Proudfoot awards-
1st. Kathryn Denommee - U of Waterloo
2nd. H. Dube-Loubert - UQUAM
3rd. Fonya Irvine - UNB

Lorti awards
1st. Denise Brushett - Memorial
2nd. Josh Kurek - UNB
3rd. Kayla Vickers - SFU

Applications of geomorphology and sediment analysis to mineral exploration in a periglacial terrain, Yukon Territory.

Denommee*, Kathryn, **Ross**, Martin, Department of Earth Sciences, University of Waterloo, Waterloo, ON, N2L 3G1; **Bond**, Jeff D., Yukon Geological Survey, Whitehorse, YT, Y1A 2C6

Throughout the Klondike Mining District, geochemical exploration techniques involving soil sampling have been used extensively in the search for lode gold. However, the presence of permafrost and active periglacial processes on north-facing slopes has caused these techniques to yield mixed results. A number of features and processes associated with these north-facing slopes make it difficult to ensure that soil samples are free of loess and that they are consistently taken from the same soil/sediment horizon, bringing into question whether or not they are representative of the underlying bedrock.

Firstly, in order to avoid loess dilution or pedogenic effects, all geochemical soil samples should be derived from the C horizon. This is difficult to achieve on north-facing slopes where near surface permafrost commonly restricts sample collection to the A horizon. In addition, the soil horizons on north-facing slopes are poorly defined and heterogeneous in nature compared to south-facing slopes that are permafrost free and have well-developed, homogeneous soil horizons. For soil sampling to generate meaningful results on north-facing slopes in this area, it is necessary that sampling techniques and the interpretation of geochemical results take into account the impact that hillslope processes (e.g. colluviation) and shallow permafrost processes (e.g. solifluction) have on the development of soils and surficial deposits.

In order to identify and document these periglacial and geomorphological effects, a geomorphological map and detailed sediment profile analysis were produced for the north-facing aspects of the Lone-Sta4r area, Yukon Territory. Geomorphologic features including areas of extensive reworking and thick colluvial deposits were identified and mapped using aerial photographs and by examining soil profiles in the study area. Soil exposures at multiple locations were used to produce a sediment profile analysis of the study area that establishes and documents the relationships between landforms and hillslope and permafrost processes in the study area as well as relating soil structures to these processes.

It is anticipated that by identifying and documenting areas where extensive reworking by hillslope and permafrost processes have occurred, soil sampling techniques employed by mineral exploration firms on north-facing slopes in this area can be improved. This will help to generate more meaningful data that can be effectively used in the exploration process as well assisting with the evaluation of pre-existing geochemical data.

* kcdenomm@scimail.uwaterloo.ca student presenter

Ice flow directions and transport in glacial sequences of the James Bay lowlands of Québec: implications for mineral exploration in areas of thick drift cover

Dubé-Loubert*, H., Department of Earth Sciences, Université du Québec à Montréal, Qc, H3C 3P8; **Roy**, M., Department of Earth Sciences, Université du Québec à Montréal, Qc, H3C 3P8; **Veillette**, J., Geological Survey of Canada, 601 Booth Street, Ottawa, ON, K1A OE8; **Parent**, M., Geological Survey of Canada, Quebec, Qc, G1K 9A9; **Lamothe**, M., Department of Earth Sciences, Université du Québec à Montréal, Qc, H3C 3P8

