

Origin and growth history of a deep-water coral mound in NE Atlantic - age model based on Sr isotope

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Challenger Mound in Porcupine Seabight (Irish offshore) is the first deep-water mound that was scientifically cored in IODP Expedition 307 in May 2005. We have successfully collected sediments and geophysical information from three drilling sites (mound foot U1316, mound summit U1317, and back-mound shelf U1318), and represented the lithological, biostratigraphic and geochemical results during the cruise, which sufficiently improve our understanding on origin of deep-water coral mounds. However, we left some unsolved critical issues, such as age-determination. Our preliminary investigation has recognized only several biostratigraphic horizons, due to lack of some key-species. Among the geochemical age-determination tools, strontium stable isotope is a potential method for the sediments from Exp 307, which largely consist of the lower Pleistocene-Miocene. The strontium isotope was measured by a thermal ionization mass spectrometry (TIMS; ThermoFinnigan TRITON) in Marine Core Research Center, Kochi University. Age was determined by projection of the global standard curves. Uncertainty of the measurement was mostly equivalent to less than 0.4Ma.

The oldest age was 16.58Ma that was measured for the specimen below the mound in U1316C. This age is certainly older than the Miocene of the back-mound shelf, which was evaluated from 13.38Ma to 8.96Ma. Ages of the 28 corals from the mound section (Hole U1317E) generally become younger from the base at 2.70 to the top at 0.57Ma, and record an abrupt shift from 1.67 to 1.03Ma at 23.6 mbsf. The amplitude of this shift significantly exceeds the range of error bars of the two ages. This horizon likely corresponds to the level of the sediment color change from darker to lighter and abrupt increase of carbon isotopic values of the matrix sediments. An unconformity is strongly suspected.

Age of the basal mound sediments coincides with the onset of Northern Hemisphere Glaciations, which provided oceanographic conditions required for coral growth. Mound growth persisted throughout glacial/interglacial fluctuations, reached the maximum growth rate (24 cm/ky) around 2.0 Ma, and ceased at 1.7Ma. Unlike other buried mounds in Porcupine Seabight, Challenger Mound was only partly covered during its growth interruption, and growth restarted around 1.0 Ma.