OVER THE EDGE: LINKING ON-PLATFORM PROCESSES TO DEPOSITION OFF THE MARGIN OF THE GREAT BAHAMA BANK

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PROJECT OBJECTIVES

- To assess the Great Bahama Bank (GBB) sediment budget.
- Reconcile platform-top sediment production and transport with off-platform deposition.

PROJECT RATIONALE

Since reflooding of the platform top ~6 ky ago during the Holocene transgression, Great Bahama Bank (GBB) has yet to fill its accommodation space (Purkis and Harris, 2016). This situation flouts conventional sequence stratigraphic principles. Given our estimates of GBB's ability to over produce sediment, how can accommodation be regionally unfilled during the Holocene highstand? Our hypothesis is simple – sediment transport.

To test this hypothesis, we must compare sediment production and transport against the volumes of sediment actually deposited off the platform's flanks (Fig. 1). Here, sediments residing on the slope, show substantial along-strike variability in their sedimentary facies (Anselmetti et al., 2000; Mulder et al., 2012). However, it remains unclear whether this heterogeneity is due to the variation in sediment producers which inhabit the margin, or can

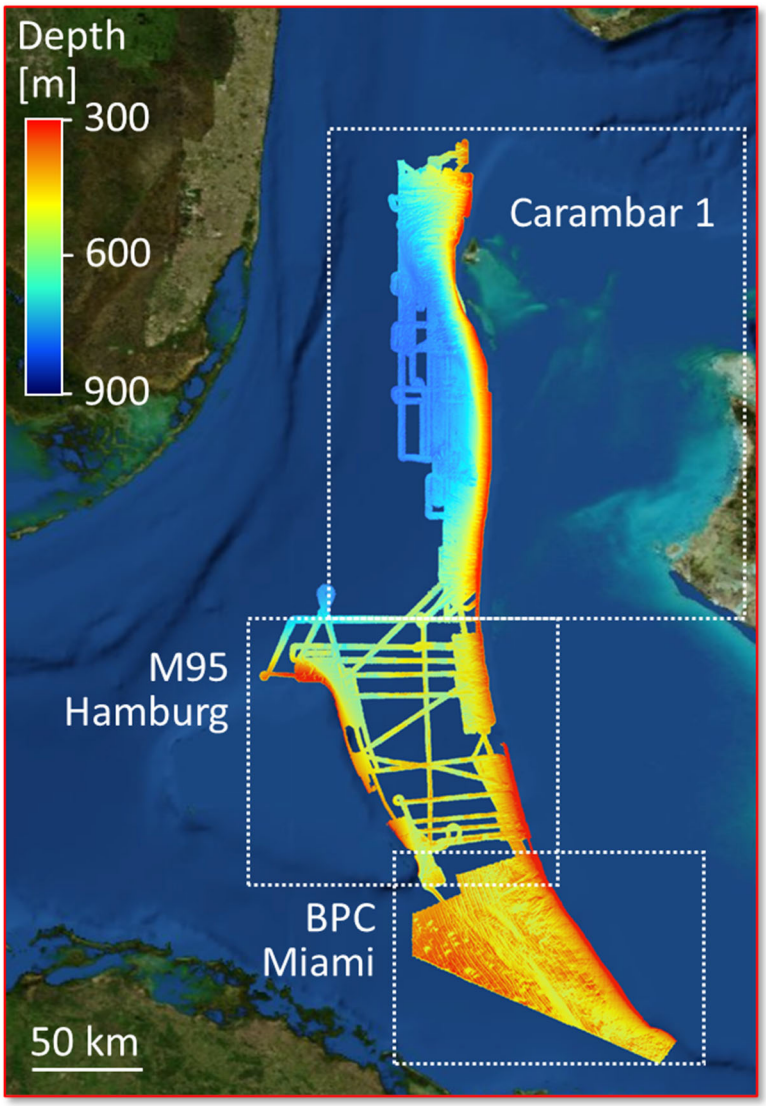

Figure 1: Bathymetry and CHIRP seismic surveys on the western margin of the Great Bahama Bank. Datasets will be used to assess off-platform sediment volumes and facies.

be attributed to the mosaic of producers atop the platform, which link to the slope via lengthy transport pathways.

Atop the platform, our hydrodynamic model indicates sediment can be transported up to 300 km/yr under fair-weather conditions. Further simulation of Category 4 Hurricane Matthew (Oct. 5th, 2016) suggests that sediment transport can be amplified by a factor of four during the two days that the storm raged, as compared to a full year of fair-weather conditions. The extended cross-platform transport of sediment implied by the modelling is capable of delivering substantial quantities over the platform margin, onto the slope of GBB, and beyond. Such loss of material from the platform-top is an essential ingredient of any comprehensive sediment budget and is the motivation for this study. Building off the decades of research conducted by our CSL collaborators, past and present, we intend to marry our platform-top hydrodynamic modelling with off-platform geophysical data. The intended outcome is an elevated understanding of the drivers of facies heterogeneity on the flanks of the GBB.

APPROACH

Satellite-retrieved water turbidity measurements will be compared to model outputs during fair- and storm-weather conditions to quantify their ability to loft and transport sediment. Next, the quantity of sediment lost from the platform in our model will be compared to seismic-derived volumes that have accumulated on the western margin of GBB.

SIGNIFICANCE

Accurate knowledge of sediment production and water movement atop GBB is paramount to understanding the volumetric significance of sediment dispersal. All these processes influence platform-top sedimentation, slope architecture, and facies anatomy.

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