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## ABSTRACTS

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Again this year, abstracts from the annual Atlantic Universities Geological Conference (AUGC) are published in Atlantic Geology. This provides a permanent record of the abstracts, and also focuses attention on the excellent quality of the presentations and posters and the interesting and varied geoscience that they cover.

THE EDITORS

## Fold mechanisms in the shallow crust: an example from the Siluro-Devonian Arisaig Group, Antigonish Highlands, Nova Scotia

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The Silurian-early Devonian Arisaig Group, consisting mainly of shale and fine-grained sandstone, was deformed in the middle Devonian into regional NE- to NNE-trending folds, an event traditionally attributed to the Acadian orogeny. These strata are unconformably overlain by interbedded basalt and red clastic rocks of the McArras Brook Formation. The Arisaig Group affords a chance to study fold mechanisms in the shallow crust related to the Acadian orogeny. The observed structural features are indicative of classical complementary fold-fault regimes with evidence of coeval compressional and extensional tectonic features. Outcrop-scale fold propagation is associated with ramp-flat thrust fault geometry and local extension is recorded by a set of conjugate normal faults. Many of the outcrop-scale folds have sheared limbs and show evidence of a complex progressive deformation. The rare occurrence of slickensides along bedding planes indicates that flexural slip mechanisms are not dominant.

Although a synoptic plot of structural data suggests a complicated folding pattern, stereoplots of bedding data around individual folds reveal a more simple geometry, one that is dominated by conical folds rather than classically cylindrical folds (i.e., the axis of rotation does not lie in the bedding plane). The axial plane, fold, and conical axes orientations show high variability, further suggesting a complex progressive deformational history. Taken together, the data suggest that outcrop-scale structural features in the Arisaig Group are more complex than regional geometries would indicate. The data indicate that fold mechanisms in the shallow crust during the Acadian orogeny were related to coeval fault movements in underlying strata, yielding geometries possibly imposed by coeval dextral strike slip movement along the Hollow Fault.

## The Takla Group of the Stikine and Quesnel terranes, British Columbia: co-genetic, or the product of consistent Triassic volcanism?

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The late Triassic Takla Group is located in the Intermontane Belt of the Canadian Cordillera, in the allochthonous Stikine and Quesnel terranes in British Columbia. These terranes are juxtaposed in the McConnell Creek map area, but elsewhere are separated by the oceanic Cache Creek Terrane. The Takla Group is an assemblage of effusive and sedimentary rocks. Dominant lithologies are clinopyroxene-plagioclase porphyries, and associated volcaniclastic and sedimentary rocks. Major- and trace-element geochemical data indicate that the Takla Group is subalkaline and intermediate between tholeiitic and calc-alkaline. The Stikine Takla Group and Quesnel Takla Group are in fault contact. In the past, the Takla Group has been grouped together on the basis of lithological similarity, and split along the boundary between the Stikine and Quesnel terranes based on field relationships. Determining whether Takla Group rocks are co-genetic will better our understanding of the Canadian Cordillera and late Triassic volcanism.

## Clastic loaded Arctic icebergs as potential threats to northern exploration

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The density of icebergs (pure ice) is 0.917 and thus they float in seawater (density of 1.026), with about 10% of their volume exposed. However, if icebergs can be loaded with rocks (ice-rafted debris, IRD), whereby their bulk density increases, they may sink deeper or totally, making them invisible to radar.

During the Canadian-German Nares Strait Geo-Cruise August 17, 2001, expedition such a near-neutral buoyancy, rock-loaded, iceberg was encountered (Kane Basin, Lat. 80°N; Long. 69°W; Zentilli & Harrison, 2002, GSC Open File Report, #4828). The large, roughly 70 by 50 m, iceberg was significantly weighed down by IRD, floating only 5 to 15 m above sea level. The coverage of dark debris gave no contrast with the dark sea, and the submerged nature of the iceberg made it otherwise invisible to radar. The ice surface was dark with boulders, gravel, sand and silt. Blocks were generally less than 1 m, with one impressive large limestone block (2 × 2 × 3 m). The iceberg was boarded to collect samples with the intent of ascertaining its potential source glacier, and its significance in terms of glacial processes and northern navigation, the subject of my study.

