

IMAGES SciCOM REPORT

Iceland Meeting (14 -15 September - 2002)

The I G M - D G M contribution:

Report relative to the period: August 2001 to August 2002

1. 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)”. Aiming to convert the IGM-Institution sole Portuguese participation into a broad national interest, a proposal prepared by a group of Portuguese researchers was presented to the Institute for International Scientific and Technological Cooperation (ICCTI) in October 12, 2001.

Given that, no answer has yet been received from that Institution, the 2002 contribution was once again guaranteed by the IGM-DGM.

2. Portuguese Activities

2.1. Work Performed on IMAGES Cores:

IMAGES I - Portuguese Margin

With the objective of reconstructing, at high resolution, the history of the ocean/climate interactions over the last glacial/interglacial cycles off Portugal, with particular emphasis to the rapid and high amplitude changes, the four cores recovered from the Iberian margin in 1995 during the IMAGES MD101 cruise (MD95-2039, MD95-2040, MD95-2041 and MD95-2042) have been re-sampled and are being studied by Lúcia Abreu.

Emphasis has been put on the reconstruction of the sea-surface palaeoenvironment from the study of the planktonic foraminiferal fauna,

mineralogical and geochemical proxies (oxygen isotope ratio performed on both planktonic and benthic foraminifera, Ba/Al, AMS dating), and the identification of regional effects on the palaeoceanographic and palaeoclimatic changes.

Holocene, Last glacial and Stage 3 millennial-scale variability, Stage 6 and Stage 11 are the specific time intervals considered in this study. For Stage 11, core MD01-2443 (37°52.89'N, 10°10.57'W) collected under the POP project (MD123 Geosciences cruise) is also being studied and will be compared to the partial record of MD95-2040.

The MD cores recovered from the Portuguese margin during the IMAGES I cruise in 1995, (MD95-2039, -2040, -2041, -2041) have also been investigated for diatoms. Preliminary data, partially published (Thompson et al, 1999), point towards important increases in diatom flux at Terminations IV, II and I mainly in the offshore cores (2039 and 2042), as a consequence, these terminations are now being studied at higher resolution as part of Sandra Vaqueiro's Ph.D. work plan.

IMAGES II - SW Africa

To investigate productivity variations within the Benguela Upwelling System over the last two climatic cycles constitute part of the Ph.D. work plan of Sandra Vaqueiro. One of the sites in study is MD96-2086 (25° 48' S, 12° 7' E) from the Luderitz transect. Diatom quantification for this core is complete, with higher resolution for the time intervals 202-168 ky, 137-120 ky and 23-7 ky and diatom identification and assemblages determinations are now in progress.

IMAGES V – Portuguese Margin

Within the project "MOWFADRI" two MD cores from the Gulf of Cadiz, MD 99-2336 and –2339, are studied with the objective to reconstruct changes in the Mediterranean outflow (MOW) with grain size analyses of both total and decarbonated samples, especially for the sortable silt method, and with benthic

stable isotope data. Along with the deep water changes, variations in the surficial Atlantic inflow are monitored by planktonic stable isotopes, sea surface temperatures (SST) based on the planktonic foraminifera assemblage, lithic fragment counts, and sediment geochemical tracers. LECO measurements and both kinds of grain size analyses are finished for the first 190 samples of core MD99-2339. For most samples, benthic isotope data is also available. Planktonic isotope samples, assemblage counts and ^{14}C dates for chronostratigraphy are under way. Samples of core MD99-2336 are currently processed for grain size measurements and coarse fraction analyses. A first set of sample from the Holocene and from high-resolution sections of MIS 2 and MIS 4 has been measured in the LECO.

At site MD99-2339 increased grain sizes, indicating contourites, occur during cold intervals of the Younger Dryas, last glacial maximum and most Dansgaard-Oeschger stadials. They are accompanied by a lower C/N ratio, lower Corg content and lower SST's. Benthic ^{13}C levels similar to those at site MD95-2043 during MIS 3 reveal a constant water mass exchange across the Strait of Gibraltar.

