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Cold-water coral mound initiation and early development - results of benthic foraminiferal assemblages and grain-size analysis

A. Rüggeberg, C. Dullo, and IODP Exp. 307 Scientific Party

Leibniz-Institute for Marine Sciences (IFM-GEOMAR), Wischhofstr. 1-3, D-24148 Kiel, Germany (arueggeberg@ifm-geomar.de / Phone: +49-431-600 2314)

Cold-water corals reefs and carbonate mound provinces in the Porcupine Seabight and the Rockall Trough of the north Atlantic are known since their first discovery in the 1990s (Hovland et al., 1994; Henriët et al., 1998; De Mol et al., 2002). These cold-water coral ecosystems build up several 100-m high mound structures. The controlling mechanisms of initial mound growth and development are still under debate but recent mound development is dependent on sedimentary, oceanographic and climatic processes (De Mol et al., 2002; Freiwald et al., 2002; Rüggeberg et al., 2005, 2007; Dorschel et al., 2005). However, explanations of the origin and evolution of the Porcupine mounds revolve around two scenarios that may be expressed as either competing or complementary hypotheses:

- (1) oceanographic and paleo-environmental conditions control mound initiation and growth, and
- (2) hydrocarbon seepage initiates microbial-induced carbonate formation and indirectly fuels coral growth (endogenous control) (Hovland et al., 1998; Henriët et al., 2001).

Integrated Ocean Drilling Program (IODP) Expedition 307 was performed to obtain evidence to better understand the origin and evolution of the deepwater carbonate mounds in Porcupine Seabight. Challenger Mound, a carbonate mound structure covered with fossil cold-water coral rubble, was the focal point of scientific drilling during

IODP 307. Our study of benthic foraminiferal assemblages and grain-size distribution on the first five meters of mound initiation also indicates an environmental control of their distribution and variability. No indication of hydrocarbon seepage or microbial-induced carbonate formation has been found, which supports the first hypothesis that cold-water coral distribution and growth is controlled by oceanographic and paleo-environmental conditions. Recent findings of Dullo et al. (EGU2008-A-02458) underline that oceanographic/physical boundary conditions are a prerequisite for living cold-water coral occurrences. This underpins that environmental and oceanographic factors are controlling mound initiation, at least until more information on mound bases exist.

References:

De Mol B., Van Rensbergen P., Pillen S., Van Herreweghe K., Van Rooij D., McDonnell A., Huvenne V., Ivanov M., Swennen R., and Henriët J.-P. (2002) Large deep-water coral banks in the Porcupine Basin, southwest of Ireland. *Marine Geology* 188, 193-231.

Dorschel B., Hebbeln D., Rüggeberg A., Dullo W.-Chr., and Freiwald A. (2005) Deglacial sweeping of a deep-water carbonate mound. *Earth and Planetary Science Letters* 233, 33-44.

Expedition Scientists, 2005. Modern carbonate mounds: Porcupine drilling. IODP Prel. Rept., 307. doi:10.2204/iodp.pr.307.2005

Freiwald A. (2002) Reef-Forming Cold-Water Corals. In *Ocean Margin Systems* (ed. G. Wefer, D. Billett, D. Hebbeln, B. B. Jørgensen, M. Schlüter, and T. v. Weering), pp. 365-385. Springer Verlag.

Henriët J.-P., De Mol B., Pillen S., Vanneste M., Van Rooij D., Versteeg W., Croker P.F., Shannon P.M., Unnithan V., Bouriak S., and Chachkine P. (1998) Gas hydrate crystals may help build reefs. *Nature* 391, 648-649.

Henriët J.-P., De Mol B., Vanneste M., Huvenne V., Van Rooij D., and the Porcupine-Belgica 97, 98, and 99 Shipboard Parties (2001) Carbonate mounds and slope failures in the Porcupine Basin: a development model involving fluid venting. In: Shannon, P.M., Houghton, P., and Corcoran, D. (eds.) *Petroleum Exploration of Ireland's Offshore Basins*. *Geol. Soc. Spec. Publ.*, 188, 375-383.

Hovland M., Croker P.F., and Martin M. (1994) Fault-associated seabed mounds (carbonate knolls?) off western Ireland and north-west Australia. *Mar. Pet. Geol.*, 11, 232-246. doi:10.1016/0264-8172(94)90099-X

Hovland M., Mortensen P. B., Brattegard T., Strass P., and Rokengen K. (1998) Aher-

matypic coral banks off mid-Norway: evidence for a link with seepage of light hydrocarbons. *Palaios*, 13, 189-200.

Rüggeberg A., Dullo C., Dorschel B., and Hebbeln D. (2007) Environmental changes and growth history of Propeller Mound, Porcupine Seabight: Evidence from benthic foraminiferal assemblages. *International Journal of Earth Sciences*, DOI: 10.1007/s00531-005-0504-1.

Rüggeberg A., Dorschel B., Dullo W.-Chr., and Hebbeln D. (2005) Sedimentary patterns in the vicinity of a carbonate mound in the Hovland Mound province, northern Porcupine Seabight. In: A. Freiwald and J.M. Roberts (eds.) *Cold-water Corals and Ecosystems*. Springer-Verlag Berlin Heidelberg, pp 87-112.