In addition to scarce rounded fragments of gneiss and granitoid rocks, the predominant sedimentary rock fragments are angular, in part fossiliferous and petroliferous, and do not have any indication of foliation. Their characteristics match those of Cambrian, Ordovician, and Silurian strata mapped in valley outcrops of the enormous Petermann and Humbolt glaciers in NW Greenland (e.g., Cape Webster, Cape Storm and/or Goose Fiord formations). Similar rock types also exist in Dobbin Bay, Richarson Bay, and Rawlings Bay tidewater glaciers on Ellesmere Island (e.g., Allen Bay Formation) but the glaciers are small in comparison and rocks there have been affected by Eurekan deformation.

My study investigates whether or not the iceberg sediment load is the consequence of rock fall and landslide activity onto the most probable source glacier prior to calving, the possible path of the iceberg since calving, and its likely fate. Archival air photographs and recent satellite image of some representative glaciers are being studied. It is important to know whether this activity is on the increase as a result of climate change, because rock-loaded icebergs could pose a threat to exploration and development in northern waters, and may require improved detection methods.

## Lithofacies, detrital petrology, and diagenesis of the mid-Cretaceous Chaswood Formation, Elmsvale Basin, Nova Scotia

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The mid-Cretaceous Chaswood Formation of central Nova Scotia is a fluvial sand-clay succession that is the proximal equivalent of offshore deltaic reservoir rocks of the Scotian Basin. Borehole RR-97-23 provides a section, 130 m long, that penetrates all three members of the Chaswood Formation and has thus been studied in detail using a variety of analytical techniques. The rocks have been classified into 22 lithofacies and five main facies associations: light grey clays, dark grey clays, silty clays and muddy sands, sorted sands and gravels, and paleosols. Facies associations were based on the frequency of transitions between facies, as determined by the construction of a lithofacies transition matrix. Facies transitions in the coarser facies are related to deposition in and near fluvial channels; in the mudrocks, the transitions indicate a progression from the dark grey clay association (swamps and floodplain soils) to mottled paleosols (well drained soils following syntectonic uplift). The light grey clay association formed from early diagenetic oxidation and alteration of the dark grey clay association.

The bulk mineralogy of 176 sandstone and mudrock samples was determined by X-ray diffraction. Principal minerals in the mudrocks are illite/muscovite, kaolinite, vermiculite, and quartz, with rutile, hematite, and goethite in the paleosol association and siderite and pyrite in the dark grey clay association. Both mudrock and sandstone were examined using a scanning electron microscope to aid in the identification of diagenetic mineral growth. Sandstone samples were examined further using an electron microprobe to characterize both the detrital and diagenetic petrology. Translucent heavy minerals in the sandstone comprise stable and unstable assemblages, indicating the potential for both proximal immature sources and more distal and/or polycyclic sources. Ilmenite is the most common opaque heavy mineral and is variably altered to rutile; detrital rutile, magnetite, and titano-magnetite are also present. In the sandstone, only the interior of muscovite grains is altered to kaolinite, indicating weathering in the source area. The earliest phase of sandstone cementation, occurring under reducing conditions in swamps and ponds, produced siderite nodules and framboidal pyrite, which were later corroded and oxidized during development of paleosols. Kaolinite is an early cement, occurring as a coating on quartz grains and as well-crystallized, pore-filling booklets. Later illite and barite cement indicate a source of abundant K and Ba in formation waters.

The sediment delivered to the Chaswood Formation is equivalent to that deposited in the Logan Canyon Formation delta offshore, where sandstone layers are reservoirs for important gas fields. Although part of the same sedimentary system, the offshore deposits experienced marine rather than subaerial early diagenetic processes and more advanced diagenesis associated with greater depth of burial. Analysis of the Chaswood Formation does, however, provide information on the early stages of diagenesis and may therefore be used for comparative purposes in order to better understand the processes that lead to the development of good reservoir rocks.