Core MD99 2333 as well as two cores recovered during the Discovery 249 cruise on the Tagus prodelta deposition center off Lisbon (Western Iberia) are being studied as part of the European project HOLSMEER. Physical properties, XRF and magnetic properties from core logging, grain size, $\delta^{18}\text{O}$, TOC, CaCO_3 , total alkenones, n-alkanes, alkenone SST, diatoms, benthic and planktonic foraminiferal assemblage compositions and fluxes are the proxies being utilized.

North Atlantic Surface Circulation

With the objective of investigating the relationship between Rapid Climatic Changes and Oceanic Productivity, mainly opal productivity, several IMAGES cores (MD95-2008; MD95-2014; MD95-2027; MD95-2034; MD95- 2037) spread throughout the North Atlantic are being studied as part of the Ph.D. work

plan of Silvia Nave. In order to understand the impacts of the iceberg discharges on the hydrology and the related biochemical response of the ocean dynamics, this study will comprise a time-slice analysis (using several proxies) of two HE (HE1 and HE4). Moreover, a detailed high-resolution study of the last 60 kyr in three cores located within a North-South profile will be performed for siliceous microfossils (mainly diatoms), and biomarker records in order to try to estimate whether the increase of silica is related to the erosion of the icebergs or to the southern invasion of polar waters.

2.2. Other Activities

Participation of Ph.D. students on the 2002 IMAGES cruise

Two Ph.D. students, Isabelle Gil and Victor Magalhães working at IGM-DGM have participated on two legs of the 2002 IMAGES cruise. Both students have been supported by IMAGES funds.

PROPOSAL MD 2003 / European Infrastructure

Following the information that the use of the Marion Dufresne Giant Coring as a European infrastructure for 26 days (about 30-50 coring sites) within 2002-2003 has been approved by the EU, we have presented a proposal in conjunction with the following institutions/ researchers:

Cambridge University – Nicholas Shackleton, Harry Elderfield

University of Barcelona / Institute of Chemical and Environmental Research (CSIC)
- Joan Grimalt

University of Salamanca – José-Abel Flores, Francisco J. Sierro, M. Barcena

Free Amsterdam University – Dick Kroon

Marum / University of Bremen – Ralph Schneider, Gerold Wefer

IPIMAR (Lisboa) – Teresa Drago

University of Lisbon – Francisco Fatela

The main objective of this proposal are paleoceanographic: to reconstruct the history of climatic and oceanographic variability off Portugal over the latest Pleistocene, at orbital and millennial timescales. By means of a high resolution multidisciplinary study we propose to assess:

- a) Holocene climate variability.
- b) changes in coastal upwelling intensity and related productivity;
- c) climate of the hinterland, continent-ocean linkages, and source to sink relationships for terrigenous material;

PALEO 1 – Poseidon 789

This cruise took place onboard the German ship Poseidon between April 21st and May 3rd and 45 stations were occupied along the Portuguese margin. The main objective was to recover box and/or multi-cores from four sedimentation areas located off the Rivers Douro-Ave, Lis, Mira and Tagus, and gravity cores from three transects across the margin at the latitudes of Douro, Mondego and Cabo da Roca, was successfully accomplished.

TTR 12 Leg 5

Leg 5 of the Training-Trough-Research (TTR) 12 cruise, aboard Prof. Logachev, aimed at studying the seismic stratigraphy of the Azores Archipelagic Apron, located south of the Azores Islands, and at obtaining information on the structural setting of the Atlantic crust east of the Mid-Atlantic Ridge. Two seismic reflection lines (PSAT 223 and 224), OKEAN sidescan sonar, MAK deep-towed sidescan sonar and 3.5 kHz profiler data were acquired. In parallel, dredging, TV filming and grabbing were conducted on selected sites of the Atlantis seamount and Lucky Strike hydrothermal field. As a complement, and with the objective of reconstructing the impact/reaction of the Azores front to the major climatic changes of the latest Quaternary, 6 gravity cores were recovered north and south of the modern position of this front.

Lisboa, September 13, 2002

-Fatima Abrantes-