

Architecture, Distribution, and Sequence Stratigraphy of Cold-water Coral Mounds around Great and Little Bahama Banks

Rani Sianipar, Gregor P. Eberli, and Thierry Mulder and colleagues¹

¹ *University of Bordeaux, France*

Project Objectives

1. Determine the number and distribution of deep-water carbonate mounds on the slopes of Great Bahama Bank and Little Bahama Bank based on multibeam data.
2. Determine the ages of the distinct coral mound horizons and the age of the modern coral mounds using high resolution seismic data that are correlated to the stratigraphy in the cores of ODP Legs 101 and 166.
3. Assess role of antecedent topography, in particular slump scars and mass gravity flow deposits, as potential locations for deep-water coral mounds.
4. Examine internal architecture in the top 13 meters of a large mound that was recovered in a piston core.

Project Rationale

Recent studies document that the lower slopes of Great Bahama Bank are sites of extensive cold-water coral growth (Grasmueck et al., 2006, 2007). In some areas, the average density of coral mounds is 18 mounds/km². These mounds can be as high as 120 meters and form kilometer long linear ridges. These findings are based on surveys with an autonomous underwater vehicle in five areas in the Straits of Florida, covering approximately 80 km². The multibeam data collected during the CARAMBAR cruise reveals an even greater abundance and diversity of mound architecture (Figure 1). Furthermore, the data set allows questions about the punctuated stratigraphic occurrence and the internal growth pattern of such mounds to be addressed.

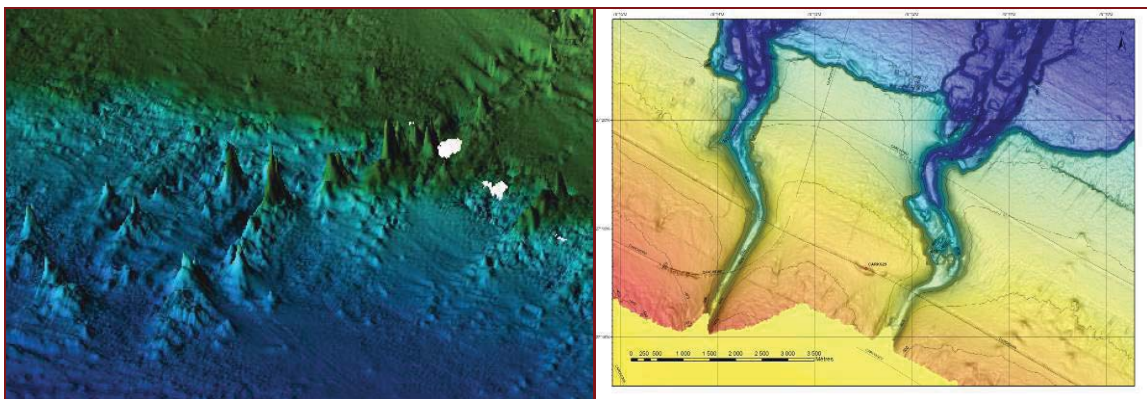


Figure 1. (Left) An approximately 10 x5 km bathymetry map of the lower slope off Bimini in 600-700m water depth images ridges of cold-water coral mounds that cover most of the slope in this area. (Right) A bathymetry map based on multibeam data reveals scattered coral mounds and large meandering canyons on the slope of Little Bahama Bank.

Scope of work

All the modern mounds in the Straits of Florida seem to start growing above a mid-Pleistocene (?) sequence boundary (Eberli et al., 2006). The newly acquired high-resolution seismic and chirp data is capable of separating the individual Pleistocene sequences. Together with the core information, it will be possible to accurately assess the synchronous (?) onset of the modern cold-water coral mound features.

Furthermore, the high-resolution multichannel seismic data images buried mound fields. This will allow addressing one of the unsolved questions about the deep-water coral mounds in the Bahamas: The timing of their first occurrence. A preliminary seismic stratigraphic analysis during the cruise indicates that the deepest buried coral mound north of Little Bahama Bank is as deep as 1700 ms, in middle Eocene strata.

The location for cold-water coral mound initiation remains enigmatic. As in shallow water corals, hard surfaces, such as antecedent topography, are required for colonization by larvae. Based on the multibeam bathymetry data, the edges of gullies and canyons on the lower slope seem like an ideal place for mounds to grow (Figure 1). We will examine the bathymetric maps to assess how big a role these features play in controlling the distribution of deep-water coral mounds.

A piston core with 13 m recovery through the flank of the over 100 meter high Matterhorn mound offers the unique opportunity to examine the inside of these mounds. The large penetration of the core documents that the mound is not cemented, although some early marine diagenetic alteration was observed. A planned CT scan of the core will reveal the distribution of the coral framework and the trapped sediment. U-Th dating of the corals will provide the first information about the growth rate of these cold-water coral mounds.

Key Deliverables

This project will generate a sequence stratigraphic distribution of deep-water carbonate mounds adjacent to Great and Little Bahama Bank. The additional stratigraphic data from the cruise will make more accurate age interpretation of the mounds possible. The number of mounds will be calculated for each bank and their general distribution will be assessed with respect to morphologic features, such as gullies and slump scars.

The piston core through the mound will reveal the growth rate and pattern of cold-water coral mounds and document the early diagenetic processes in the mound.

References

- Grasmueck, M., Eberli, G.P., Viggiano, D.A., Correa, T., Rathwell, G., and Luo J., 2006, Autonomous underwater vehicle (AUV) mapping reveals coral mound distribution, morphology, and oceanography in deep water of the Straits of Florida. *Geophysical Research Letters*, v. 33, L23616, doi:10.1029/2006GL027734
- M. Grasmueck, Eberli, G.P. Correa, T.B.S., Viggiano, D.A. , Luo, J., Reed, J.K., Wright, A.E. and Pomponi, S.A. , 2007, AUV-Based Environmental Characterization of Deep-Water Coral Mounds in the Straits of Florida. OTC 18510, Houston, p. 1-11.
- Eberli, G.P, Correa, T., Grasmueck, M., McNeill, D.F., and Andres, M., 2006, Geological Perspective and Reservoir Potential of Deep Water Coral Mounds. CSL annual meeting meeting, p. 77-78.