

## Sand resources on the continental shelf of Faial Island (Azores)

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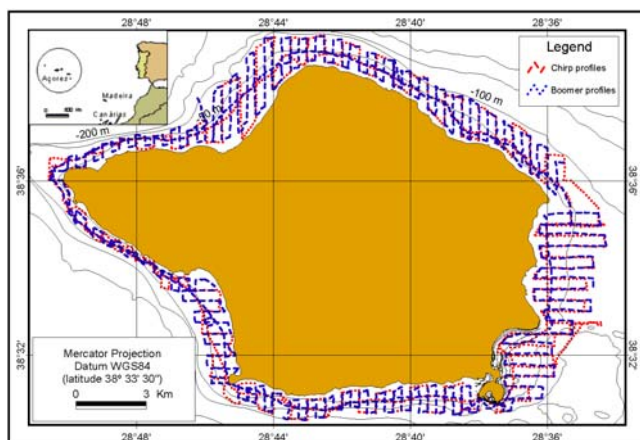
### 1. INTRODUCTION

The continental shelf of Azores is being subjected to sand exploitation. Unfortunately, the industry has started exploitation in almost all islands, without previous geological studies.

Under these circumstances, the Marine Geology Department (DGM) of the Instituto Geológico e Mineiro (IGM) and the Department of Oceanography and Fisheries (DOP) of the University of Azores were invited by the Regional Government to initiate the mapping of the distribution of sediments around the Faial Island.

### 2. DATA AND METHODS

During July 2001 the DGM conducted one survey to map the sand bodies around the Faial Island. A total of 500 Km lines of high-resolution seismic profiles were collected between 0 and 100 m water depths. Two equipments were used: a Chirp sonar system (Datasonics CAP-6000W) and a Boomer (EG&G 230-1 Uniboom). Bathymetric data were acquired concurrently using a probe Koden CVS-821. The survey lines were made parallel and normal (ca. 0.4-0.8 Km intervals) to the shore (fig. 1). Another line was made around the island crosscutting the previous network at 30 m water depth.

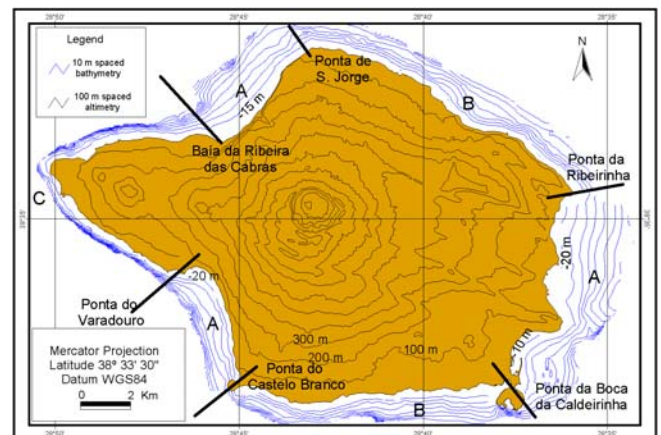


**Figure 1:** Location and track lines of the Chirp and Boomer seismic profiles.

### 3. RESULTS

The detailed bathymetric map obtained from the survey revealed three different areas according to the slope of the sea bottom (fig. 2):

- Low slope areas (A areas).
- Medium slope areas (B areas).
- High slope areas (C areas).