## The Satorsoakulluk ferrodiorite dyke of the Nain Plutonic Suite, Labrador

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Satorsoakulluk arcuate dike is a component of the Nain Plutonic Suite (NPS) that extends in a belt up to 0.5 km wide and at least 15 km long and averaging 300 m thick in the vicinity of Nain, Labrador. The NPS is one of the best examples of an AMGC suite (anorthosite, mangerite, orthopyroxene-bearing monzonite and granite, charnokite- pyroxene granite); such suites are distinctive features of Earth's history between 1.0 to 2.5 Ga. These large anorthosite complexes are generally considered to have formed in anorogenic environments, and are mainly composed of anorthosite, leuconorite, troctolite, and granite with Na-rich plagioclase ranging from $An_{60}$ to $An_{40}$. The anorthositic rocks are commonly referred to as massif-type anorthosite, which form spatially associated complexes. Massif-type anorthosite bodies including the NPS, are generally considered to have been emplaced as diapers, though recent detailed structural investigations of anorthosite/country rock relations suggest emplacement by stoping mechanisms. A more extensive reinvestigation of a transect across the NPS by J. Myers (Memorial University of Newfoundland) has indicated that the diverse plutons of anorthosite and associated rocks are intruded into a belt of transcurrent faulting with space for rising magmas generated by faulting and stopping. Small-scale evidence of stoping is generally removed during ongoing emplacement of large bodies of magma. Evidence of stoping is most widely preserved as xenoliths of country rocks within plutons as well as fragments of older plutons in younger plutons. The Satorsoakulluk dike contains diverse xenoliths and is associated with net veining and fragmentation of country rocks. This intrusion provides excellent examples of intrusion mechanisms within the NPS and provides insight into how other associated rocks of the NPS were emplaced. The overall structure of this ferrodioritic dike is difficult to identify due to lost exposure into the sea; however, 11 km of this unit gently curves and dips 50 to 60 SSE. It has been labelled as a ring dike. However, the moderate dip of the margin in its concave direction does not support typical ring dike structure. The body more resembles a segment of a cone sheet, although it is unclear where it may terminate or continue. This ferrodiorite body may have a possible eastern extension on the western shore of South Aulatsivik Island, as suggested by earlier workers in the area; however, this interpretation still remains uncertain despite recent reinvestigation. More research is needed on the Newark Island region north of Aulatsivik Island to determine whether the Satorsoakulluk dike may be a feeder dike into the Newark Island layered intrusion.

## Ice-contact volcanism and hyaloclastite flow emplacement in the Vífilsfell region, SW Iceland

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Ice-contact volcanism, and specifically subglacial volcanism, can provide information about paleo-environments such as the extent and thickness of former glaciers and ice sheets. Ice-contact volcanism can produce hyaloclastite flows, composed of mobilized volcaniclastic glass originating from melt-water interaction; however, their preservation in the geological record is rare. The Vífilsfell region, located approximately 30 km SE of Reykjavík on the Reykjanes Peninsula, includes three principal landforms associated with ice-volcano interaction: Northern Bláfjöll, Vífilsfell, and Arnarþúfur. This study combines remote sensing classification of multispectral satellite imagery and field observations to determine the relationship between these features. The remote sensing analysis involves classification of discrete spectral clusters within SPOT 5 imagery using geographic information systems (GIS). Cluster analysis identifies 22 separable spectral signatures within the data set of which 15 are significant (cumulative proportion 94.67%). The spatial distribution of significant clusters provides direction for subsequent field investigation. Ground-truthing revealed that Northern Bláfjöll is a flat-topped volcano with basal pillow lavas, altered hyaloclastite (palagonite), breccia, welded scoria, and subaerial lava. Vífilsfell is a conical feature situated directly on top of Northern Bláfjöll and composed of palagonite with isolated welded scoria deposits, volcanic bombs, and dykes. Arnarþúfur consists of a series linearly oriented mounds with rhythmically layered beds of palagonite, glass clasts, and accretionary lapilli that contain flow indicators such as climbing ripples, cross-beds, and flukes. Northern Bláfjöll emerged from a deep englacial melt-water lake and is, therefore, a tuya. Vífilsfell is a subglacial mound (SGM) that formed beneath thin-ice conditions with episodic melt-water drainage during its emplacement. Arnarþúfur combines the characteristics of pyroclastic density currents, turbidites, and eskers and is a hyaloclastite flow deposit, not the in situ product of a subglacial fissure eruption. Hyaloclastite flows are volumetrically significant relative to the total volume of erupted material in subglacial environments and require more attention in models of ice-volcano interaction.

