



Centennial scale surface hydrology off Portugal during Marine Isotope Stage 3.

Insights from planktonic foraminiferal fauna variability.

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The MIS3 interval at ODP Site 1060 (Gulf Stream) shows both sharp onset and end of interstadials (GIS), the existence of very short-lived warm event during stadials (GS) and points to differences in detail between the sea surface temperature record from the western North Atlantic and the atmospheric temperature record inferred from 18-O in Greenland ice. Investigating MIS3 and obtaining comparable data from other location appears crucial. Since the Eastern Atlantic has provided well-documented records we have selected a core from off Portugal,

We examine D/O at centennial scale resolution (139 years on average between two data points). We have obtained a faunal data set for core MD01-2444, 37°N, 10°W, 2600 meters water depth. We use a group of species (*G. bulloides* + *G. glutinata*) as proxy of upwelling intensity through trade winds intensity changes. We tentatively relate the variation of this group to a North Atlantic Oscillation like phenomenon (NAO) off Portugal. We observe that it resembles the rainfall index in the Caribbean as recorded at site ODP 1002 (Cariaco basin) which traces the ITCZ location through changes of terrigenous inputs (Peterson et al., 2000). The driest intervals (ITZC to the south) at Site 1002 correspond to increase upwelling intervals in MD01-2444 as well as the driest periods identified during GS on similar cores in the area.

Because an ITZC to the south is consistent to an ENSO+ situation, our study suggests

a positive correlation between ENSO-like situation and NAO-like situation at a millennial time scale. During GIS intervals when increased wetness over Cariaco is recorded (ITCZ to the north) and the upwelling in MD01-2444 is decreased we see from both SSTs and faunal tropical indicators that MD01-2444 site is warm, and through each so-called Bond cycle, In addition GIS are equally warm. This contrasts with the GRIP record where GIS peaks are successively cooler through each Bond Cycle. This record confirms link between the tropical climate linked to the ITCZ position and the climate of southern Europe at millennial time scale, in spite of showing a very good correlation with polar latitudes (GRIP) through 18-O on *G. bulloides*. Since, the warmest SSTs and the 18-O on *G. bulloides* are so remarkably different our work points to changes in seasonality as a strong control over the climatic pattern of the North Atlantic area and the marked influence of winter condition.