Glaciated regions bearing thick glacial sedimentary cover present a considerable challenge to mineral exploration. To achieve success in such regions, mining companies using glacial deposits in order to locate diamond, gold, or base metals source areas must have access to data on glacial transport and ice flow directions associated with the glacial deposits obscuring the sub-surface bedrock geology. This is particularly the case in the James Bay lowlands of Québec, where little information is available on the composition and provenance of glacial deposits forming the extensive glacial sequences of this region. The glacial geology of this area is also complicated by the fact that this region lies near the former geographic center of the Laurentide ice sheet, and was thus subject to different ice advances coming from the near-by ice-dispersal centers. Because success in drift prospecting is highly dependant on accurate knowledge of ice flow patterns and glacial transport, it is important to increase our understanding of the lowlands' stratigraphy. Here we report till sedimentological and compositional (petrology, mineralogy, geochemistry) data from stratigraphic sections exposed along the Harricana River, in the lowlands of Québec. Our investigations indicate that the regional stratigraphy consists of at least 3 to 4 distinct till units that are separated by a 20-m thick unit of varves. This till sequence lies on a nonglacial unit consisting of fluvial sands bearing wood-fragments and showing a normal drainage towards the bay. Till fabrics and the petrological data indicate that the till units record a complex succession of ice advances from the center of the ice sheet as well as different advances from the Labrador-Québec sector. Geochemical and sedimentological analyses are currently being processed, and the results should provide additional constraints on the sequences of events recorded by the glacial deposits. The provenance of tills should also be reinforced by the application of radiogenic tracers (Sm-Nd, Ar isotopes) on the glacial deposits. The nonglacial unit is being dated by both radiocarbon and Optical Luminescence methods. The combined compositional and chronological data will characterize the provenance of tills and provide an age constraints on the sequence of shifting ice flows. These results will integrated into a detailed chrono-stratigraphic framework that will contribute to effort in mineral exploration in region affected by thick-drift cover, and will also be useful to the interpretation of stratigraphic data coming exclusively from overburden drilling.

* dube-loubert.hugo@courrier.uqam.ca student

Paleoclimate reconstruction from Trout Lake, northern Yukon, eastern Beringia

Irvine*, Fonya and **Cwynar**, Les C., University of New Brunswick, Biology Department, 10 Bailey Drive, Fredericton, New Brunswick, Canada E3B 6E1

Beringia was a predominantly unglaciated land mass during the Last Glacial Maximum (LGM) when the Laurentide Ice Sheet covered most of North America about 20 ka BP. As water from the ocean was incorporated on land as ice, lower sea levels exposed the Bering Land Bridge between Siberia and Alaska. The Bering Land Bridge facilitated the intercontinental migration of plants and animals as well as the hypothesized entry point of humans into North America. Beringia was a refuge for many plant species and enabled the radiation of vegetation communities following the retreating ice sheets. Beringia consisted of unique vegetational communities and now extinct megafaunal assemblages (mammoth, horse, long-horned bison). Whether the extinctions were driven by climate change, human depredation, or a combination of both remains a topic of debate.

Continuous paleorecords encompassing the LGM to the present are limited from the northern Yukon and are of great value for understanding long term climate variability. Trout Lake (68º49'N, 138º45'W, elevation 150m a.s.l., maximum measured water depth 9.9m) is situated in the northern Yukon, eastern Beringia. Sediment records are presumed to be 20,000 years old based on previous pollen studies thus providing a unique opportunity to obtain long records of climate change. A long core from Trout Lake has been sub-sampled and analyzed to obtain high resolution, quantitative estimates of past temperature using a biological proxy, Chironomidae (Insecta: *Diptera*). Chironomid analysis has been used to reconstruct past temperature changes at Trout Lake attempting to identify and characterize the Younger Dryas, Holocene Thermal Maximum and the 8200 Event.

Preliminary results indicate that the magnitude of the Holocene Thermal Maximum at Trout Lake was 1.56°C warmer than present. Paleorecords from Trout Lake will be incorporated into a larger project disseminating the spatio-temporal response of climatic change within Beringia.

* Fonya.Irvine@unb.ca 'student presenter'

Ice flow history of Placentia Bay, Newfoundland as interpreted from Seabed Mapping

Brushett*, D.; Memorial University, Dept. of Geography, St. John's, NL, A1B 3X9; Bell, T., Memorial University, Dept. of Geography, St. John's, NL, A1B 3X9; **Shaw**, J., Geological Survey of Canada (Atlantic), Bedford Institute of Oceanography, 1 Challenger Drive, P.O. Box 1006, Dartmouth, NS, B2Y 4A2; **Batterson**, M.J., Geological Survey, Dept. of Natural Resources, P.O. Box 8700, St. John’s, NL, A1B 4J6

