Quaternary unconsolidated sediment thickness on the Grand Banks of Newfoundland and Northeast Newfoundland Shelf

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Scale 1 : 1 500 000

0 25 50 100 150 200 km

-60°0' -58°0' -56°0' -54°0' -52°0' -50°0' -48°0' -46°0'

51°0' 50°0' 49°0' 48°0' 47°0' 46°0' 45°0' 44°0' 43°0'

Labrador
Strait of Belle Isle
Belle Isle
Cape Norman
Hare Bay
Groais Island
Great Northern Peninsula
Belle Island
Canada Bay
Baie Verte Line
Twillingate
Gulf of St. Lawrence
Fogo Island
Newfoundland
St. George's Bay
Grand Bank
St. Anthony Basin
Funk Island Bank
Notre Dame Channel
Trinity Trough
Orphan Basin
Catalina Basin
Bonavista Bay
Sackville Spur
Trinity Bay
Conception Bay
Flemish Pass
Avalon Peninnsula
Avalon Channel
Downing Basin
Wolfall Bank
Placentia Bay
St Mary's Bay
Bantam Bank
Trepassy Bay
Ballard Bank
Virgin Rocks
Eastern Shoals
Nose of the Bank
Laurentian Channel
Burgeo Bank
Hermitage Channel
Laurentian Moraine
St. Annes Bank
St Pierre Bank
Carson Canyon
Green Bank
Halibut Channel
Haddock Channel
Whale Bank
Whale Deep
Misaine Bank
Lilly Canyon
Banquereau
Southeast Shoal
Laurentian Fan
Kettle Canyon
Cameron Canyon
Tail of the Bank
Denys Canyon

Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, NAVTEQ, Geonames.org, and other contributors

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7513
GEOLOGICAL SURVEY OF CANADA
COMMISSION GEOLOGIQUE DU CANADA
2014

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Explanatory Notes

Introduction

The thickness Quaternary unconsolidated sediments (overburden) across the Grand Banks of Newfoundland and the Northeast Newfoundland shelf has been compiled and incorporated into a Geographic Information System (GIS) -based geodatabase. It is derived from interpretation of a vast grid of high and mid-resolution seismic reflection profiles collected over about 40 years (1969 to 2010) by the Geological Survey of Canada (Atlantic) (GSCA). This spatial database is in the form of spot thicknesses along survey tracks and thickness-classed zonation interpolated from these points. It complements contemporary bedrock and surficial geology and surface and sub-surface geo-features GIS database compilations.

Thickness Compilation

Raw data utilized for database population were generally limited to GSCA seismic data holdings. A series of shaded relief bathymetric/topographic images generated for purposes of surficial and bedrock mapping, was also utilized for the isopachyte map, providing control between seismic survey tracks, for delineation of basins and thin cover over bedrock.

The GIS database from which this map presentation derives, comprises over 85 000 point thickness entries, each identifying the stratigraphic unit (or range in units) measured, a code linking to the raw data source, thickness in metres and milliseconds, notes on the source of interpretation and the process and positional accuracy, and generally the stratigraphic unit underlying the sediment at that position. The GIS version includes a feature class with an attribute table field entitled "Dominant Sediment Type". This captures generic characterizations of sediment type, their sequence, presence of inferred lags, or other aspects governing the sediment.

Product Formats

The map product is provided in several digital formats. The primary product is a vector-based GIS file database, accessible via an ESRI® Arc GIS project or though other GIS platforms via shapefiles. It provides a display of this map plus custom views of spot thicknesses of the stratigraphic units, where available. This map view is in Adobe® pdf format with user-interactive ability to display various layers of the original database.

