Climate-related formation of cold-water coral mounds in the Alboran Sea since the mid-Pleistocene transition

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Framework forming cold-water corals (CWC) such as Lophelia pertusa and Madrepora oculata have built giant seabed structures such as ridges and mounds in the southern Alboran Sea (East Melilla coral province) at depths ranging from 230 m (Dragon Mounds) to 450 m (base of Brittlestar Ridge). In 2014, these coral mounds and ridges were drilled using the Bremen Seafloor Drill Rig (MeBo), providing up to 70-m-long cores of coral-bearing sediment. Here, we present results of coral ages obtained from two MeBo cores: Dragon Mound (35°18.6' N; 2°34.9' W, 236 m), which was fully penetrated down to its base at 62 m depth, and the Brittlestar Ridge (35°26.1' N; 2°30.8' W, 329 m) whose core encompasses roughly half of its overall height of 150 m. Using high precision Th/U dating and Sr-Isotope stratigraphy, the discontinuous nature of coral mound formation is revealed. The more than 200 dated corals, mostly of pristine preservation, show a remarkable mound aggradation pattern back to ~500 ka, marked by a 100-kyr cyclicity. Periods of sustained coral proliferation seem coincident to warm climates with vertical mound aggradation rates of up to 140 cm/kyr. In contrast, during cold climate periods corals occurred in strongly reduced numbers likely hampering mound growth. Based on these results, we assume that the initial formation of the largest mounds, such as Brittlestar, started during the mid-Pleistocene transition some 0.8 to 1.2 Million years ago. What caused mound growth to begin and the key environmental factor which influence it remain to be discovered.