## Description of planispiral burrows in shoreface sandstone of the Redman Formation, Bell Island, Newfoundland, and feeding strategy of the trace-forming organism

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The scope of this poster presentation is to describe the setting, geometry and shape of planispiral burrows found on Bell Island, Newfoundland, in order to develop a hypothesis for the original depositional environment and to constrain the original habitat of the organism. The spiral traces are situated in sandstone at Freshwater Cove North on Bell Island. There are hundreds of these traces at this locality, which indicate intense deposit feeding on a middle to lower shoreface. This study includes descriptions of lithology, trace fossils, and facies, as well as process interpretations of the strata.

## Metamorphic petrology of calc-silicate nodules from greenschist facies to migmatite grade, Liverpool-Pubnico area, Nova Scotia

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Calc-silicate nodules occur within the low-pressure regionally metamorphosed rocks of the Meguma Group in southwestern Nova Scotia. These nodules show the effects of increasing temperature during metamorphism by changes in the zonation of their mineral assemblages. The purpose of this study was to determine what mineral zonation within the nodules occurred during diagenesis as opposed to metamorphism and to determine the role of fluids during the metamorphism of the pelitic, psammitic, and calc-silicate rocks of the Meguma Group. To determine the amount of Ca and Si metasomatism between the surrounding siliceous rocks and calcareous nodules during metamorphism, the mineral assemblages of the nodules were analyzed and compared across the different metamorphic zones. Approximately 40 samples from chlorite to sillimanite grades were collected from Pubnico to Liverpool. Petrological and petrographic studies and electron microprobe analysis were performed to estimate the temperature, pressure, and fluid composition during metamorphism.

The calc-silicate nodules are generally located within psammitic beds in the Goldenville Formation. The nodules have a range in size and shape, from lens to irregular shaped to continuous layers of calc-silicate mineral assemblages. Calcareous nodules found at the lowest metamorphic grade at Green Bay do not show mineral zonation, suggesting that the zonation was not a result of diagenetic processes. At chlorite grade, the nodules vary gradationally from a quartz-plagioclase ($An_{18}$)-garnet rim to a quartz-plagioclase ($An_{37}$)-actinolite-chlorite-epidote core. At higher andalusite-staurolite grade, the nodules have a quartz-plagioclase ($An_{30-83}$)-garnet-epidote±hornblende-biotite-chlorite-muscovite rim that grades to a coarser grained quartz-plagioclase ($An_{97}$)-epidote-garnet±calcite-diopside core. At the highest grade (sillimanite grade) the nodules grade from a plagioclase ($An_{27-57}$)-quartz-biotite±chlorite-hornblende rim to a plagioclase ($An_{90-96}$)-quartz-biotite-garnet-chlorite±epidote-muscovite core. With increasing metamorphic grade, there is a general increase in the abundance of epidote, biotite, hornblende, diopside and anorthite. A change in mineral composition across individual calc-silicate nodules also occurs, with a general increase in epidote, anorthite, spessartine and grossular garnet, diopside, and hornblende from rim to core of the nodule.

