Cold-water coral mini-mounds on the Ferrol Canyon (Cantabrian Margin): initiation and controlling factors

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Abstract

The Ferrol Canyon is located on the northwestern Iberian Margin, in the southern part of the Bay of Biscay. The 2009 R/V Belgica campaign revealed the existence of small mounded features on the upper flanks of this canyon. These so called "mini-mounds" are 100-300 m in diameter and up to 2.5 m high and occur in water depths ranging between 400 and 550 m. Their size and distribution is different on the northern and southern flank of the canyon with the northern mounds being smaller and more clustered while the southern ones are larger and are further apart. Video groundtruthing revealed that the mounds are covered with fossil *Lophelia pertusa* branches with an early Holocene age. This supports the hypothesis that these mini-mounds are a failed experiment of cold-water coral (CWC) mound growth. In this study we use geophysical and video data to identify the processes involved in the initiation, growth and demise of these CWC mini-mounds.

In the shallower part of the southern flank of the Canyon, an extensive network of pockmarks is identified. These features are likely caused by gas migration from Albian Units along NE-SW oriented faults. They have a size and distribution strikingly similar to the southern mini-mounds located further downslope. Therefore, these mini-mounds could potentially have formed on top of seepage features which can provide methane-derived authigenic carbonates acting as hardgrounds for settling of coral polyps. Furthermore, the lack of observed pockmarks in the vicinity of the northern mini-mounds could explain their different morphology and distribution. This would indicate that hydrocarbon seepage forms no prerequisite for coral mound initiation but could have an important influence on the mound start-up phase. The deeper part of the study area is characterized by erosional and depositional processes related to the Mediterranean Outflow Water (MOW). Contemporary CWC's in the area dwell within the range of this water mass, relying on its density and dynamics for their food supply. Contrastingly however, the fossil mini-mounds are located right above the present upper boundary of the water mass. This could mean that the mini-mounds on the Ferrol Canyon flanks were linked to the re-introduction of a shallow MOW in the NE Atlantic during the last glacial to Holocene transition, bringing favorable conditions for CWC growth to the shallower canyon flanks.

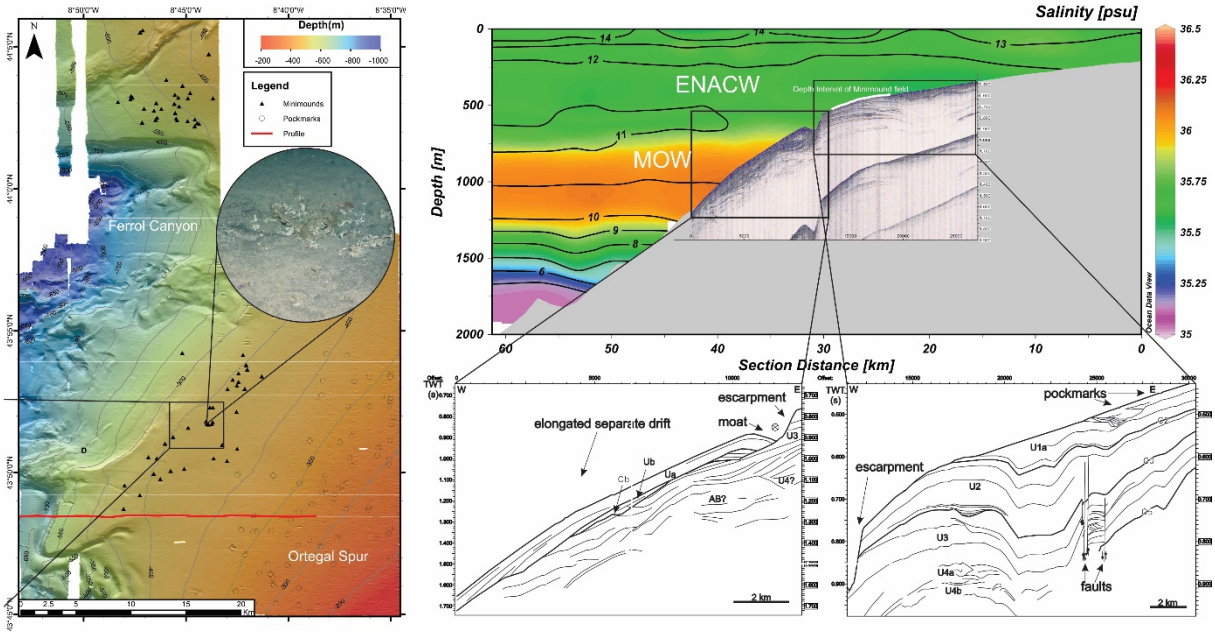

Figure. Left: Multibeam bathymetry map of the Ferrol Canyon Area with indications of minimounds (black triangles), pockmarks (black circles) and seismic profile (red line) and ROV still of *L. pertusa* branch on mound; Right: Seismic profile and interpretation plotted on hydrographic salinity profile with temperature contours based on CTD data from WOD13.