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A new vision of carbonate slopes: the Little Bahama Bank

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Recent high-quality multibeam and seismic data allow to image a large part of the uppermost slope of Northeastern Little Bahama Bank between 30 and 400 m water depth and to characterize the uppermost slope (Rankey and Doolitle, 1992) over a surface of 170 km2. The new data set includes multibeam bathymetry and acoustic imagery, 3.5 kHz very-high resolution (VHR) seismic reflexion lines (1120 km), 21 gravity cores and 11 Van Veen grabs. This dataset completes the recent surveys of the slope adjacent to LBB (Carambar cruise, Mulder et al, 2012). The data provide insight into sediment transfer from the shallow carbonate bank to the adjacent slope. Four major terraces and escarpments dominate the morphology of the slope. The terraces are located at 22 m, 27-33 m, 40-46 and 55-64 m below present water depth (mpwd). They could either be related to periods of stagnating sea-level and therefore increased erosion by waves, or periods of accelerated sea-level rise since the Last Glacial Maximum. Escarpments bound the terraces. The deepest one (64-56 mpwd) is also the steepest 35-50°). It corresponds to the marginal scarp of Rankey and Doolitle (1992). The lower part of the uppermost slope shows a discontinuous Holocene sediment wedge with varying thickness between 0 and 35 m. It forms a blind or very crudely stratified echo facies. This Holocene unit can be thicker than 20 m and consists of mud that forms most of the present sediment export. This unit fills small depressions in the substratum and thickens in front of gullies that cut the carbonate platform edge. It forms by off-bank export initiated when a cold front passes by, resulting in density cascading currents. The associated sediment fall-out and convective sedimentation can generate density currents that flow through linear structures on the upper slope. The survey reveals the presence of recently active channels that extend laterally over the entire uppermost slope and interrupt the density cascading fall-out wedge. At channel location, Holocene wedge is absent. At present, the platform-derived sediments are transported downslope only in areas where a barrier is absent, i.e. between cays and shoals. Tidal energy increases at these positions and density currents can flow through small channels extending along the uppermost slope. The channels transport sediments to submarine valleys on the upper slope which connect to canyons further downslope.

References

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