## Environmental geochemistry of the Cochrane Hill Gold District, Nova Scotia

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Since the first Nova Scotian gold rush in the early 1860s, gold mining and milling processes have generated tailings piles containing mercury, arsenic, cyanide, and other potentially toxic elements. Most of the gold deposits occur in the Cambrian-Ordovician Meguma Group of southern Nova Scotia, and mining has been carried out at more than 60 formal gold districts for a total production of 47 t of gold. The Cochrane Hill gold deposit is located in Guysborough County, approximately 15 km north of the town of Sherbrooke. The host rocks consist of amphibolite-facies quartzite and slate, and most of the gold is associated with quartz veins that intrude slate rich in arsenopyrite. Mining and milling of gold ore at Cochrane Hill took place from 1877 to 1928, and again from 1981 to 1988, resulting in two separate tailings piles. During the first period of operation, stamp milling and mercury amalgamation were used to extract gold from the ore, and the tailings were slurried into a local drainage. In the 1980s, ball milling and cyanidation were used to process the ore, and the tailings were deposited into an on-site impoundment. During gold extraction, mercury and/or cyanide can be lost to the tailings, which may also contain high concentrations of other toxic elements (e.g., arsenic, thallium) that occur naturally in the ore. As a result, windblown tailings and runoff from the tailings disposal areas may have a significant adverse effect on the surrounding environment. The main objectives of this study are to: (1) characterize the mineralogy and metal concentrations in the two tailings piles; (2) assess the relative reactivity of metals and metalloids in the amalgamation versus cyanidation tailings; and (3) examine the downstream impacts of drainage from the tailings piles. Forty three samples of tailings were collected from 15 different sites at Cochrane Hill in September 2003, and water samples were collected within and downstream of the tailings in October 2003. Efflorescent salts were also collected from the surface of the cyanidation tailings, and stream sediments were collected to determine the distance that tailings have been transported downsteam. Future laboratory work will include analyses of metal concentrations in the tailings using atomic absorption methods, X-ray diffraction and electron microprobe studies of the tailings mineralogy, and analyses of the water chemistry data using computer models.

## Modelling the thermal sensitivity of shallow organic lakes in Nova Scotia

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Most freshwater lakes in Canada are small (< 4 ha) and shallow (< 6 m average depth). To interpret lake sediment records in terms of fluctuating climate, it is necessary to understand contemporary processes operating in these lakes and within their catchments. As well, although these lakes comprise significant habitat for a wide variety of species, very little is understood about how climate change will affect the physical state of these lakes. Canoran Lake, Lunenburg Co., and Sandy Lake, Annapolis Co., have similar volumes, areas, and elevations but have unique basin morphometries. Datalogged thermistor strings were placed in the littoral and profundal zones of both lakes and data was collected hourly from May – August, 2003. Thermistors were also placed in the canopy surrounding the lake to monitor air temperature change. The physical (morphometric) character of each lake was determined using 50 kHz sonar and the water quality characteristics (in particular lake trophic state) were determined using a wide variety of standard analyses.

Sonar results indicate that these lakes have very different morphometries, though surface areas and volumes are almost the same. Canoran Lake is a complex basin with two profundal zones and a discontinuous, vegetated littoral zone; Sandy Lake, has one profundal basin and a continuous, largely unvegetated littoral zone. Preliminary thermal results indicated that these two lakes reacted uniquely to thermal variation. For instance, during a rapid 10°C temperature decline (a low-pressure system influx) Sandy Lake mixed to a 5 m depth within a 24 hour period whereas only the top 3 m of Canoran Lake mixed over a period of 50 hours. During the subsequent temperature increase (high-pressure influx) Sandy Lake stratified more rapidly than Canoran Lake. Littoral temperatures in both lakes warmed from about 15 to 25°C during the study period. Profundal lake temperatures remained nearly constant in Canoran Lake but increased consistently in Sandy Lake; at

both sites profundal temperatures were unaffected by short-term thermal variation. These results indicate that Sandy Lake is more sensitive to summer air mass circulations changes, possibly as a result of its larger and largely unvegetated littoral zone. Though these changes are subtle, they are anticipated to have a significant affect on productivity; a relationship between wind dynamics and thermal response is still being investigated. Thermal sensitivity models based on this data will allow ecologists to better understand how the lake (as habitat) will evolve and are essential to the implementation of species monitoring and conservation programs.

