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A new vision of carbonate slopes: the Little Bahama Bank

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Recent data collected in November 2014 (RV Walton Smith) on the upper slope of the Little Bahama Bank (LBB) between 30 and 400 m water depth allowed to characterize the uppermost slope (Rankey et al., 2012) over a surface of 170 km2. The new data set includes multibeam bathymetry and acoustic imagery, 3.5 kHz very-high resolution (VHR) seismic reflection lines, 21 gravity cores and 11 Van Veen grabs. The upper slope of the LBB does not show a steep submarine cliff as known from western Great Bahama Bank. The carbonate bank progressively deepens towards the basin through a slighty inclined plateau. The slope value is < 6° down to a water depth of about 70 m. The plateau is incised by decameter-wide gullies that covered with indurated sediment. Some of the gullies like Roberts Cuts show a larger size and may play an important role in sediment transfer from the shallow-water carbonate bank down to the canyon heads at 400-500 m water depth (Mulder et al., 2012). In the gully area, the actual reef rests on paleo-reefs that outcrop at a water depth of about 40 m. These paleo-reef structures could represent reefs that established themselves during past periods of sea-level stagnation. Below this water depth, the slope steepens up to 30° to form the marginal escarpment (Rankey et al., 2012), which is succeeded by the open margin realm (Rankey et al., 2012). The slope inclination value decreases at about 180-200 m water depth. Between 20 and 200 m of water depth, the VHR seismic shows no seafloor sub-bottom reflector. Between 180 and 320 m water depth, the seafloor smoothens. The VHR seismic shows an onlapping sediment wedge, which starts in this water depth and shows a blind or very crudely stratified echo facies. The sediment thickness of this Holocene unit may exceed 20 m. It fills small depressions in the substratum and thickens in front of gullies that cut the carbonate platform edge.
Sediment samples show the abundancy of carbonate mud on the present Bahamian seafloor. In gullies, coarser sediment can be found. In some case, soft sediments are absent suggesting by-passing. At water depth between 40 and 100 m, the present-day seafloor is covered with bioclastic sediments. The main carbonate producer seems to be the alga genus Halimeda.

Sediments collected in the deeper part of the basin (water depth = 1080 m) on the distal lobe consist of massive fine to medium well-sorted aragonitic sand. This suggests that carbonate slope systems are able to sort sediment despite the relative short slope distance. Sorting could either be due to flow spilling above the terraces identified in the canyon heads (Mulder et al., 2012) or could result from bottom currents. In this area, flow velocity profiles in the water column show the presence of two superposed water masses with a pycnocline at about 600-700 m water depth.

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