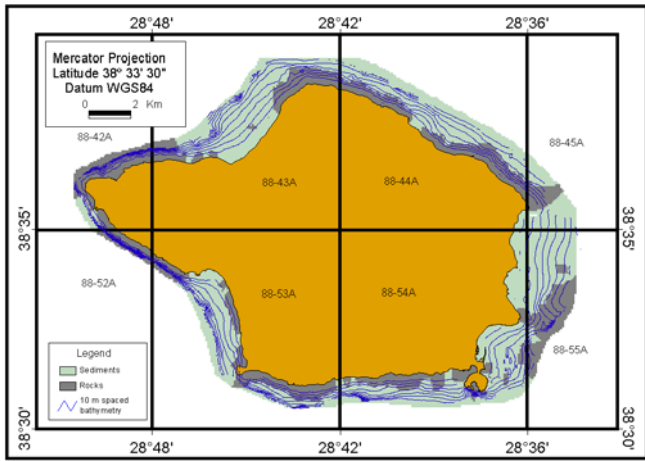


**Figure 2:** Detailed bathymetric map of Faial's shelf.

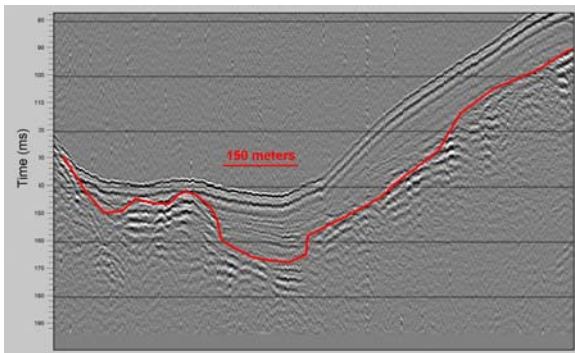
Acquisition of closely spaced Chirp subbottom profiles in the continental shelf of the Faial Island provided a valuable dataset for the detailed analysis of echo character and its regional distribution. Damuth (1975, 1980) e Chough et al, 2002) proposed a classification based on high-frequency (3.5-12 kHz) systems to obtain correlations between certain kinds of echoes and the nature of the sea floor. The interpretation of these echoes allowed the distinction between rocky and sedimentary bottoms (fig. 3).

Boomer seismic profiles were made in the areas that Chirp had revealed to have a sedimentary bottom and it was used essentially to define the sediments' thickness. In those areas it was possible to define one seismic unit (fig. 4). Its top is bounded by the sea bottom reflector; its lower boundary is an unconformity, sometimes characterized by the onlap terminations of the overlying reflectors. This unconformity is represented by a mostly irregular, medium

amplitude reflector, which probably corresponds to the sediment/rock interface. This unit is stratified, showing parallel to sub-parallel and low to medium amplitude reflectors.



**Figure 3:** Echo characters' classification based on the Chirp seismic profiles.



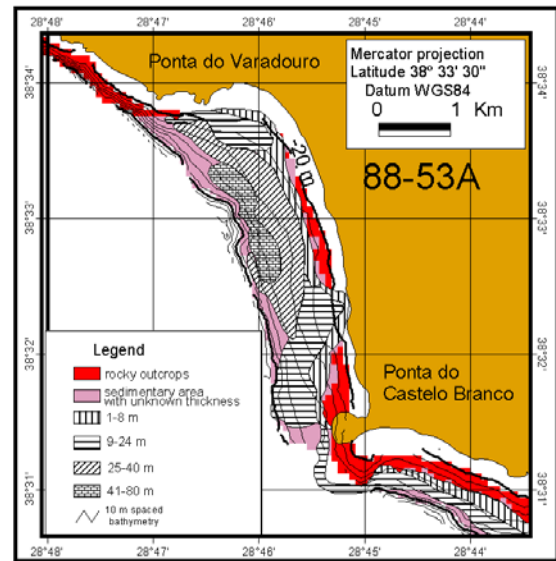
**Figure 4:** Sedimentary unit defined with the Boomer seismic profiles

The interpretation of Boomer seismic profiles allowed us to make isopach maps of the seismic unit and consequently to describe the spatial distribution of sediments in the continental shelf of the Faial Island. As an example, Figure 5 shows the area between Ponta do Varadouro and Ponta do Castelo Branco. Rocky outcrops are observed between the coastline and 30 m water depth, except on the embayment near Ponta do Varadouro. This depth marks the transition to the sedimentary unit described before, that reaches 45 m of thickness in the most distant area.

## 5. CONCLUSIONS

The sediments' geographic distribution in the continental shelf of Faial allowed us to conclude that the more promising areas to find sand were those showing the conjunction of high thickness of sediments and low slope.

It is extremely important to assure that sand extraction is made without putting in risk the coastline dynamics and its ecosystems. Taking into account that the present knowledge of the littoral and shelf sedimentary dynamics is insufficient, it would be wise not to exploit below the 30 m water depth, because it appears that this depth corresponds to the normal wave-base level (the level where the sea bottom begins to be remobilised). The rocky outcrops that emerge at this depth confirm this assumption.



**Figure 5:** Map showing the sedimentary unit's thickness

## ACKNOWLEDGEMENTS

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