## Structure, stratigraphy, and contact relationships of Middle Ordovician to Lower Silurian turbidites and the Dunnage Mélange, New World Island, Newfoundland

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An important contact zone between a succession of siliciclastic turbidites and the Dunnage Mélange is located along the southern coast of New World Island, northeastern Newfoundland. Detailed structural and stratigraphic field analysis along 8 km of well exposed coastal outcrop and associated small tidal flats and small islands shows a complex map pattern controlled by multiple phases of tectonic deformation.

The siliciclastic turbidites are generally north facing and lie to the north of the contact zone. This sequence consists mainly of pebble conglomerate, greywacke, and variously coloured shale. A thick unit of mélange lies to the south of the contact zone which consists of large resistive blocks of igneous blocks, and calcareous and siliciclastic sedimentary blocks, which are contained within a highly foliated, dominantly shale matrix.

Three phase of tectonic deformation have been deduced through both geometric fault analysis and fold and fabric overprinting relationships. $F_1$ folds are generally isoclinal and commonly intrafolial with respect to $S_2$, and were recumbent prior to $F_2$. Regionally, work by P. Williams, Karlstrom and Van Der Pluijm linked the $F_1$ fold structures to thrusting. $F_2$ folds and the associated cleavage are the dominant structures and are strongly asymmetrical, tight, upright folds which create both micro- and macro-scale mushroom fold interference structures with $F_1$. $F_3$ folds are generally kink folds which nucleate around areas of higher competence such as quartz veins and dykes. Broad warping is also related to $F_3$ where up to four orders of folds are observed.

A number of gold showings occur within the turbidite succession, and are concentrated in quartz veins within the greywacke units as well as within both felsic and deictic (is this correct?) dykes. A link relating mineralization with the hinges of $F_1$ folds can be explained by the more competent greywacke fracturing to accommodate for space problems caused by the folding of the less competent, overlying shale. Determining the spatial distribution of large-scale fold interference patterns is key to the successful extrapolation of economically important lithologies into areas of no exposure and into the subsurface.

## Sedimentology and stratigraphy of Upper Wisconsinan deglacial marine rhythmites from the Humber Arm, west Newfoundland

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In 1999, an approximately 37 m-long piston core was retrieved from the Humber Arm, western Newfoundland. The lower, undeformed portion of this core, between 26 and 33 m depth, is made up of red, rhythmically bedded deglacial muds and represents a complete record of deglaciation during the time period between ~12,350 and 13,500 cal. yr BP (calendar years before present). The sedimentology and stratigraphy of this core section has been studied using visual descriptions of sedimentary and biogenic features, combined with grain size analyses using sieve and sedigraph techniques, to determine sedimentation processes and approximate sedimentation rates. The understanding of these processes can be used to restrain the timing of known deglacial events such as the rate of ice margin retreat, and the time of drainage of a large proglacial lake.

