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UPDATED SURFICIAL GEOLOGY COMPILATION OF THE SCOTIAN SHELF BIOREGION, OFFSHORE NOVA SCOTIA AND NEW BRUNSWICK, CANADA

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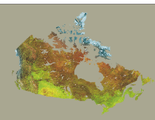

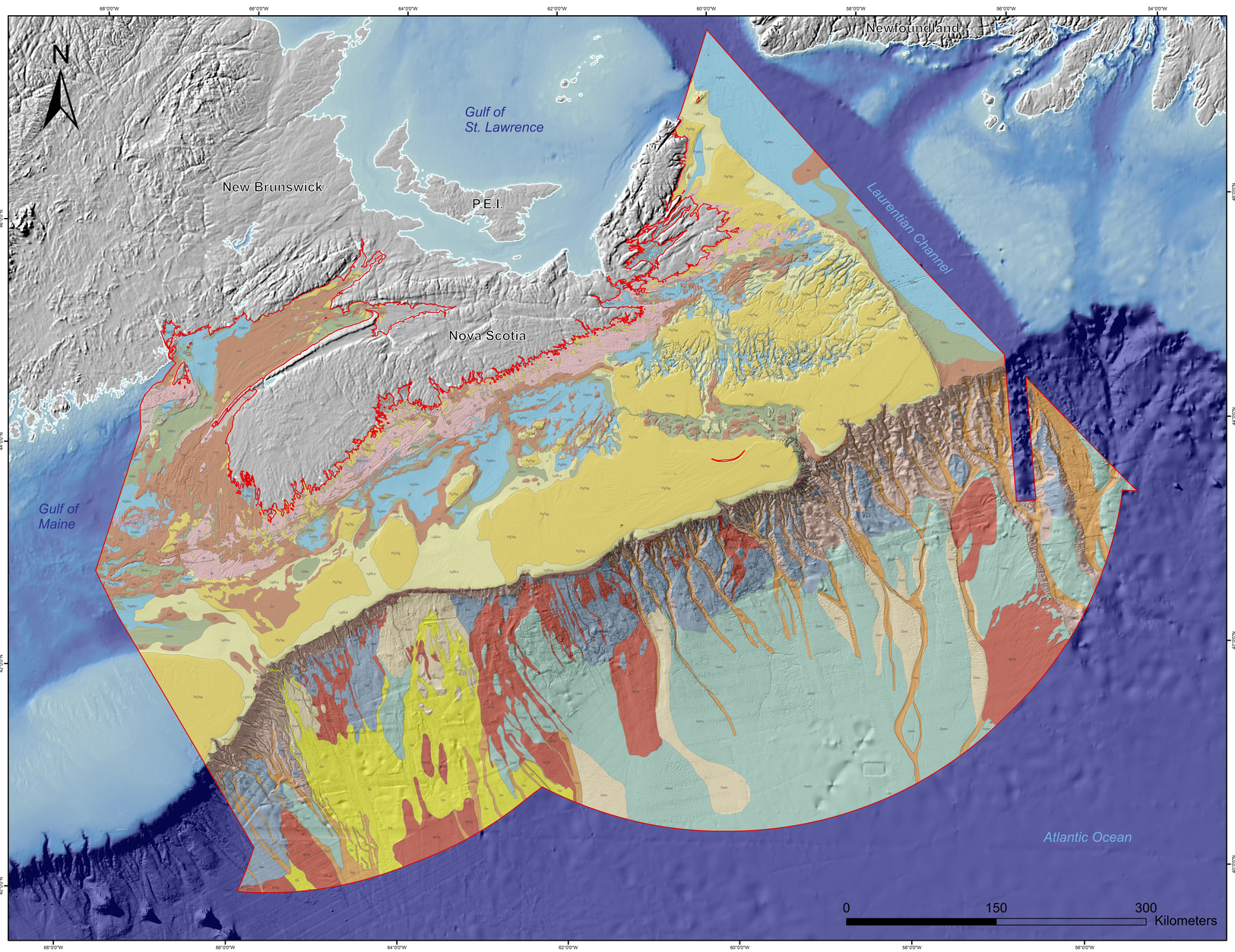

CONTEXT

This poster presents the results of the updated surficial geology compilation of the Scotian Shelf Bioregion. Details about the context and objectives of this study, methods, detailed results and references are provided in the associated open file report.

