Buried cold-water coral mounds along the Moroccan Atlantic Margin: new insights in cold-water coral mound growth processes?

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Abstract

During the past two decades, many marine geoscience studies have focused on the genesis, growth and decay of medium-sized to large cold-water coral (CWC) mounds, especially along the margins of the northeastern Atlantic Ocean. A key study site was the Belgica mound province, located on the eastern slopes of the Porcupine Seabight, where during IODP expedition 307 core samples were drilled through the base of a mound, enabling to date mound initiation at 2.65 Ma. Although this expedition offered a lot of insight in the evolution of CWC mounds, still a lot of questions regarding the "start-up" phase and growth remain unanswered. This is partly due to the inability to obtain a continuous high-resolution environmental record from such a mound, to compare with continuous "off-mound" records. Luckily, the Belgica mounds are just one of the many expressions of CWC mound growth. More enigmatic is the buried Magellan mound province, located in the northern part of the Porcupine Basin, featuring over 1000 relatively closely spaced buried mounds, which are all rooted on a common reflector. This indicates a common and sudden start-up event, but the true driving forces behind the initial settling, growth and demise of this province are also still unknown.

In 2013, some 3000 km south of the Magellan mound province, a new province of buried CWC mounds was discovered along the Moroccan Atlantic Margin, which may shed new light on the "life" cycle of CWC mounds. About 487 buried CWC mounds have been identified from high-resolution seismic reflection profiles, and can be associated to a vast province of several clusters of seabed mounds. They have an average height of 10-20 m and are approximately 250 m wide. They occur in water depths between 500 and 1000 m, buried under up to 50 m of sediment. With respect to the Magellan mounds, they are smaller, but more importantly, they do not root on one single stratigraphic level. At least 8 different initiation levels were identified. The off-mound reflectors indicate a slight influence of bottom currents, since the mounds are located in a large sediment drift that is related to the Pen Duick CDS. The individual initiation levels of these mounds seem to indicate fast and relatively short-lived mound growth during one or more climatic cycles (Marine Isotope Stages). This site may thus very well contain the key to better understand mound growth in relationship to palaeoclimatological variability.