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First discovery of channel-levee complexes in a modern deep-water carbonate slope environment in Bahamas

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New high-quality very-high-resolution seismic data along the western slope of the Great Bahama Bank reveals the presence of the first modern channel-levee complex developed in a pure carbonate setting along the western slope of the Gran Bahama Bank (Andros Island, Bahamas).

This complex has presently a very subtle morphology on the actual seafloor. The last complex grew over two buried complexes separated by erosion surfaces suggesting both the continuity of downslope gravity-driven processes along this carbonate slope, and the channel migration through avulsion processes similar to what happens along a siliciclastic slope. Complex morphology and geometry are similar to analogs described in siliciclastic systems but size of the presented carbonate complex is substantially smaller (length = 9 km; width = 4 km). Both high-resolution seismics and core studies show that this complex was built by the stacking of gravity-flow deposits, including turbidites, but it is presently inactive and buried by deposits resulting from hemipelagic fallout or low-energy density processes channeled by the gully network, which are permanently reworked by along-slope bottom currents dominated by internal tides. The channel-levee surface is now covered with antidune-like bedforms probably related to density-cascading-induced downslope currents. The recent and present channel dissymmetry is probably related to the activity of the northward moving Santaren current.

The discovery of channel-levee complexes has major implications both on the conceptual models describing the behavior of carbonate slope systems and on hydrocarbon exploration by enhancing the reservoir-bearing potential of carbonate slopes.

In addition, these finding can have impact on living benthic biologic community (such as those occupying deep-sea carbonate mound, because a part of nutriments could be supplied by turbidity. Finally, importance of turbidity currents in remolding carbonate slope can also impact the Global Carbon cycle because the transport of mineral carbon to deeper seas by turbidity currents could induce carbonate dissolution and recycling on carbon in the global cycle.