Late Quaternary Depositional Environments of the Canadian Beaufort Shelf

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Seismic and borehole data have been studied from the Beaufort Shelf, east of Mackenzie Trough. Three acoustic sequences, separated by unconformities can be recognised from high resolution seismic records. Sequence 1 consists of complex horizontal and progradational reflectors, with variable acoustic penetration. It is bounded above by an unconformity on which two broad valleys are incised to a depth of 30 m. Sequence 2 has a wedge-like geometry at the margins of these valleys and consists predominantly of oblique progradational reflectors which become sigmoidal towards the centres of the valleys. A second unconformity marks the top of this sequence, although in intervalley areas, it is often impossible to distinguish from the lower unconformity.

Five lithostratigraphic units can be defined; the names presented here are used informally. In the west of the shelf area, only one unconformity can be recognised and the Tarsuit Silt Unit extends from this unconformity to approximately 140 m below seabed. It consists predominantly of marine and marginal-marine laminated silt and clay, with intervals of sand and a freshwater peat bed near the base. The Sauvrak Clay Unit overlies the unconformity and extends across the whole shelf, thinning markedly to the east. This unit consists of bioturbated marine clay. The Kaslutut Sand is sampled in only one borehole and occurs between the Tarsuit Silt and the Sauvrak Clay, separated by unconformities as recognised in the seismic data. In the east, two sand units are present, separated by the Tarsuit Silt Unit, which thins to approximately 40 m. The Uviluk Sand unit underlies the Tarsuit Silt and consists of massive well-sorted sand. Grain surface textures of the sand show the characteristics of glacial, aeolian and beach environments. The Tingmiark Sand Unit overlies the Tarsuit Silt and consists of 40 m of well-sorted sand with similar characteristics to the Uviluk Sand. Two intervals of shell-bearing sand, at 19-21 m and 0-5 m from the top are interbedded with barren sand.

The Tarsuit Silt Unit is interpreted to have been deposited in a delta-influenced marine environment. Delta distributaries prograded onto the shelf and the sand bodies within the unit may represent channels. The Uviluk Sand and Tingmiark Sand Units represent alluvial and aeolian deposits from glacial outwash which subsequently underwent marine transgression. Subaerial conditions were also present on the western shelf when incision of the valleys took place as a result of lowered sea level. The valleys were partly infilled by sand of the Kaslutut Unit before the most recent marine transgression and deposition of the Sauvrak Clay.

Igneous Geochemistry and Its Implications for Terrane Analysis of the Avalonian Event in Southeastern New England

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During the past four years we initiated a detailed geologic, petrographic and geochemical study of rocks within ten specific target areas, which encompass a zone broadly identified as the Avalonian Block. Although this effort is only about 30% complete at this time, the data gathered sofar do allow us to give at this meeting a preliminary assessment on the nature of the Avalonian event in eastern Massachusetts and adjacent regions.

The Avalonian Block of southeastern New England is represented by two distinct crustal segments, The *southeastern segment* (known as either the Boston Platform or as the Milford-Dedham Zone), to the east of the Bloody Bluff Fault system (BBF), is dominated by igneous rocks emplaced during the Avalonian magmatic pulse. Rocks of this segment (the Avalonian terrane "proper") belong to a sequence of cogenetic caldera-type explosives and shallow intrusives formed between 580 m.y.b.p. and 630 m.y.b.p., that were largely spared from any of the post-Avalonian dynamometamorphic deformations with the exception of the late Paleozoic (Alleghanian) event, which primarily affected the southern sections. These studies were undertaken to determine the mode of origin of the cogenetic tonalite-granodiorite-granite/dacite-rhyolite associations: one preceding and one postdating the voluminous series. The data indicate that the Avalonian "proper" sequence was formed in an area of thermal anomaly which manifested itself as an intracontinental rift triggered by subduction of the Late Proterozoic mid-ocean-ridge (back-arc rift). The igneous activity began as a bimodal alkali/transitional basalt-rhyolite series followed by a voluminous unimodal magmatic sequence formed by magma mixing of two parental magmas - one being a tholeitic magma and the other an anatectic granitic magma derived from crustal rocks of Late Archean or Early Proterozoic lineage. Concluding the magmatic activity is a bimodal series but of apparent calc-alkaline character.

