HIGH-RESOLUTION CARBONATE SLOPE MORPHOLOGY REVEALING SEDIMENT TRANSFER FROM BANK-TO-SLOPE (LITTLE BAHAMA BANK, BAHAMAS)

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New very high-resolution multibeam and seismic data (CARAMBAR 1.5 cruise – 2014) allow imaging of a large part of the uppermost slope of Northeastern Little Bahama Bank between 20 and 300 m water depth. They add to data collected during Carambar cruise (2010). The data provide insight into sediment transfer from the shallow carbonate bank (< 10 m) to the adjacent slope. Several submerged coral terraces and escarpments dominate the morphology of the upper part of the uppermost slope. The terraces could be related to Late Quaternary eustatic variations and are interpreted either as sea-level stillstands or as waveravinement surfaces. Increased erosion by waves during either periods of stagnating sea-level, or periods of accelerated sea-level rise since the Last Glacial Maximum could be a possible cause for these terraces.

The lower part of the uppermost slope shows a discontinuous Holocene sediment wedge with varying thickness between 0 and 35 m. It is separated from the upper part by a highly cemented sea-floor area forming the marginal escarpment at the base of the lowermost terrace. Passing cold fronts result in sediment export caused by density cascading. The probable associated sediment fall-out and convective sedimentation can generate deposition of periplatform ooze that forms this Holocene wedge. Wedge destabilization can be the cause of the linear structures extending downward on the upper slope. In addition, the survey reveals the presence of recently active channels that extend over the entire uppermost slope and interrupt the wedge. These channels are settled on the side of sub marine cone shaped topographic highs representing probably the remnants of lowstand deltas that were active during the Last Glacial Maximum. The channels connect upslope to disrupted parts of the barrier, which form passes between small islands and shoals. In these passes, acceleration of tidal currents at velocity > 1 m/s allows downslope export of fine-grained carbonates whilst coarse-grained particles such as ooids and bioclasts remain trapped in tidal deltas. The successive connection of channels to shallow tidal passes to submarine valleys to the proximal part of canyons directly feeds these canyons with platform-derived sediment forming very low-density turbidity currents transporting fine-grained particles. The currents deposit a fine-grained carbonate mud blanket within the canyon, which extends from canyon head down to thin lobes up to 40 km downslope. At present-day, most of sediment export would thus be due to tidal currents with increased activity during ebb tides, occurring after hurricanes or passing cold fronts generating density cascading.

Little Bahama Bank shows at least two major periods of activity: canyon formation by retrogressive erosion and partial filling during highstand periods when carbonate platform is flooded and the carbonate factory is active. During largest highstand, carbonate production is intensified and export can lead to the construction of small channel levee complexes.