

IMAGES SciCOM REPORT 2003

The IGM-DGM contribution for the period August 2002 to November 2003

THE PORTUGUESE STATUS

The Portuguese participation in IMAGES has been funded exclusively by the Instituto Geológico e Mineiro (IGM) through the program "Programa Nacional de Investigação Geológica dos Oceanos e da Faixa Costeira (PRONIGO)".

PORTUGUESE ACTIVITIES

1. Work Performed on IMAGES related Cores:

IMAGES I - Portuguese Margin

High-resolution studies of the paleoceanographic and paleoclimatic changes over several glacial-interglacial cycles are still ongoing by Lucia de Abreu for core MD95-2040 and core MD01-2443 (POP project; MD123 cruise) with special emphasis on the stages older than MIS 5 (e.g. de Abreu et al. 2003). In cores MD95-2040 and MD95-2041 – in combination with cores MD99-2336 and -2339 – , multi-species planktonic isotope data is used by Antje Voelker to reconstruct changes in the upper water column structure along the Portuguese margin during MIS 2 and 4.

IMAGES II - SW Africa

Productivity variations within the Benguela Upwelling System are reconstructed as part of the Ph.D. thesis by Sandra Vaqueiro. The studied core sites include MD96-2086 from the Luederitz cell for which diatom accumulation rates were calculated for the last 300 kyr. Higher resolution studies for the time slices of terminations 1 and 2 as well as the base of MIS 6 also include organic carbon as productivity tracer.

IMAGES V – leg 5 Portuguese Margin

Within the project "MOWFADRI" (Abrantes, Lebreiro, Voelker, Veiga-Pires) cores MD99-2336 and -2339 are used to reconstruct hydrographic changes in the Gulf of Cadiz with a special emphasis on the Mediterranean outflow (MOW). MOW variability is derived from grain size analyses of both total and decarbonated samples - for the sortable silt method - and from benthic stable isotope data. Changes in the Atlantic inflow and the North Atlantic central water are monitored by multi-species planktonic stable isotope data, sea surface temperatures (SST) based on the planktonic foraminifera assemblage, lithic fragment counts, and sediment geochemical tracers. On the basis of the good results for MIS 3 in core MD99-2339 (Voelker et al. in prep.), the resolution for Sedigraph and LECO data will be increased to decadal-to-centennial scale in MIS 1 and 2. Planktonic and benthic isotope, grain size and LECO data are available for this core at 1-10 cm sample resolution during MIS 3 and 10-20 cm resolution during MIS 1-2. ^{14}C ages constrain this core's age model. Samples of

core MD99-2336 have been processed for total grain size measurements, coarse fraction and LECO analyses. ^{14}C ages and stable isotopes measurements in two planktonic species for the time slices MIS1-2 and MIS 4 will be available in the next months. The excess data have been obtained by Cristina Veiga-Pires for in MIS 1-2 of both cores.

Climate records of core MD99-2339, reveal clear Dansgaard-Oeschger cycles in MIS 3 with SST increases in phase with warmings above Greenland. MOW intensity, as evidenced by coarser grain sizes, increased during DO-stadials and other colder periods like the Younger Dryas. The data from core MD99-2336 will indicate the changes in the upper MOW branch and will allow the reconstruction of MOW variability back into MIS 5.3.

Heinrich event productivity changes

High-resolution studies in the time slices of Heinrich events 1 and 4 are underway in several cores in the North Atlantic, including IMAGES cores MD95-2008, MD95-2014, MD95-2027, MD95-2034, and MD95-2037, in order to investigate the impact of iceberg discharges on the hydrology and the related biochemical response of the ocean dynamic (PhD thesis of Silvia Nave). Diatom abundance, LECO and IRD counts are already available for the time slices and biomarker concentrations will be measured in the upcoming months. Diatom abundance, organic carbon content, and total alkenone concentration will be used as productivity indicators.

2. Cruise participations

- **PICABIA cruise on RV Marion Dufresne (leg 1; July 2003)**

Recovery of four cores at 3 sites (MD03-2698 to –2700G) on the western Portuguese margin funded by an Access to Research Infrastructure (ARI) grant to Fatima Abrantes; participation of 6 scientists related to the ARI proposal and the SEDPORT project

- **FORAMPROX cruise on RV Atalante (August 2003)**

Isabelle Gil Martin participated as Portuguese observer and obtained sediments from several multicore sites on the Iberian margin.

- **PO304 – SEDPORT on RV Poseidon (October 2003)**

First cruise of the ESF Euromargins project "SEDPORT" (Schneider, Kroon, , Abrantes) during which two sediment trap moorings were deployed on the western Portuguese margin. During the second leg, in which Lucia de Abreu and Teresa Rodrigues participated, 4 sediment cores were retrieved in the Tagus pro-delta and on the southern edge of the Estremadura spur. ROV underwater camera pictures and shallow water seismics will give insight into the sediment dynamics on the shelf regions north and south of Lisbon.

- **CANYONS 2003 (legs 2 and 3; October – November 2003) on RV Pelagica**

Isabelle Gil Martin participated as Portuguese observer on leg 2 and obtained subsamples from several sites in the regions of the Lisbon-Setubal and Nazare canyons; Tiago Alves sailed on leg 3 during which TOBI data was obtained in the canyons' regions.

3. Conference presentations

Results obtained on the studied IMAGES cores have been presented at numerous international and national meetings, including the AGU 2002 Fall meeting (Voelker et al.), the EGS-EUG-AGU meeting (de Abreu et al., Lebreiro et al., Nave et al., Vaqueiro et al.), the 6th National Geology Congress (Vaqueiro et al.), INQUA (Shackleton et al.; Vautravers et al.), the Chapman conference on "The role of diatom production..." (Vaqueiro et al.), and the Euresco Conference on Polar Regions Climate (deAbreu et al., Nave et al.; Voelker et al.).

4. Publications

de Abreu, L., Shackleton, N. J., Schoenfeld, J., Hall, M. and Chapman, M. (2003).

Millennial-scale oceanic climate variability off the Western Iberian margin during the last two glacial periods. *Marine Geology*, 196(1-2), 1-20.

Schönfeld, J., Zahn, R. and de Abreu, L. (2003). Surface and deep water response to rapid climate changes at the Western Iberian margin. *Global and Planetary Change*, DOI 10.1016/S0921-8181(02)000197-2.

Voelker, A. H. L. (2003). Cruise report for the Portuguese sites during the MD134 – PICABIA cruise on board "Marion Dufresne" 15th July – 25th July, 2003. DGM Relatorio Técnico INGMARDEP 18/2003-05/08/2003

Manuscripts on the MOW variability in core MD99-2339 by Voelker et al. and on the productivity changes in the Luederitz cell by Vaqueiro et al. are in advanced stages of preparation.

5. Other activities

Antje Voelker is involved in the preparation of a new glossy for the IMAGES project and compiled several figures with IMAGES related results which shall be made available as transparencies through the IMAGES server.

Lisboa, December 3rd, 2003

Antje Voelker