The geochemical and geologic evidence gathered on rocks of the *northwestern segment* to the west of BBF (the Nashoba Block) suggests that their origin took place within a depositional basin either in epicontinental or eugeoclinal environment, but in direct association with the Avalonian continent. Widespread tholeiitic basalts (now metamorphosed to middle amphibolite facies: the Marlboro Formation) were most likely emplaced during Early Paleozoic and, if so, they may represent an Early Paleozoic arc sequence. Some of the formations within this block yield inherited zircons pointing toward a Late Archean or Early Proterozoic provenance. In contrast to the southeastern segment, this entire region was subjected to pervasive partial melting and to intrusions of calc-alkaline intermediate (dioritic) magmas during the time span between 450 m.y.b.p. and 400 m.y.b.p. As of now we believe that the northwestern segment represents a separate Avalonian terrain which originated as a eugeoclinal sequence on the flanks of the Avalonian "proper" continent.

Geology and Petrogenesis of the Plutonic Rocks of North Mountain, River Denys Area, Central Cape Breton Island

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North Mountain covers a 6 x 24 km area, bordering on Bras d'Or Lake, located approximately 35 km northeast of Port Hawkesbury, Cape Breton Island. During the 1985 field season the study area was mapped and sampled as a basis for an M.Sc. thesis at Acadia University.

The greater part of North Mountain consists of granitoid rocks which intrude the Precambrian George River Group carbonate-clastic sequence and a "gneissic complex" whose age and relation to the George River Group is unclear. Field mapping suggests that there are at least two major phases of granitoid rocks; a light colored, medium to coarse-grained, massive to weakly lineated, biotite-hornblende granodiorite to quartz monzodiorite and a pink, coarse-grained, massive, highly fractured, feldspar-megacrystic, biotite-hornblende monzogranite to quartz monzonite. The relations between these two units has not been clearly determined due to poor exposure. A small body of diorite predates the granodiorite unit. The George River Group consists of complexly folded quartzite, phyllite, limestone and dolomite, or marble, and minor mafic volcanic rocks. These rocks are all of unusually low metamorphic grade in proximity to the surrounding granitoids, and are in sharp contrast to adjacent(?) higher metamorphic grade rocks of the "gneissic complex". The "gneissic complex" appears to be dominantly composed of quartz-feldspar-biotite gneiss of metasedimentary(?) origin, minor orthogneiss(?), and less common intercallated carbonate rocks. These carbonate units are host to the Lime Hill zinc deposit. The "gneissic complex" is intruded by a variety of granitoid phases from "dioritic" to "granitic". The rocks of the "gneissic complex" may represent either metamorphosed equivalents of the George River Group or a separate, older, basement unit(?).

The granitoid rocks of the area will be the subject of detailed petrographic and geochemical studies, including possible age dating, in order to determine their chemistry and petrogenesis. The host rocks will be examined to help determine the environment of emplacement. The study will include comparisons of the rocks of the area with other granitoid terrains of Cape Breton Island.

Geology of the Burnthill Granite and its Associated Sn-W-Mo Mineralization

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The Burnthill Granite in the Miramichi tectonostratigraphic zone of central New Brunswick contains two major mappable phases: (a) coarse-grained equigranular to porphyritic biotite granite in the north, and (b) medium- to fine-grained equigranular biotite granite in the south. Exposed contacts between these two phases are gradational over distances of up to 500 meters. Ubiquitous miarolitic cavities indicate a high level of emplacement. The main phases are cut by late-stage felsic dykes that exhibit variable mineralogy and include biotite-, muscovite-, and garnet-bearing varieties. Muscovite occurs in all of the intrusive phases, where its modal distribution increases with decreasing grain size; it is predominantly a late-stage alteration product of feldspar and biotite, but in the fine-grained intrusive phases it may be of magmatic origin.

Sn-W(-Mo) mineralization is developed in fissure veins in the southern part of the granite and adjacent country rocks. Quartz is the major gangue. The mineralogy at the Burnthill and McLean Brook South deposits includes wolframite, cassiterite, molybdenite, arsenophyrite, pyrite and a variety of fluorine- and beryllium-bearing minerals. A complex paragenetic sequence includes a high temperature oxide facies, a well-developed intermediate-temperature sulfide facies and a poorly-developed low-temperature carbonate facies. Zinc-poor stannite of the sulfide facies has partially replaced cassiterite at McLean Brook South. Quartz fissure veins at the Tin Hill and McLean Brook North showings are mineralized with cassiterite and wolframite and are sulfide-poor, mineralogically simple systems.