SURFICIAL GEOLOGY LEGEND

SURFICIAL GEOLOGY UNITS ON THE SCOTIAN SHELF

PgTsg — **Postglacial Transgressive Sand and Gravel:** Predominately composed of sand, gravelly sand or patchy gravel. Generally present on banks and the inner shelf in water depths less than 120 m. Generally less than 1–2 m thick, but much thicker on eastern outer shelf banks. Comprises the coarser remnants of reworked glacial deposits and other bank sediments following glacial retreat when low sea-level exposed them to subaerial weathering and erosion. Reworked and transported by wave and current action in littoral and sublittoral environments during the subsequent transgression (late Pleistocene and early Holocene). The finer grained sublittoral facies equivalents of this unit are LgSLs. Much of the sand was swept off bank areas, contributing to shelf-edge canyon development (erosion) and thalweg deposits. Some was preserved in thick (many metres), prograded sheets in an evolving transport pattern with sea level rise. Some entire banks were swept free of sand, leaving dominant gravel distribution. These sediments (up to small gravel size) can be reworked and redistributed in the upper centimetres or decimetres by bottom currents and storm waves. Patchiness is generally governed by diverse bedforms (dunes) generating sandy crests and gravelly troughs with metres to hundreds of metres spacing, especially in shallow (<30 m) water. Relict bedforms can be locally preserved in deeper areas. Time-transgressive genesis, from time of glacial retreat in deeper water depths to present day in shallow water depths. Locally reworked into periodically active bedforms (sand with gravel troughs), locally deeper in current-influenced channels.

PgUn — **Undifferenciated Postglacial Sediments:** Characterized by a smooth surface in bathymetric data. Identified in areas where no further data beside bathymetry provide insight into the nature of the deposit. Located on the shelf, close to the coastline. Could either correspond to postglacial mud, postglacial sand or postglacial sand and gravel with possible bedrock and/or till outcrops. This interpretation is based on the context of the region and knowledge of the geological history of the area.

PgMm — **Postglacial Marine Mud:** Mud consisting mostly of silty clay and clayey silt. Corresponds to the winnowing of silt and clay from glacial debris on banks during late Pleistocene and early Holocene sea-level rise, where finer material was deposited in lower lying depressions. This postglacial sediment has a predominantly ponded sedimentary style. Overlies glacial drift and glacial marine mud. It is a lateral equivalent to the postglacial sand and gravel. Mainly confined to basins and local depressions on the shelf.

LgSLs — **Late Glacial Sublittoral Sand:** Muddy sand or silt with little gravel. Generally a thin (<1 metre) wedge, thinning significantly in deeper water depth. Generally restricted to a band along bank edges and along submarine terraces in water depths > 120 m, but may also be found in small embayments. Deposited in a mostly proglacial environment, along the littoral of the Late Pleistocene shoreline during sea level low stand. Locally reworked into periodically active bedforms. May overlie glacial diamict and may underlie postglacial sand and gravel. Some time equivalency with latest deposits of GMm and earliest PgMm and PgTsg.

GMm — **Glacial Marine Mud:** Clayey to silty mud with variable content of scattered clasts. Distributed principally partially infilling large basins on the shelf in over 110 m water depth, overlying or locally interfingering with the glacial diamict map unit (Gd), near paleo-glacial margins. Up to tens of metres thick, generally >15 m, while thinning to zero at basin margins. Generally covered with postglacial mud (PgMm) in basins, but in shallower water depths commonly occurs as pockets in smaller topographic lows. Locally the uppermost surface has been partly eroded (up to several metres removed), developing a thin (centimetres to decimetres) surficial sandy and/or gravelly lag (PgTsg). Deposited during the last glaciation (~20 to 14 ka) beyond the ice sheet by proglacial meltwater plumes in a proximal to distal marine environment. Proximity of the ice front can be tens of kilometres distant, influencing the texture of the unit. Where present, clasts are generally ice-rafted debris while sand or mud layers were deposited from turbidity currents.

Gd — **Glacial Diamict:** Poorly sorted homogeneous mixtures of mud with matrix-supported sand, gravel and cobble clasts. Generally competent. Dense to very stiff. Diamict can be referred to as glacial diamict or till where recognized as being deposited in direct contact with ice. Diamict has strong glacigenic origin in the study area, but is not necessarily all till. Commonly occurs on the inner shelf as multiple moraines at various scales. Less commonly occurs as drumlins, grounding zone wedges or variably thick (up to tens of metres) blankets with glacially sculpted surface (fluting or similar glacial lineations), indicating a subglacial and glacial margin origin. Its upper surface is commonly iceberg-turbated along the flanks of banks and shelf edge. Commonly overlain by sand and gravel and boulder lag deposits or by glacial marine mud and postglacial mud. Generally differentiated from map unit Br by geomorphic elements, samples or homogeneous body character where seismic profiles depict acoustic penetration which is not common in bedrock. Chronology assessments invariably indicate deposition during the last glaciation, but with a complex and time-transgressive glacier flow and margin retreat pattern governed by basin and trough elements yet with a general retreat from west to east and from the shelf edge to the shoreline.

BrGdUn — **Undifferenciated Bedrock or Glacial Diamict:** Chaotic and rugose surface on bathymetric/topographic renderings. Located on the inner shelf close to the coastline. Characterized by an undifferentiated, possibly patchy combination of map units Br and Gd. Bedrock and till are generally differentiated from detailed geomorphic elements; bedrock exhibits differential bedding relief, strike, sharp and irregular relief and acoustic basement while the diamict permits acoustic penetration, returns a homogeneous internal seismic character and smoother, but equal relief. Further, they can occur juxtaposed or with Gd cover on bedrock. Thus, their differentiation can be challenging, especially where lacking appropriate survey data, adequate resolution or further supporting data. This map unit encompasses areas where their differentiation is not sufficient to trace contacts beyond limited survey control.

