HABITAT MAP AND GEOMORPHOMETRY OF EAST CAMPECHE BANK: A PROXY FOR CURRENT DIRECTIONS

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PROJECT OBJECTIVES

- Geomorphometric analysis and topographic classification of the multibeam data of Campeche Bank.
- Develop a hydrodynamic model in order to obtain a proxy for local/regional currents and relate to coral-habitat distribution.

PROJECT RATIONALE

Campeche Bank, the submerged remnant of a larger bank that drowned in the Mid-Cretaceous, and the adjacent Yucatan Strait are under the influence of two current systems; 1) the northbound Loop current and 2) a benthic countercurrent underneath (Hübscher et al., 2010). High-resolution current models (NOAA) display two dominant current directions affecting Campeche Bank seasonally (Fig. 1). On the upper slope of the Campeche Bank a large cold-water coral (CWC) province exists in intermediate water depths of 500 to 600 m where 20–40 m high elongated coral mounds are arranged in a honeycomb fashion (Hebbeln et al., 2012). The CWC province is located where upwelling, a dynamic bottom current regime, and a physicochemical setting provide ideal conditions for coral growth (Hebbeln et al., 2014). This project tests the hypothesis that sediment distribution and the orientation of sea-floor-mound topography are directly related to the current system.

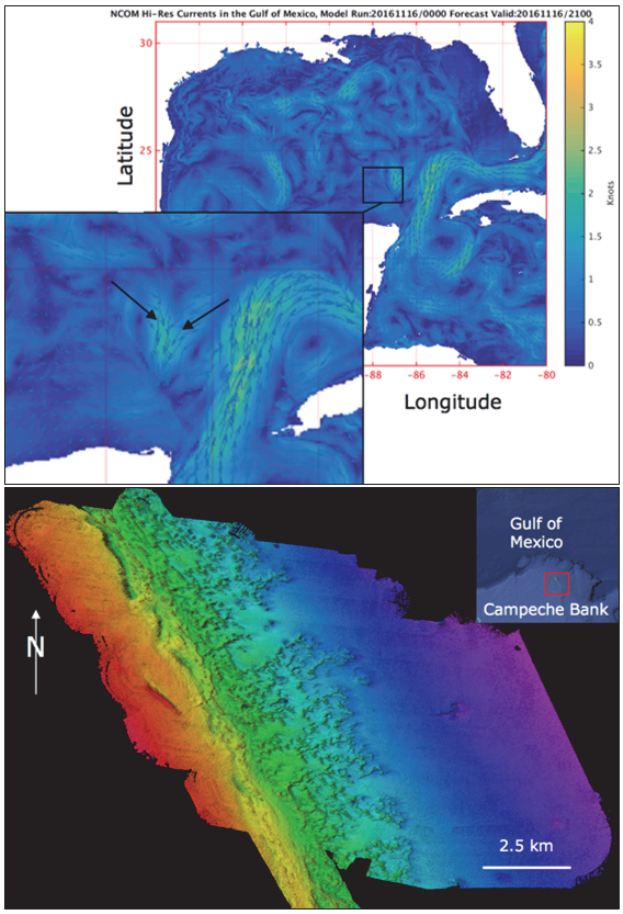

Figure 1. Top: NCOM high-resolution current model in the Gulf of Mexico (from NOAA). Bottom: Multibeam bathymetry of the upper slope of the Campeche Bank with cold-water coral ridges that are onlapped by the muddy sediments of the middle slope. The alignment of the ridges is likely the result of the current directions across this part of the slope.

Cold-water coral ecosystem of Campeche Bank

In the Campeche CWC province coral colonization preferentially occurs from the mid-slope of the elongated mounds towards their peaks (Hebbeln et al., 2012). Coral rubble is deposited on the flanks of the mounds interfingering with a muddy seabed, and small coral thickets grow within the muddy areas where coral rubble is exposed. The pelagic ooze is transported in a NE flow and collects between the coral-covered ridges and in the lower portions of the slope forming a mud-draped seabed (Hebbeln et al., 2014).

Faunal assemblages consist of *Enallopsammia profunda* and *Lophelia pertusa* as the dominant reef-building framework. *E. profunda* thickets form in the mid-slope region while towards the mound peaks, *L. pertusa* dominates (Hebbeln et al., 2012, 2014). The frameworks are mostly built from individual colonies, however, secondary fusion is observed within a number of coral colonies to form a larger structure. Numerous other benthic organisms are reliant on these CWC reefs including crinoids, anemones, echinoderms, sponges, decapods, fish, and crustaceans.

WORK PLAN

High-resolution multibeam bathymetric data and sub-bottom profiles acquired during MSM 20-4 show that the CWC-ridges are aligned in a bidirectional way, resulting in an apparent "honeycomb pattern" (Fig. 1). In this study we plan to perform a classification of the topographic elements and geomorphometric analysis of their orientation as a proxy for current direction. The preferential alignment of CWCs due to feeding purposes will help establish the habitat map for the region. The results will be compared to currently used hydrodynamic models.

SIGNIFICANCE

The goal of the study is to relate morphometric features to physical (current) and biological processes that might be a guide for interpreting current regimes from seismic data.

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