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Deep Submarine Giant Scours in northern Gulf of Cadiz (offshore SW Iberia): a singular case of sedimentary and tectonic coupling?

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Multi-beam swath bathymetry carried out in NW Gulf of Cadiz(offshore SW Iberia - MATESPRO campaign) revealed several intriguing morphologic features, lying at depths between -3900 and - 4700 m., in an area characterized by very shallow general slope gradients (dipping approximately 0.4 degrees). These three dimensional features are characterized by elliptical crescent shapes of kilometric length (major axis around 5 km), displaying internal escarpments up to 100 m high and slopes varying between 6 and 14 degrees.

A single channel seismic profile acquired across two of these features shows that they have a sub-surface composite structure. The internal part of the crescent consists of a depression filled up with upslope prograding sedimentary units developing towards the scarp that sharply truncates the sedimentary horizons. The growth processes of these structures appears to be by retrogressive displacement of a morphological scarp and remobilization followed by deposition of the eroded material in front of the scarp, prograding towards it. This process is similar to the development of contourite bodies in which the current direction is parallel to the scarp, whilst in the present case the flow direction may be mainly perpendicular to the scarp.

These units are overlain by a sub-horizontal turbidite-like sedimentary unit that partially infills the depression. A deep multi-channel seismic profile across the same

structure revealed the existence of an underlying thrust, part of a major structure, the Gulf of Cadiz Accretionary Prism. These singular features are interpreted as the coupled of sedimentary and tectonic processes. It is proposed that the Deep Submarine Giant Scours formed when a local morphologic irregularity, corresponding to the bathymetric expression of movement on an underlying thrust, is enhanced by the erosional activity of turbidity and thermohaline bottom currents driven by the formation of local eddies in front of the scarp. The drift results from the re-deposition of the eroded material in the same location.