

HIGH RESOLUTION SEISMIC STRATIGRAPHY OF THE RIA OF AVEIRO (PORTUGAL) (TALK)

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Introduction

The Ria of Aveiro is a 50 km² barrier type lagoon, located in Northwestern Portugal at the mouth of the Vouga River. Onshore geology reveals dune, beach and lagoonal sediments of Quaternary age, composed essentially of unconsolidated sands and clays. Core data and seismic reflection profiles show that these sediments are less than 10 metres thick to the East, and over a 100 meters thick to the West (the deeper sediments are probably Neogene), and that they have an erosive lower boundary, locally channelized, mostly flat and gently dipping less than 1° westwards (Marques da Silva 1992; Teixeira & Pinheiro, 1998). Where it is thinner, the lower boundary of the Quaternary sediments cuts through Mesozoic clays and limestones (probable Upper Cretaceous). In 2002 and 2003, three high-resolution seismic surveys (with Chirp and Boomer systems) were conducted in the Ria to investigate the sedimentation, structural control and evidence of gas and gas seepage. Here we present an example of the interpreted seismic stratigraphy, based on seismic data acquired during these surveys.

Material and Methods

Three surveys, RIAV02, RIAV02A and RIAV03, were conducted in this area, on board “Ria Azul” of the Aveiro Harbour Authorities. 177km of Chirp profiles (Datasonics, CAP-6000W) were digitally acquired during RIAV02 and RIAV02A; the signal bandwidth was 1.5-10 KHz, the output power was 1KW and the chirp length 10 ms (approximate vertical resolution of 15 cm). 47km of Boomer profiles (EG&G Uniboom) were digitally acquired during the RIAV03 cruise; the energy was 100-watt s⁻¹ and a single-channel streamer with 24 hydrophones was used. The signal frequency spectrum ranged from 250 to 1400 Hz (estimated vertical resolution <2 m). Seismic processing included frequency band pass filtering, time variant amplitude gain correction, predictive deconvolution, spiking deconvolution and trace mixing. The total survey grid covers most of the navigable channels of the Ria, and separation between profiles ranges from 10 to 75 m (Fig. 1). Positioning of the profiles was done with differential GPS, except where differential correction was not available (approx. 60 km of Chirp profiles).

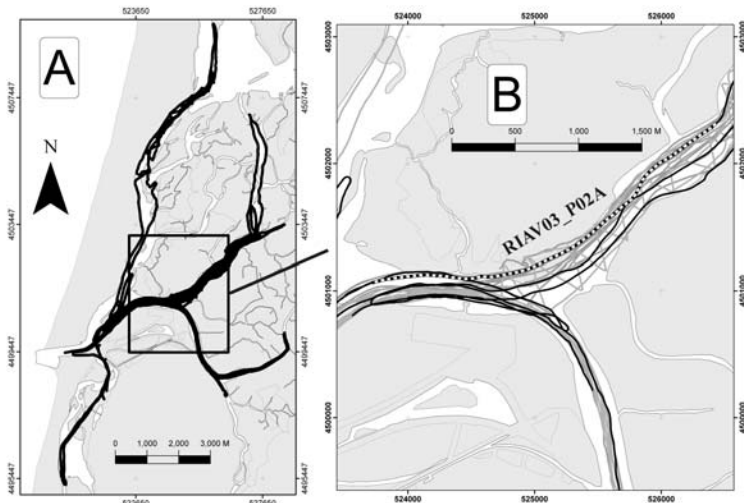


Figure 1 - A – Boomer and Chirp seismic coverage of the Ria of Aveiro (in black). B – Detail of survey grid. Grey lines: Chirp profiles; Black lines: Boomer profiles; Dotted line: profile RIAV03-P02A (figure 2).