## Historical records of metal contamination in the Tantramar Salt Marshes, Nova Scotia

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Sediment cores collected from the Tantramar salt marshes in northern Nova Scotia record changes in atmospheric metal fluxes during the past 300 years. Salt marsh sediments were collected from six locations in May 2002 and analyzed for carbon content, metal concentrations, and grain-size distributions. Field and laboratory observations show that the salt marsh cores consist of four main units: (1) brown, silty, organic-rich soil (0–30 cm); (2) dark-brown, mottled soil with thin laminations (30–125 cm); (3) grey mud with peat layers (125–140 cm); and (4) peat (140–160 cm). Depth profiles of the raw metal concentration data show significant down-core fluctuations, which result from changing sediment grain size and scavenging of some metals (e.g., Cu) by organic matter. Diagenetic remobilization of Mn has resulted in a near-surface Mn peak within the oxic zone of one core; however, diagenesis does not appear to have significantly altered the vertical profiles of other elements. To account for the effects of changing grain size on metal profiles in the sediment cores, the concentrations of Cr, Cu, Ni, Pb, and Zn were normalized using Li, which serves as a reasonable proxy for sediment grain size in these cores. The ages of sediments at various depths within the salt marsh were calculated using measurements of the mean accretion rate of the marsh (39 cm per century) based on published results from earlier workers. The normalized profiles of all metals except Pb do not vary significantly with depth in the cores, indicating that the fluxes of Cr, Cu, Ni, and Zn to the Tantramar marshes have remained relatively consistent for the past 300 years. The normalized Pb profiles in all sediment cores correlate well with the history of atmospheric Pb pollution throughout North America. The results show a general increase in the concentrations of Pb in the 18th century, which may reflect atmospheric contamination from coal burning and increasing industrialization. A rapid increase in Pb concentrations in the sediment cores is evident from about 1875–1890, which corresponds to the North American Industrial Revolution. The highest Pb concentrations occur in the late 1960s to early 1970s, reflecting the widespread use of leaded gasoline during this time. During the 1980s and 1990s, Pb concentrations in the salt marsh cores show a progressive decline, which most likely reflects the phase-out of leaded gasoline use in North America. No evidence is seen for widespread metal pollution from local industrial centres (e.g., Amherst, NS and Sackville, NB). The results of this study show that although salt marsh geochemistry is complex, historical records of metal contamination can be derived from sediment cores provided that the effects of diagenesis and changing sediment grain size are carefully considered.

## Geology of the Washabuck Peninsula, central Cape Breton Island, Nova Scotia

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The Washabuck Peninsula lies in the central part of Cape Breton Island in the area between Iona, Baddeck, and Whycocomagh in Bras d'Or Lake. Recent geological mapping on the peninsula, at a scale of 1:10 000, confirms the presence of pre-Carboniferous basement blocks with lithological similarities to other Neoproterozoic basement blocks in the Bras d'Or terrane. These basement blocks are unconformably overlain by Carboniferous sedimentary rocks of the Horton Group and in fault contact with Carboniferous sedimentary rocks of the Windsor Group.

The oldest stratified rocks in the basement blocks, named the Maskells Harbour formation (MHf), occur in two separate areas. In the northeast the formation consists of interbedded quartzofeldspathic metasandstone and metasiltstone with thin minor quartzite and marble; however, the block in the southwest consists dominantly of calcitic to dolomitic marble interbedded with minor quartzite. The MHf in the northeastern block is intruded by unfoliated, medium-grained diorite, quartz diorite, and hornblende-biotite granodiorite of the Washabuck pluton. Associated with the pluton are late-stage coarse-grained hornblendite dykes. The MHf in the southwestern block is intruded by unfoliated medium- to coarse-grained hypidiomorphic hornblende-biotite granite and associated aplitic dykes named the Grass Cove granite. Similar granite occurs in the northeastern block as large dykes in the MHf and Washabuck pluton. All igneous units contain metasedimentary xenoliths of the MHf, and like the MHf, are cut by numerous mafic dykes.

Regional metamorphic grade in the MHf is relatively low, and reaches only biotite grade; however, close to the margins of the plutonic units, grade has increased to produce cordierite-biotite assemblages. This increase in grade has imparted a gneissic appearance to the metamorphic rocks by accentuating the bedding but it is clearly related to contact metamorphism. No gneissic or migmatitic rocks were observed.

Because of lithological similarity to the Blues Brook and Malagawatch formations, the MHf is considered to be part of the Neoproterozoic George River Metamorphic Suite. The similarity of the Washabuck pluton and Grass Cove granite to dated igneous units in the Creignish Hills and North Mountain areas suggest similar Late Neoproterozoic ages for these units. These correlations indicate that the basement blocks on the Washabuck Peninsula are part of the Bras d'Or terrane. Geochemical comparisons are in progress and will help provide detailed correlations.