

Detailed geomorphology and surficial geology of the outer Nova Scotia margin

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Most of the western North Atlantic margin has a relatively steep, eroded upper slope and a gentle, constructional lower slope. Along the lower slope south of Nova Scotia, a second break in slope occurs between the 4500 m and 5000 m isobaths. This subtle but consistent reduction in slope gradient tends to divide slopes $>0.5^\circ$ from slopes $<0.5^\circ$. Prior to this study, it was not apparent if this gradient change coincides with a major change in surficial depositional processes, subsurface depositional processes, or if it is structurally controlled. During August 2012, 135 000 km² of multibeam bathymetry and 10 000 km-line of sub-bottom profiler data were collected along the outer Nova Scotia margin, from the area seaward of Georges Bank to Laurentian Fan. The purpose was to accurately map the geomorphology of this area and determine surficial geological processes.

The data reveal that canyons on the upper Scotian Slope coalesce to form valleys on the lower slope. Most of the valleys extend seaward of the new data limits, beyond the 5000 m isobath. Exceptions are several canyons on the central slope that terminate in a 100 km-wide, escarpment-bound depression that likely formed through seabed failure. Inter-valley areas on the lower slope are dominated by mass transport deposits sourced from upslope sediment failure, or well-stratified deposits of interbedded turbidites and hemipelagic deposits. Along the western slope, sandy deposits of Northeast Fan, a major glaciogenic submarine fan, dominate the surficial geology and likely extend as far south as the New England Seamounts. An extensive zone of mass transport deposits lies immediately west of Verrill Canyon and may have initiated on the flanks of shallow salt diapirs further upslope. The western levee of Laurentian Fan forms a major morphological feature on the margin. These new data show that mass transport deposits are the main depositional feature of the seabed and shallow sub-surface of the levee. Results of this study do not show a significant change in surficial slope processes across the lower slope gradient change suggesting that the change is inherited morphology due to processes that occurred earlier along the margin.