Results

The following seismic units were interpreted (see figure 2): *Unit U1(a,b)* is the uppermost unit with oblique tangential to sigmoid reflections that downlap a channel-like truncation surface; *Unit U1a* is partially filling a modern channel; *Unit U1b* is totally filling a paleo-channel; *Unit U2* has few irregular reflections that downlap or onlap the lower boundary which is an ubiquitous truncation surface that dips slightly to the west; this unit is limited above either by the sea bottom or by unit *U1*; *Unit U3* is

mostly transparent with few, cross, oblique parallel reflections with poor continuity that onlap the lower truncation surface which is an approximately 1.5 km wide, NNW-SSE oriented channel-terrace feature; it is limited above by unit *U2*; Unit *M* is characterized by strong, continuous, parallel reflections, folded and faulted but generally dipping to the west (steeper the lower boundary of unit *U2*); the lower boundary of this unit was not imaged.

Discussion and Conclusions

Lithological data from hydrogeology cores (Marques da Silva, 1992) allows the correlation of unit *M* with shales and limestones, probably of the Upper Cretaceous (Fig. 2). This unit was partially eroded most probably during the last glacial maximum (LGM), in sub-aerial conditions, as indicated by the *M-U3* erosive boundary, and possibly, by parts of the *M-U2* boundary. Unit *U3* is interpreted as valley infill sediments deposited after the LGM, and prior to the wave/tidal erosion that is suggested by the *U3/U2* boundary. Unit *U2* is interpreted as marine/tidal channel sediments deposited after the sea level reached a depth near the *U2* lower boundary, and, possibly, before the artificial opening of the tidal inlet, which would be marked by the *U2/U1* boundary. Units *U1* are interpreted as tidal channel infill sediments probably deposited after the artificial opening of the tidal inlet (which caused the development of new tidal channels).

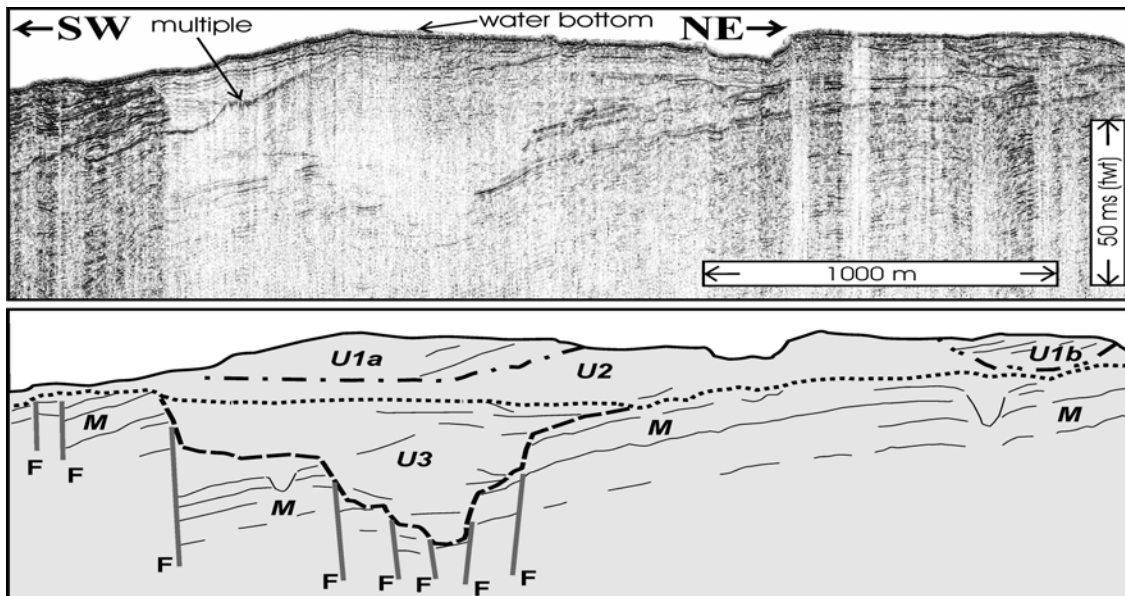


Figure 2 - Top – Segment of Boomer profile RIAV03-P02A (location in Figure 1); Bottom – interpreted section. *Thin black lines* - reflections; *Dotted lines* – unit boundaries; *U1:U3* post-last glacial maximum units; *M* – Up. Cretaceous unit; *F* – faults.

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