Geomorphology of the Northwest Atlantic continental margin: the role of deep sea sedimentation processes

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Deep-sea sedimentation processes impart a fundamental control on the morphology of the western North Atlantic continental margin from Blake Spur to Hudson Strait. This fact is illustrated by the variable patterns of cross-margin gradients that are based on extensive new multibeam echo-sounder data in concert with subbottom profiler and seismic reflection data. Most of the continental margin has a steep (>3^{o}) upper slope down to 1500 to 2500 m and then a gradual middle and lower slope with a general concave upward shape There is a constant interplay of deep sea sedimentation processes, but the general morphology is dictated by the dominant one. Erosion by off-shelf sediment transport in turbidity currents creating channels, gullies and canyons creates the steep upper slope. These gullies and canyons amalgamate to form singular channels that are conduits to the abyssal plain. This process results in a general seaward flattening of gradients, producing a concave-upward continuous, curvilinear slope profile. Comparatively, sediment mass failure produces steeper upper slopes due to head scarp development and a wedging architecture to the lower slope as deposits thin in the downslope direction. This process results in either a two-segment slope, and/or a significant downslope gradient change where MTDs pinch out.

Large sediment bodies deposited by contour-following currents are developed all along the margin. Blake Ridge, Sackville Spur, and Hamilton Spur are large detached drifts on disparate parts of the margin. Along their crests, they form a linear profile from the shelf to abyssal plain. Deeper portions of the US continental margin are dominated by the Chesapeake Drift and Hatteras Outer Ridge; both plastered elongate mounded drifts. Farther north, particularly on the Grand Banks margin, are plastered and separated drifts. These drifts tend to form bathymetric steps in profile, where they onlap the margin. Stacked drifts create several steps. Turbidites of the abyssal plain onlap the lowermost drift creating a significant gradient change at this juncture. Understanding the geomorphological consequences of deep sea sedimentation processes is important to extended continental shelf mapping, for example, in which gradient change is a critical metric.