THE MELILLA CARBONATE MOUNDS: DO DEEP-WATER CORAL MOUNDS COUNT ON SEEPING FLUIDS IN THE ALBORAN SEA?

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Abstract
A large cluster of Holocene to Present deep-water coral mounds -the Melilla Mound Field (MMF)- occurs in the southeastern margin of the Alboran Sea. High-resolution and multichannel seismic, side-scan swath bathymetry, acoustic sub-bottom profiling, and sampling have investigated the MMF. The mounds are ridge-like buildups 100–250 m wide, 2-6 km long, and 20–60 m (up to 200 m) high above the seabed, which lie in water depths ranging from 230 to 500 m. Sampling proves that mound are largely formed of cold-water corals with a muddy matrix. Seismic profiles across the MMF show that faults exist beneath the mound-ridges, so that mounds nucleation would have influence from fluid venting via fractures that may leak thermogenic gas or cold hydrocarbon seepages in addition to any likely oceanographic control in mound's origin.
Keywords: Alboran Sea, Bio-Accumulation, Deep Waters, Sediments, Seismics

A cluster of Holocene deep-water carbonate mounds -the Melilla Mound Field (MMF)- was discovered in the southeastern margin of the Alboran Sea (Morocco margin) during the MARSIBAL-06 Cruise (R/V BIO Hespérides, 2006) [1]. The carbonate-mound field was revisited and sampling during the TTR-17 Leg 1 survey [2]. The MMF occurs from the upper to the middle slope, with NW-SE trending, on a gentle-dipping margin segment and covers an area of more than 20 km^2. Deep-water carbonate mounds, comparable to those of the MMF, have not been documented before in the Alboran Sea. Swath bathymetry, acoustic sub-bottom profiling, high-resolution MAK-1 side-scan sonar, multichannel seismic, high-resolution seismic, and coring have investigated the MMF Seafloor mounds appear as ridge-like buildups 100–250 m wide, 2-6 km long, and 20–60 m (up to 200 m) high above the seabed; which lie in water depths ranging from 250 to 500 m. They are also surrounded by elongated erosional moats, probably caused by bottom currents on the sea floor, which are 5-10 m deep and 50-100 m wide. Some ridges have no linear but branched shapes. Buried or partly buried mounds, as showed by sub-bottom profiles, are elongated and domed families of buildups (transparent acoustic facies) rooted on highly reflective sedimentary layers and surrounded by dark reflective moats, with dome-size increasing seaward. They grow beneath the upper slope off the shelf break (water depth from 230 m), producing bulges in the seafloor, and give way to seabed mounds with depth. At least three generations of successive mound-growth families are observed. Some ridged-mounds nucleated upon former ones so that buried constructions (columnar appearance in acoustic sections) grow up to 160 m high. The internal architecture of mound-cluster prograding seawards suggests that mounds developed during a period of sea-level drop or slope tilting. Sampling by coring, TV grab and dredging during TTR-17 Leg 1 encountered that mounds are formed of biogenic accumulations made up of corals (*Madrepora occulata, Caryophyllia sp, Desmophyllum sp, Lophelia pertusa)* and other common associated fauna. Colonies of dead *scleratinean* corals and a diverse community dominated by soft corals, sponges and asteroids were observed in TV runs. So that it is proved that mounds from the MMF correspond to modern cold-water carbonate knolls The MMF occurs about 200 km to the east of the Alboran Mud Diapir Province were mud volcanoes, pockmarks fields, seepages (methane) and fluid vents are well documented as controlled by recent or actual tectonics. The geological setting indicates the entire Alboran Basin, which is depleted of Messinian evaporites, is affected by a significant Plio-Quaternary and still active wrench tectonics producing local subsidence and uplifting. Seismic profiles across the MMF show that faults exist beneath the mound ridges, so that we propose and argue that in addition to probable oceanographic control, mounds nucleation may have some influence from fluid venting via fractures that may leak thermogenic gas or cold hydrocarbon seepages. in addition to any likely oceanographic control in mound's origin. Contribution from Projects SAGAS CTM2005-08071-03-01, MARCAL CGL2006-13327-C04-04 and TOPO-IBERIA CSD2006-00041 (Funded by R & D National Plan of the Ministry of Science and Technology and FEDER funding, Spain) and Research Group RNM 215 (Junta de Andalucía).

References
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