Sedimentary dynamic and associated morphologies of the northern slope of Little Bahamas Bank (LBB): a re-evaluation of the carbonate base of slope apron model

Tournadour, E.[1], Mulder, T.[1], Borgomano, J.[2], Chabaud, L.[1], Hanquiez, V.[1]

[1] UMR 5805 EPOC, Université de Bordeaux, Pessac Cedex – France - e.tournadour@epoc.u-bordeaux1.fr
[2] Total, CSTJF, Pau Cedex – France

The northern slope of Little Bahama Bank (LBB) has been considered as a typical modern example of a base of slope apron, in opposition to the classic submarine fan model, essentially because of the lack of a clear architectural organisation, e.g., the development of channelised geometries, levees and depositional lobes. However, thanks to the new set of data collected during the recent Carambar cruise (Nov. 2010), several types of architectural elements have been identified and induce a re-evaluation of previous models.

An integrated approach is proposed, from a multi-scale geophysical dataset (multibeam echosounder, 3.5 kHz/Chirp profiles and 2D multichannel seismic lines) and gravity cores. It allows to distinguish three main parts along the slope, according to the slope degree, facies pattern and architectural element distribution. (1) The platform margin is associated with a steep slope until 400 m water depth, and is characterised both by bypass and depositional processes, the latter leading to the development of a thick sediment wedge. (2) The upper-middle slope is mainly composed of periplatform ooze with a downslope decrease of submarine cementation. This part is incised by 18 canyons associated with wedge-shaped and/or aggrading terraces bordering their talwegs. These complex canyon morphologies appear to be controlled by the interplay between internal slope slides, regressive erosion, diagenetic cementation and turbidity current activity. (3) The end of canyons, at 950 m water depth, marks the beginning of the lower slope where canyon mouths open to several shallow distributary furrows. These shallow furrows are filled by very fine-grained carbonate sand and stop on the distal lower slope in partially confined depositional areas, at about 1150 m water depth. In addition, the lower slope is also characterised by erosional structures oriented in a NW direction, highlighting the Antilles Current action that reworks sediments in the eastern part and deposits fine-grained sediments in the western part, hence contributing to the contourite LBB Drift growth.

This study shows that the base of slope apron model is too restrictive to describe the northern slope of LBB. Indeed the sedimentary dynamic and associated morphologies occurring on this slope are not limited to a platform-parallel apron of debris fed by coarse gravity deposits originating from internal slope erosion, but are the results of the combined action of off-bank transport, turbidity currents and bottom currents. These processes induce a sorting of particles and the onset of distinct deep-water architectural elements that are specific to Bahamian carbonate slopes.