Br — **Bedrock:** Dominated by bedrock of various types and ages. Inner shelf areas dominated by granite or very competent schist, shale, or quartzite of Paleozoic age. Generally more diverse, older and competent rock types off Cape Breton. Mid and outer shelf outcrops are rare, mainly in the canyon walls along the continental slope, and comprise less competent Cenozoic age shales and sandstones. Inner shelf bedrock exposures are generally higher relief than in sediment-covered areas, exhibiting exposed mound or ridge and intervening hole or trough relief, reflecting alternating rock types or differential glacial sculpting. Relief can also be governed by bedrock structure, jointed or faulted; regional patterns can follow broad fold structure. Depressions are commonly partly sediment-filled, washed from the adjacent highs under past coastal conditions. This fill is generally patchy and can be composed of thin mud, sand, gravel and cobble or boulder lags and less commonly pockets of till or moraines.

SURFICIAL GEOLOGY UNITS ON THE SCOTIAN SLOPE

Hm — **Hemipelagic Mud:** Silty and clayey mud, may contain sparse clasts. Mostly present on inter-canyon ridges. Generally 1 to 3 m thick. Deposited by suspension settling sourced from adjacent shelf. Clasts are likely ice-rafted. Sand and mud layers deposited from turbidity currents in adjacent canyon thalwegs. This map unit may be under-represented across large parts of the slope because it is thin, faithfully drapes underlying topography and thus may be largely unrecognized from most hydroacoustic images.

Gsg — **Proglacial Sand and Gravel:** Predominantly comprised of mixed sand and gravel confined to large down-slope channels and canyon floors. Deposited during the Late Pleistocene by high velocity sediment density currents at the front of the ice sheet. May be covered in places with a thin drape of pelagic or hemipelagic sediment (Hm).

Gs — **Proglacial Sand:** Thin sand-rich sheets on the mid to lower slope, generally associated with down-slope channels. Recognized largely from high acoustic backscatter values. Deposited during the Late Pleistocene by sediment density currents at the front of the ice sheet. Mostly located on gently sloping deep-sea fans beyond the mouth of canyons. Generally associated with turbidite sand sheets.

Gsm — **Interbedded Sand and Mud:** Sandy mud, often stratified, and may contain occasional ice-rafted debris. Up to tens of metres thick, generally preserved on the mid or upper slope and commonly associated with large down-slope channels. Deposited during the Late Pleistocene, beyond the front of the ice sheet by sediment density currents. Generally associated with sediment waves and/or flow lineations on levees, differentiating them from map unit Gstm. May have a very thin (decimeters) cover of Hm.

Gstm — **Interbedded Silt and Mud:** Silty mud, often stratified, and may contain occasional ice-rafted debris. Up to tens of metres thick, generally preserved on the mid to lower slope, deposited during the Late Pleistocene beyond the ice sheet margin near the shelf edge by proglacial sediment density currents. Generally associated with levee deposits without sediment waves. May encompass more than one glaciation phase. On the western slope it comprises >15 m and overlies glacigenic debris flows.

GOd — **Glacial Overconsolidated Diamict:** Diamict of glacial origin (till) with interbedded mud and sand, deposited at the seaward limit of glaciers. Distributed at the shelf edge and at canyon heads where it crops out on the upper slope between 300 m and 500 m water depth. Contact with its stratified proglacial equivalents in deeper water is commonly disturbed by iceberg scouring or removed by canyon erosion but less commonly interfingering with a broad but thin diamict wedge approximately marking the former glacial margin. A higher competence of the till compared to underlying deposits appears to moderate canyon retrogression.

Omd — **Overconsolidated Mud to Diamict:** Exhumed mud and diamict situated on canyon and mass-transport scarps. Middle Pleistocene and older overconsolidated sediment mostly exposed on canyon walls with progressive headwall and tributary erosion. Can locally have thin surficial cover of other map units. Comprises a wide range of deposits formed through the burial and compaction diagenesis of ice-margin, proglacial and hemipelagic sediment.

MTD — **Mass Transport Deposits:** Poorly sorted and structurally disturbed mud and sandy mud and clasts. Several to tens of metres thick. Headwall and sidewall scarps, chutes, and depositional lobes and wedges. Derived from mass failure of surficial sediments, locally repeated. Present on inter-canyon ridges and gullies over a range of water depths. Parent sediments mainly glacigenic, but failure masses locally incorporate older, more deeply buried (upper 10–50 m) and more consolidated material (can involve most map units). Rugose and lineation-rich morphology, commonly with ridge and trough oriented normal to downhill flow (rotational faulting) and transport chutes with downhill-oriented linear flow fabric. Less rugose where parent sediment disintegrated almost completely. Includes creep, slides, slumps, mass flows, slope failure complexes, but excludes turbidites. Includes only MTDs located at the sediment water interface, usually associated to most recent events. Buried MTDs with variable thickness cover (2–20 m) of units Gsm, Gstm and Hm are common in places but not identified on this map.

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