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The giant Mauritanian cold-water coral mound province: Oxygen control on coral mound formation

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ABSTRACT

The largest coherent cold-water coral (CWC) mound province in the Atlantic Ocean exists along the Mauritanian margin, where up to 100 m high mounds extend over a distance of ~400 km, arranged in two slope-parallel chains in 400–550 m water depth. Additionally, CWCs are present in the numerous submarine canyons with isolated coral mounds being developed on some canyon flanks. Seventy-seven Uranium-series coral ages were assessed to elucidate the timing of CWC colonisation and coral mound development along the Mauritanian margin for the last ~120,000 years. Our results show that CWCs were present on the mounds during the Last Interglacial, though in low numbers corresponding to coral mound aggradation rates of 16 cm kyr^{-1}. Most prolific periods for CWC growth are identified for the last glacial and deglaciation, resulting in enhanced mound aggradation (>1000 cm kyr^{-1}), before mound formation stagnated along the entire margin with the onset of the Holocene. Until today, the Mauritanian mounds are in a dormant state with only scarce CWC growth. In the canyons, live CWCs are abundant since the Late Holocene at least. Thus, the canyons may serve as a refuge to CWCs potentially enabling the observed modest re-colonisation pulse on the mounds along the open slope. The timing and rate of the pre-Holocene coral mound aggradation, and the cessation of mound formation varied between the individual mounds, which was likely the consequence of vertical/lateral changes in water mass structure that placed the mounds near or out of oxygen-depleted waters, respectively.

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1. Introduction

Cold-water coral (CWC) mounds formed by framework-building scleractinian CWCs (mainly *Lophelia pertusa*) are widely distributed along the continental margins of the Atlantic Ocean (Hebbeln and Samankassou, 2015; Roberts et al., 2009). They occur from shelf environments down to the upper and middle slopes (<1000 m water depth) and are mostly arranged in large provinces that comprise hundreds of individual mounds and cover extensive areas of several tens of square kilometres (e.g., Fosså et al., 2005; Glogowski et al., 2015; Grasmueck et al., 2006; Hebbeln et al., 2014; Paull et al., 2010; Vandorpe et al., 2017; Wheeler et al., 2007). Coral mounds are the result of a complex interplay between CWC growth and sediment input. In particular, the capability of the coral framework to baffle current-transported sediments plays a crucial role as the entrapped sediments stabilize the biogenic construction, and hence, favour mound aggradation (Huvenne et al., 2009; Thierens et al., 2013; Titschack et al., 2015, 2016). Consequently, coral mounds can develop into impressive seabed structures up to 300 m high and several kilometres in

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