Deposits

Quaternary sediment across the Grand Banks of Newfoundland and the Northeast Newfoundland shelf (NE NL Shelf) is derived from multiple glaciations, some reaching up to 400 km from the island. Most of the sediment (volumetrically) comprises till in broad blankets of ground moraine but also locally in thick stacked blankets. A typical stratigraphic succession includes one or a combination of units including a single sheet of till stemming from the last or penultimate glaciation and possibly pro-glacial and post glacial sediments. These might include various facies of glacimarine muds, post-glacial sandy and gravelly transgressive systems track remnants on the banks and adjacent sub-littoral sandy muds and basinal mud time equivalents.

The bedrock geology has considerable control on the style, thickness and distribution of overlying sediments. Rough innermost shelf topography generally begets patchy partial mini-basin fill while smooth-surfaced bedrock in mid shelf locations is commonly covered with a thin but continuous sediment blanket, often till or thin glacimarine muds with thicker deposits in low-lying areas.

Only local remnants of the penultimate and older glaciations are preserved, the most complete section located in outermost SE Laurentian Channel but others spread across the banks and basins. In terms of volume, the vast majority is interpreted as till, locally in thick stacked blankets. Sediments from the last glaciation (Wisconsinan; MIS 2) are ubiquitous and comprise locally thick and thin but continuous till blankets, moraines, outwash, and commonly various facies of glacimarine muds. Generally tills (m to 100s m thick) occupy glacially-carved troughs and basins while muds occupy large and small basins. The expansive banks have thin, patchy cover (cm to m) dominated by sands and gravels. Post-glacial sediments are generally either sandy and gravelly transgressive systems track (TST) remnants, mainly on the banks, or mainly shallow sub-littoral facies and the TST basinal mud time equivalents.

Sediment thicknes values derived entirely via a digital work-flow (collected since 2006) include not only a total sediment thickness over bedrock but often also a subdivision of Quaternary stratigraphic map units. These sub-divisions include a total Quaternary section (this display), till, uppermost till and post-till muds, glacimarine mud, post-till muds, post-glacial marine mud and sand dominated post-glacial sand and gravel. A summary of geotechnical properties following this classification is included in the accompanying report.

Quaternary Spot Sediment Thickness, m

- 0
- 0 - 3
- 3 - 10
- 10 - 25
- 25 - 50
- 50 - 60
- 60 - 90
- 90 - 120
- 132 120 - 220

spot thickness measure

GSC Seismic Survey Tracks to 2010

Thickness Range in metres

- 0 - 3
- 3 - 10
- 10 - 25
- 25 - 50
- 50 - 120
- >120
- variable 0-50
- data limit

doi:10.4095/295113

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

Recommended citation

King, E.L., 2014. Quaternary unconsolidated sediment thickness on the Grand Banks of Newfoundland and Northeast Newfoundland Shelf; a GIS database; Geological Survey of Canada, Open File 7513, 1 .zip file. doi:10.4095/295113

References

Geonautics Ltd. 1981b. Mobil Hibernia Development Studies 1981 Geotechnical Survey South of Avalon Peninsula. Report prepared by Geonautics Ltd. of St. John's NL and d'Appolonia Consulting Engineers Inc. of Houston for "Joint Venture" participants, including Mobil Oil Canada Ltd. Gulf Canada Resources, Inc. , Petro-Canada Exploration, Inc., Chevron Standard, Ltd. and Columbia Gas Development of Canada, Ltd.

King, E.L. and Sonnichsen, G. 2000b. Characterization of near-surface seismo-stratigraphy and features of Northeastern Grand Bank: Sea-level fluctuations, glaciation and slope stability. Geological Survey of Canada Open File 3886. 1 CD-ROM, doi:10.4095/212607

MacLean, B. 2004. Grand Banks of Newfoundland Direct Route Assessment. Unpublished report prepared for C-Core and partners by Canadian Seabed Research Ltd., Porters Lake, N.S.

Staal, P and Fader, GBJ with King, EL, Nadeau, O, Maass, O, and King, LH, compilers. 1987. Sediment Thickness Study of the eastern Canadian Continental Shelf. Geological Survey of Canada, Open File 1427, 47p. doi:10.4095/130265

Background Map

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