

GIANT CANYONS AND VALLEYS IN DEEP-SEA CARBONATE SLOPES (BAHAMAS)

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New high-resolution multibeam mapping, backscatter imaging and very-high resolution seismics expose in great details the deep-water sedimentary system in the southern part of Exuma Sound (ES) and the northern part of Little Bahama Bank (LBB, Bahamas). The data reveal the detailed and complex morphology of giant valleys like the Great and Little Abaco canyons (GAC and LAC) along the LBB slope, and the Exuma Valley/Canyon in the ES area. These valleys funnel numerous gravity flows. In GAC, finely-grained sediments originate essentially from the canyon flanks, driven by sediment slides as well as many secondary slope gullies and smaller tributaries. In LAC, gullies directly drain the upper LBB slope providing coarser particles. In the Exuma Valley/ Canyon, a part of the material comes from the slope of adjacent islands and cays through small-scale gravity processes and mass failures, which add to sediments derived from the upper slope that enter the system through tidal passes. A substantial part of the sediments also originate from alongslope sediment flow erosion. In both areas, the valleys abruptly turn into deep canyons incising the Bahama Escarpment (BE). The canyons link the LBB and ES sedimentary systems to the deep abyssal plain of the Western North Atlantic where water depth exceeds 5,000 m. The transition occurs through major knickpoints with outsized chutes exceeding several hundred of meters in height. The sudden transformation from a wide valley to a deep narrow canyon occurs as a result of flow erosion of the underlying lower Cretaceous carbonate platform stack. Huge hydraulic jumps as well as enormous and permanent plunge pools and related deposits were identified at the transition. In ES, the high kinetic flow energy constrained by narrow and deeply incised canyon formed a wide fan-shaped channel-levee complex on the abyssal plain. The latter is made up of coarse-grained carbonate turbidites and concentrated density-flow deposits that are mixed with fine-grained siliciclastics transported along the BE by the energetic Western Boundary Undercurrent (WBUC). Conversely the canyon mouth of the LBB system only reveals a small lobate structure with a thickness that does not balance the volume of sediment eroded in the canyon, probably because of the pirating of fine-grained sediment by the WBUC. Both canyon systems show different input characteristics, similar erosional morphologies cutting in the underlying carbonate platform deposits with major knickpoints, and different sedimentation patterns at their end points on the abyssal plains related to the impact of the deep-water currents.

References

T. Mulder et al., *Geology*, 2018, **46**(1), 31–34.