SLIDES AND RELATED FLUID ESCAPE FEATURES IN THE EIVISSA CHANNEL, WESTERN MEDITERRANEAN

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Abstract

Four slides have been identified in the Balearic margin of the Eivissa Channel. They are easily recognizable in detailed swath bathymetry maps and very-high resolution seismic reflection profiles. The slides share the same slip plane, which corresponds to a continuous, high amplitude reflector. Headwall scars are related to pockmarks, which are also present further upslope on the Balearic margin of the Eivissa Channel. Therefore, it can be stated that there is a link between fluid escape features and destabilisation of the upper sediment layers.

Keywords: Submarine slides, pockmarks, fluid escape, Eivissa Channel

The Eivissa Channel opens between Alacant, in the Iberian Peninsula, to the west, and the island of Eivissa, to the east (Fig. 1A). It has a slightly asymmetric saddle morphology, with the Iberian margin steeper than the Balearic margin. The Eivissa Channel is interrupted by a ca. 200 m high east-west trending seamount named the "Xàbia Seamount". Most of the fine sediment reaching the Eivissa Channel is thought to come from the Iberian Peninsula, transported by the southwards regional circulation along the Iberian margin.

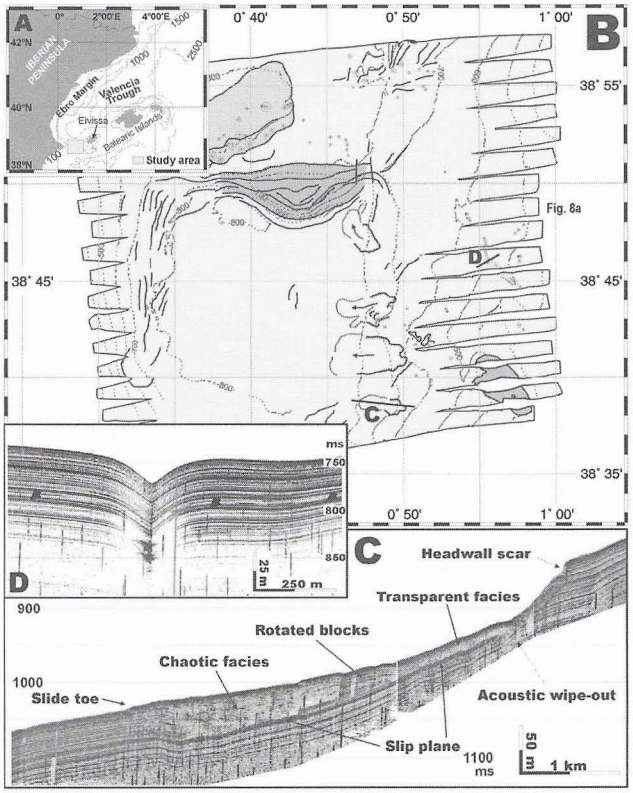

Fig. 1. A. Location map of the study area. B. Interpretation of the swath bathymetry data, showing the four slides in the Balearic margin, the pockmarks (stars), and the Xàbia Seamount (dark grey). C. Seismic profile across the Ana Slide, showing its characteristics and seismic facies. D. Seismic profile across a pockmark. Black arrows show location of the reflector related to the slip plane of the slides.

Swath bathymetry data allowed to identify four headwall scars and associated slide deposits, namely from south to north Ana, Joan, Nuna and Jersi slides, which are roughly aligned along the 0°48'E meridian on the Balearic margin flanking the southern sector of the Eivissa Channel (Fig. 1B). The Ana Slide, located at ~38°38'30"N at water depths ranging from 635 m at the rim of the headwall scar to 815 m at its toe, with a horseshoe shaped headwall scar up to 30 m high, disturbs an area of 6 km^2 and involves 0.11 km^3 of sediment (Fig. 1C). The Joan Slide, located approx. at 38°41'N from 600 to 870 m of water depth and a headwall scar up to 10 m high, affects 16 km^2 of the seafloor. The Nuna Slide, located at ~38°43'30"N between 675 and 860 m of water depth, is the result of two events disturbing 10.3 km^2 of the seafloor. It has a headwall scar of up to 20 m high. Finally, the Jersi Slide displays a 15 m high headwall scar and covers 7.9 km^2 of the seafloor at ~38°47'30"N.

Very-high-resolution seismic reflection profiles image these slides as sediment bodies mostly made of transparent seismic facies (Fig. 1C). Chaotic facies are observed at the toe of some of the slides, and blocks of coherent stratified facies embedded in the slide deposit have been identified too. These profiles demonstrate that the four slides share the same slip plane, which corresponds to a continuous, high amplitude reflector.

At a short distance from the Ana Slide headwall there is an acoustic wipe-out (Fig. 1C). In plan view, the headwall is complicated by a semi-circular embayment that could mark the location of a former large pockmark. Acosta *et al.* (1) identified the pockmark field north of Xàbia Seamount, in the northern Eivissa Channel region, but additional pockmark fields and isolated pockmarks can be identified south of the Xàbia Seamount, upslope the slides (Fig. 1B). These are often aligned, ~100 m in diameter and ~15 m in depth. They are either currently active or have been active in recent times. This is supported by the lack of buried pockmarks in the profiles and by the fact that all of them disturb not only the uppermost sediment layers but also the seafloor (Fig. 1D).

Since pockmarks are related to the headwall scars of some of the slides, it can be stated that there is a link between fluid escape features and destabilisation of the upper sediment layers. The role of pockmarks in favouring the triggering of the slides may be double. Escaping fluids forming the pockmarks may have been injected into the common slip plane, thus increasing the pore pressure; and pockmarks represent a discontinuity reducing the shear resistance along the potential failure plane. The fact that all the slides in the Eivissa Channel occupy the same stratigraphic position and share the same slip plane could indicate that they occurred simultaneously following a common triggering mechanism.

References

1 - Acosta, J., Muñoz, A., Herranz, P., Palomo, C., Ballesteros, M., Vaquero, M., Uchupi, E., 2001. Pockmarks in the Ibiza Channel and western end of the Balearic Promontory (western Mediterranean) revealed by multibeam mapping. *Geo-Mar. Lett.*, 21: 123-130.