et al., 2006). Rapid cooling of surface water at the core bottom ranging between 0.5 and 2°C was observed. This signature is consistent with the climate model experiment (Jaeschke et al., 2007) done for analysis of Heinrich events, in which the reduction of the Atlantic meridional overturning circulation (AMOC) related to North Atlantic cooling was observed and considered capable of causing intensification of the NE trade winds and southward movement of the Intertropical Convergence Zone. This can result in enhanced precipitation off Northeastern Brazil, as a possible explanation for 15N and 13C present at the base of the core associated with wood fragments.
The results show that local variations and low latitude anomalies of SST with small cooling

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(<0.5^{o}C) can reproduce enhanced precipitation pattern as occurred in the LIA under the primary influence of ITCZ (Saenger, al et, 2009), as suggested by foraminifera and sediment geochemistry proxies.

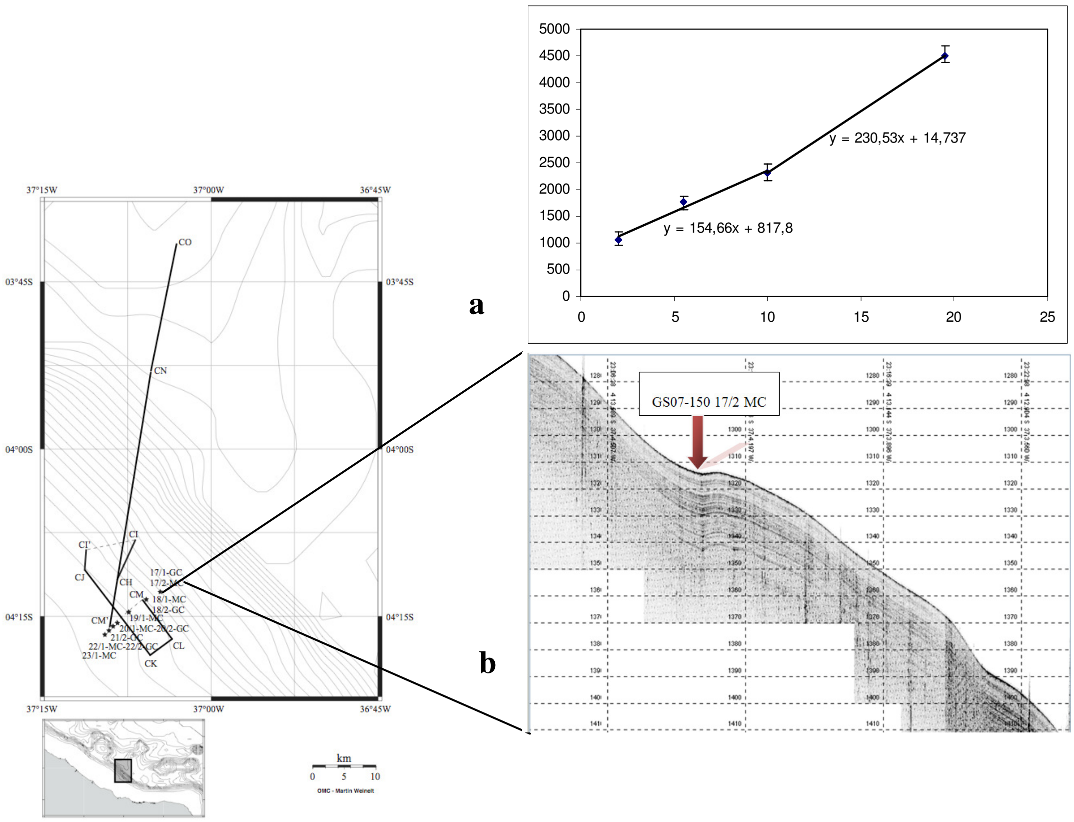

Figure 1- Location map of sampling site of the multicore GS07-150 17/2 MCA.
a: age model, b: TOPAS shallow seismic reflection definition of the Holocene talus slope between the seabed and pre-Holocene reflector with the position of MC sampling site shown.

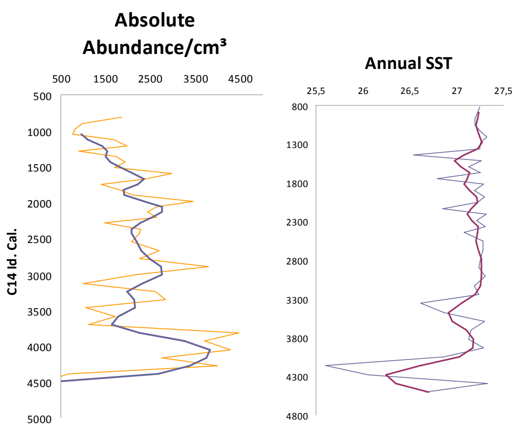

Figure 2- A: Absolute abundance of foraminifera in cm^{3} of sample; B: Paleoanalog SST estimation.

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