



Mud extrusion dynamics constrained from 3D seismics in the Mercator Mud Volcano. El Arraiche mud volcano field, Gulf of Cadiz.

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Located on the western Moroccan continental shelf of the Gulf of Cadiz, the Mercator Mud Volcano (MMV) is one of a total of eight mud volcanoes which compose the El Arraiche mud volcano field. We collected a high-resolution P-cable 3D seismic cube during the Charles Darwin cruise 178 in April 2006, covering an area of 25 km². The data image the upper 500-1000 m of the MMV. El Arraiche mud volcano field is located in the top of the Tortonian accretionary wedge in the Gulf of Cadiz, between 200 and 700 m water deep. Despite of the general compressive trend of the Gulf of Cadiz due to the westward movement of the Gibraltar arc, the local regimen of the western Moroccan margin is extensional in the study area. The MMV is a 2.5 km diameter positive conical structure at 350 m water deep that rises from the flank of a salt diapir. The high-resolution 3D cube shows the main internal structure in the southern flank of an anticline and a secondary structure southwest of it. Parallel and continuous reflections onlapping the anticline structure define the seismic character outside the mud volcano. The body of the main structure shows the typical "Christmas tree" features related to mud flow deposits. The preliminary interpretation of the 3D seismic cube shows four main mud flows southwestward oriented from the main structure and interfingering into the hemipelagic regional sedimentation. From deeper to shallower, the flows are located approximately at 0.870 s, 0.838 s, 0.774 s, and 0.685 s travel time,

respectively. The extrusions correlate with the main seismic sequences observed in the surrounding hemipelagic deposits. The maximum run-out distance for the mud flows is approximately 1 km southwestward from the main structure, which corresponds to the third youngest mud flow described. The secondary "Christmas tree" structure penetrates the hemipelagic sediments almost to the seabed. Its seismic character is defined by low amplitude and chaotic signal. Several mud flows are interfingered with the surrounding sediments and, in some cases, overlap the mud flows from the main structure but they are less extensive and thinner but more frequent than those from the main structure. The MMV is an active mud volcano and depends on complex fluid and mud dynamics. The existence of a secondary and apparently "abandoned" structure indicates the variation of mud pathways during the evolution of its plumbing system.