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The Formation of a Miocene Deepwater Erosional Unconformity and the Effects on Subsequent Deposition Patterns on the Western Scotian Slope, Canada

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Abstract
Sequence stratigraphic concepts on clastic continental margins rely on the interplay of sealevel and sedimentation, however major extraneous factors on the SW continental margin of Nova Scotia introduce complexities that make conventional sequence stratigraphic techniques impractical. In this area, depositional patterns are dependant on both down-slope and along-slope sedimentary processes and local changes in seafloor topography. This study examines the seismic reflection character of a major deepwater erosional unconformity on the western Scotian Slope, the factors that lead to its formation, and its impact on subsequent deposition patterns.

The deepwater western Scotian margin is an under-filled basin developed seaward of a major carbonate bank. Detailed mapping of the Cenozoic section in 2D and 3D seismic reflection datasets reveals a prominent erosional unconformity that is likely Middle to Late Miocene age. The erosional character of this surface is recognized over an area of >20 000 km^2 and is confined to the lower slope and rise in the western part of the study area. The unconformity is the product of a number of erosion events that over-steepened the lower slope. Shelfward and basinward, the surface is more conformable and the erosional character is less apparent.

Sediment bypass across the unconformity is evident as the lower slope responded to the changed configuration and sediment aggraded at the toe of the slope. The first sediments to onlap the unconformity at the toe of the slope are mass transport deposits, indicating lower slope mass wasting processes contributed to the initial unconformity formation. Bottom current deposits of Late Miocene and Pliocene age overlie the mass transport deposits and onlap the unconformity, creating complicated seismic-scale bedforms as they accreted against the erosion surface. In some areas these bedforms built the seabed above grade, trapping subsequent down-slope flows. Eventually, Pliocene to Quaternary age mass wasting and gravity-driven deposits sourced from the upper slope filled and smoothed the topography.

The results present an example of an extensive erosional unconformity developed in a lower continental slope setting outside of the direct influence of changing sealevel. The periodic, instantaneous modification of seabed through mass wasting had long lasting effects on subsequent deposition patterns in the study area, creating an area of prolonged slope bypass and instability. Bottom current deposits contributed significantly to construction at the toe of slope and their unique geomorphology provided a mechanism for trapping sediment gravity flows which may have otherwise escaped to deeper parts of the basin.