Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12379, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12379
EGU General Assembly 2008

Response of tropical Atlantic surface and intermediate waters to changes in the Atlantic meridional overturning circulation - RETRO

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RETRO is a project within the framework of the European Science Foundation (ESF) initiated program EUROMARC, which aims to reconstruct changes within the thermocline in the tropics during periods of reduced meridional overturning circulation. More specifically, our/the objectives are:

- To reconstruct tropical ocean responses during millennial scale changes associated with Dansgaard/Oeschger (D/O) events between 60,000 to 30,000 years Before Present (B.P.).

- To investigate large changes in tropical ocean parameters during the transition for the last glacial maximum (19-21 kyrs B.P.) to the present interglacial (11,500 yrs B.P.).

- To detect the amplitude of the typical tropical ocean variability for the recent interglacial period (Holocene) between 11,500 years B.P. and present.

Because of its relevance for the global climate, the Atlantic Meridional Overturning Circulation (AMOC) has been a major research focus for many years. It is now clear that the ocean's mode of ventilation is not unique but can, and has, switched rapidly between dramatically different states with severe and far-reaching climate repercussions. Recent studies indicate that changes in the MOC are associated with ocean-wide

reorganization in heat transport and temperature distribution. Thermocline processes exert primary control over the cycling and vertical distribution of heat in the ocean [Slowey & Curry, 1995], and may act as an amplifier for changes in the earth's climate system [Gordon et al., 1992; Wolff et al., 1999]. Moreover, Arz et al. (1999) showed that changes in the tropical ocean circulation may have seriously affected the distribution of heat, salt and moisture into high latitudinal areas.

In order to interpret past changes of the AMOC we will reconstruct palaeoproperty gradients over depth transects perpendicular to the main ocean currents on the western and eastern sides of the tropical Atlantic Ocean. We will document millennial scale variability in the sea surface, intermediate and deep water masses from about 60,000 years B.P. to present. Resolving tropical thermocline dynamics and intermediate and deep-water variations will help elucidate the specific mechanisms linking the low latitude ocean to high latitude climate changes. Finally, these observations will provide the basis for assessing the importance of ocean-atmosphere dynamics in the tropical Atlantic region and how it impacts on global rapid climate changes.