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First insights in the sedimentary environment at the base of a large cold-water coral bank (Challenger Mound, NE Atlantic), based on IODP Exp. 307 (May 2005)

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The Porcupine Seabight, W of Ireland, forms a unique opportunity to study the geological and biological processes of carbonate mound formation, as several hundred mound structures have been discovered in the area over the last decade. Although most are buried, several mounds still emerge at the present-day seabed. They can reach heights of $>$ 200 m, can be more than a kilometer wide at their base, and cold-water coral communities cover their tops and flanks. The mounds have been identified and mapped by means of acoustic techniques, and have been ground-truthed with the use of video systems, ROV's and shallow- or piston coring. However, none of these operations reached further than ca. 10 m within the mounds, leaving their base and internal structure unsampled and unknown, and leaving much debate about the possible origin and evolution of the mounds.

IODP Exp. 307, therefore, was designed to test several hypotheses, such as whether past geofluid migration (e.g. hydrocarbon seepage) acted as a prime trigger for mound genesis and whether this was linked to specific microbial activity & carbonate precipitation, or whether a relationship could be found between mound initiation, mound growth phases and global oceanographic events. The cores from the three sites drilled along a downslope transect across 'Challenger Mound' give a unique insight in the build-up of this mound and the surrounding sediments. The mound is based on a sharp

unconformity, which can also be identified on seismic profiles, and it is now clear that the entire structure (>155m high), from its base onwards, consists of cold-water corals embedded in a muddy matrix. Preliminary on-board chemical and microbiological analyses did not show any clear influences of hydrocarbon seepage or microbial activity at the initial stages of mound formation (Expedition Scientists, 2005).

This contribution focuses precisely on this start-up phase, more exactly on the (sedimentary) environment of the first coral colonies, and the interactions governing at the time of mound initiation. Based on new grainsize data, and in relation to other data sets such as imagery and physical properties, an assessment is made of topics such as the influence of currents or the role of (sandy) contourites at the mound start-up, and the process of sediment entrapment between the coral fragments and framework. The first stages of Challenger Mound are characterised by a rapid succession of phases with variable amounts of terrigeneous input of varying grainsize, mainly within the silt fraction. Also at the site just adjacent to the mound, a succession of sharply bound intervals was found, overlying the mound-base unconformity. Some of those intervals contain large amounts of coral fragments, while others contain coarse sands, different from the terrigeneous input identified in the first mound stages. This seems to indicate that different sedimentary processes have acted during the initial mound build-up and at the first stages of off-mound sedimentation. Within the context of other on-board measurements and of the mound morphology, as identified from previous seismic data, these observations may indicate that Challenger Mound was at least partly developed before considerable off-mound sedimentation began.

Expedition Scientists (2005). IODP Prel. Rept., 307.