Title: The 2.6 Ma depositional sequence from the Challenger cold-water coral carbonate mound (IODP Exp. 307): a unique palaeo-record of Plio-Pleistocene NE Atlantic climate variability


Affiliation: AA(Geology & ERI, University College Cork, Cork, Ireland; mieke.thierens@gmail.com), AB(RCMG, Ghent University, Gent, Belgium; hans.pirlet@ugent.be), AC(GeoZentrum Nordbayern, University Erlangen-Nuernberg, Erlangen, Germany; Juergen.Titschack@gzn.uni-erlangen.de), AD(IDES, Université de Paris XI, Orsay, France; colin@geol.up-psud.fr), AE(Geology & ERI, University College Cork, Cork, Ireland; b.dorschel@ucc.ie), AF(Geology & Geophysics, NOCS, Southampton, United Kingdom; vaih@noc.soton.ac.uk), AG(Geology & ERI, University College Cork, Cork, Ireland; a.wheeler@ucc.ie), AH(NIOZ, Texel, Netherlands; jbstuut@marum.de), AI(Analytical Chemistry, Ghent University, Gent, Belgium; Kris.Latruwe@ugent.be), AJ(Analytical Chemistry, Ghent University, Gent, Belgium; Frank.vanhaecke@UGent.be), AK(Analytical Chemistry, UCC Cork, Cork, Ireland; roryodonnell1@gmail.com), AL(RCMG, Ghent University, Gent, Belgium; jeanpierre.henriet@ugent.be)

Publication: American Geophysical Union, Fall Meeting 2009, abstract #PP11A-1284
Publication Date: 12/2009
Origin: AGU
AGU Keywords: [0726] CRYOSPHERE / Ice sheets, [3022] MARINE GEOLOGY AND GEOPHYSICS / Marine sediments: processes and transport, [4900] PALEOCEANOGRAPHY, [4916] PALEOCEANOGRAPHY / Corals
Bibliographic Code: 2009AGUFMPP11A1284T

Abstract

During IODP Expedition 307, the first complete sequence through a cold-water coral carbonate mound (a bio-geological seafloor feature created through successive stages of cold-water coral mediated sediment accumulation) was successfully acquired. The recovery of the Challenger Mound record, one of the large (ca. 155 m high) cold-water coral carbonate mounds along the NE Atlantic continental margin (Belgica Mounds, eastern Porcupine Seabight), finally facilitates the study of an entire coral carbonate mound’s development process and allows the identification of the environmental conditions driving and maintaining the build-up of these remarkable seafloor habitats. Furthermore, due to its...
location along the NE Atlantic continental margin, the Challenger Mound sequence contains a potential record of continent-ocean climatic evolution during the Plio-Pleistocene [1,2]. In this study, the different sediment contributors to the Challenger Mound are identified and assessed throughout its entire sedimentary sequence. High resolution siliciclastic particle-size end-member modelling and its ground-truthing (XRD, quartz-sand surface microtextures) indicate the dominant influence of a climatically-steered contour-current system. Iceberg rafting is identified as important depositional mechanism throughout the whole mound development. Furthermore, new evidence (Nd-Sr isotopes of ice-rafted grains) for locally-derived icebergs reaching the eastern Porcupine Seabight continental margin, even in the early stages of Northern Hemisphere glacial expansion, is preserved in the mound sequence. The Challenger Mound reveals a two-phase development, separated by a significant hiatus (from 1.7 to 1 Ma [1,2]). The lower mound-phase indicates a (semi-)continuous, fast accumulating current-controlled depositional environment, while the condensed upper mound-phase bears witness of the distinct shift to a more glacially-influenced, more varying global environment since the mid-Pleistocene climate transition. The density of the cold-water coral cover at the site of deposition plays an essential role in sediment deposition and preservation on Challenger Mound. Moreover, the sediment stabilising capacities of a dense coral cover facilitated sediment accumulation on Challenger Mound in the general erosive/non-depositional Pliocene environment present along the NE Atlantic continental margin. A unique, higher resolution record is hence preserved in the lower mound sequence. Overall, the potential of cold-water coral carbonate mounds as intermediate water depth, continental margin, Plio-Pleistocene palaeo-archives is showcased. [1] Foubert & Henriet (2009); [2] Kano et al. (2007)