1. Introduction

The Almería Margin, located in the eastern Alboran Sea, is characterized by a complex physiography. Successive marine geophysical surveys carried out in the area revealed the presence of the Almería Turbidite System [1], a system of tributary valleys [2], the Carboneras strike-slip fault system and small scale landslides [3] and Miocene-age volcanic banks [4]. This work aims to recognize and describe the sedimentary and tectonic features that shape the Almería Margin at a very high resolution, and to explore the surface and subsurface seafloor parameters that characterize its acoustic signature. The study has been carried out by means of an integrated dataset, comprising deep-towed TOBI sidescan sonar, swath-bathymetry, TOPAS high-resolution seismics, and sediment gravity cores.

2. Results and discussion

The morpho-sedimentary and morpho-structural elements observed are: the Almería canyon/channel turbidite system, the Dallas tributary valley system (DTVS), landslides, faults and folds, volcanic banks (Fig. 1).

Despite the strong variability of these environments, the acoustic signature of the Almería Margin shows a low average backscatter value of 32 DN, reflecting the diffused draping of hemipelagic sedimentation occurring in the area. The influence of subsea floor properties in the acoustic signature of the area was revealed by backscatter–grain size correlations, which were carried out for different depth intervals in the cores collected at the Almería Turbidite System. A poor relationship was found between backscatter and surface silty sediments at a very high resolution, and to explore the surface and subsurface seafloor parameters that characterize its acoustic signature. The study has been carried out by means of an integrated dataset, comprising deep-towed TOBI sidescan sonar, swath-bathymetry, TOPAS high-resolution seismics, and sediment gravity cores.

3. Conclusions

The integration of different marine geophysical methods (swath-bathymetry, deep-towed sidescan sonar TOBI and high-resolution seismics), supported by ground-truthing calibrations, permitted to recognize in detail the morphological and sedimentary features that shape the Almería Margin and to relate their geologic characters to the correspondent acoustic signature. Insights were provided on the relationship between seafloor and backscatter strength in a complex depositional system, characterized by the occurrence of turbidite fluxes and active tectonics. Coarse sediment layers recognized in the sub-seafloor and seafloor irregularities observed along the DTVS strongly affects backscatter variations of the area and supports volume scattering and large scale roughness as important controlling factors in the seafloor acoustic strength of a long-range sidescan sonar system. Analysis of backscatter images turned out fundamental in mapping deep coral mounds of the Almería Margin. Unusual very high backscatter facies have been identified on the coral mound areas, corresponding to the maximum scale value of 255 DN. Very high acoustic strength could be related to the roughness of coral colonies or to associated sediments.

4. Acknowledgements

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Figure 1: TOBI sidescan sonar overlapped on a 3D DTM model. Main morphological features are illustrated. DTVS: Dalías Tributary Valley System; SO: sediment overfloowing; CL: Chella landslide; SL: Sabinar landslide.

Figure 2: TOBI (1) and correspondent TOPAS records (2) of isolated carbonate mounds at the top of Chella Bank. Yellow lines on the TOBI images indicate the track of the TOPAS profile. Yellow dots on the TOBI images indicate sediment sampling points. Red patches in (1) indicate extremely high reflective areas.
APPLICATION OF HIGH-RESOLUTION SEISMO-ACOUSTIC METHODOLOGIES IN THE STUDY OF THE SEAGRASS POSIDONIA OCEANICA (L.) DELILE

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1. Introduction
The distribution of the Mediterranean seagrass Posidonia oceanica has been widely assessed using acoustic methodologies. However, informations on P. oceanica internal structure obtained with seismic methods are still very rare. In the framework of the multidisciplinary project CARBOMED (Proyecto Intramural de Frontera, PIF-2005, CSIC, Ref. 200530F0232), a seismo-acoustic survey was carried out in Port Lligat Bay (Catalonia, NE Spain) with the aim to assess the volume potentially occupied by P. oceanica organic deposits (known as “matte”), detect its internal structure and highlight the morphological and sedimentological characters of the study area (Fig. 1). A first calculation of the potential volume of P. oceanica deposits in Port Lligat Bay was estimated in about 175,000 m³ [1].

Figure 1: Navigation tracks of the seismo-acoustic records acquired in Port Lligat Bay during the Carbomed Project. Track in red: profile 71 (Fig. 2). Track in yellow: profile 8 (Fig. 3). Red dot: core site

2. Data and Methods
The high resolution parametric echosounder “Innomar SES 2000 compact” was used to acquire 75 seismo-acoustic records spaced from 5 to 40 m each others, for a total length of about 7.5 km. The positioning system was a differential GPS (DGPS) Trimble AGP 132. The echosounder was characterized by a primary frequency of 100 kHz and secondary frequency ranging from 5 to 12 kHz. Pulse Repetition Rate was up to 30/sec and the beamwidth of ±1.8°. Each seismo-acoustic record has been acquired twice, using secondary frequencies of 10 and 6 kHz. The lower secondary frequency (6 kHz) gave the best result because of its higher resolution and relatively higher penetration, and the records obtained with this configuration were used for this study. The shallow water of the study area (depth from 3 to 6m) produced high amplitude multiples.

3. Results and discussion
Here we present an interpretation of seismo-acoustic records and of data from a core collected in the matte of Port Lligat bay with the final aim of reconstruct the dynamics of P. oceanica since it was established in the study area. The acoustic masking of the internal structure of the seagrass and the presence of multiple reflectors due to the reduced depth of the area (maximum 4 m) did not allowed to associate a specific seismo-acoustic facies to the matte of P. oceanica. Nevertheless, in some sectors it was possible to detect a strong reflector, from 2 to 6 m depth, that was interpreted as the initial substratum where the seagrass established for first time (Fig. 2). Also, sporadic sandy areas, apparently no more than 4 m thick, were identified interlayered with the P. oceanica matte (Fig. 3).

A core collected on the P. oceanica meadow showed the presence of a dense matte for the first tens of centimeters downcore, degrading to sandy sediments with rhizomes and leaf sheaths for a total depth of 6 m. The base of the core presented gravelly bioclastic sediments and its depth correlates, in a seismic record near the core location, to the reflector interpreted as the base of the P. oceanica matte. Assuming a growth rate of P. oceanica of 1.3 to 4.1 mm y⁻¹ [2,3], the gravel deposits observed at the base of the core may be aged between ca. 1500 and 4500 yrs BP.

References