This paper details the ice-flow history of Placentia Bay, Newfoundland as interpreted from both onshore and offshore glacial records using recently generated seabed and landscape imagery. Recent technological advances in both terrestrial (Shuttle Radar Topography Mission (SRTM)) and marine (multibeam bathymetric sonar) mapping have generated landscape and seabed imagery that permit a broader interpretation of glacial geomorphology and palaeo ice dynamics. Multibeam sonar imagery of Placenta Bay shows a range of flow-parallel and flow-transverse glacial landforms. Flow-parallel landforms identified include drumlins, flutes, megaflutes, mega-lineations, and crag-and-tail landforms. These landforms show a general trend of convergent ice flow, interpreted to represent fast-flowing ice (an ice stream) down the axis of Placentia Bay. Drumlins and fluted terrain onshore demonstrate that the convergent ice flow can be traced up-ice to regional dispersal centres. Flow-transverse landforms interpreted as DeGeer moraines occur in several fields throughout the bay marking the intermittent retreat of a tidewater margin that became grounded in shallow water. Ice-flow mapping of Placentia Bay also demonstrated that the largely depositional record preserved on the seabed is incomplete, with the apparent absence of a strong westward flow onto the Burin Peninsula. The mostly erosional ice-flow record on land also appears incomplete because there is no evidence, to date, for a northeastward-southwestward ice flow that is recorded by a fluting field on the seabed of southwestern Placentia Bay. The integration of onshore and offshore glacial records in Newfoundland represents an important development in mapping palaeo ice flows and the understanding of ice-sheet behaviour during the transition from largely marine-based to land-based glacial conditions.

* dbrushet@mun.ca student presenter

A chironomid community perspective on paleoclimate: the Last Glacial Maximum and early Holocene in eastern Beringia

Kurek*, J., Department of Biology, University of New Brunswick, Fredericton, NB, E3B 6E1; **Cwynar**, L.C., Department of Biology, University of New Brunswick, Fredericton, NB, E3B 6E1

Chironomid larvae (Insecta: Diptera: Chironomidae) constitute the dominant component of benthic macroinvertebrate communities and can provide significant insight with regard to past aquatic ecosystem changes. We apply a temperature inference model based on 136 lakes, spanning British Columbia to the High Arctic, to investigate paleoclimate trends from three Beringian lake sediment records with particular reference to the Last Glacial Maximum (LGM: ~25-20 kyr BP), Late Glacial (L-G: ~15 kyr BP), and early Holocene.

In general, all lake sites show an individual response to environmental variability. Both Burial Lake and Zagoskin Lake (western Alaska) capture the LGM and provide some evidence of pre-LGM aquatic environs and paleotemperature patterns. During the LGM, summers were mild with average temperatures approximately 1-4 ºC below modern. Temperatures increase post-LGM, possibly in response to increasing insolation, beginning early (~21 kyr BP) at Zagoskin Lake and later (~17 kyr BP) at Burial Lake. By 12.5 kyr BP, both sites were warmer than modern by ~1-2 ºC. Major shifts in chironomid-inferred temperatures and assemblage zones also compare well to pollen-inferred vegetation changes summarized by indirect ordinations (PCA Axis 1).

The Hanging Lake (northern Yukon) sediment record likely spans the last ~17 kyr BP and demonstrates abrupt and large magnitude shifts in chironomid community composition between ~17-14.5 kyr BP. Inferred temperatures are briefly near modern at ~16.5 kyr BP and rapidly decrease toward lows at ~15 kyr BP. Assemblages during this period of extreme cold are clearly no-analog and dominated by *Pseudodiamesa*, possibly reflecting a shallow lake environment receiving summer meltwater from remnant snow or ice in the catchment. An inferred temperature maximum occurs at ~12.5 kyr BP, which supports an early Holocene Thermal Maximum in the northern Yukon approximately 1 ºC warmer than modern. Both chironomid assemblage zones and pollen-inferred vegetation shifts from Hanging Lake ultimately support a coeval response of aquatic and terrestrial communities to regional climate variability.

* kurek@unb.ca student presenter

Quaternary geology of Bluegoose Prairie, Baffin Island, Nunavut

Vickers*, K.J., Earth Sciences Department, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6; **Ward**, B.C., Earth Sciences Department, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6; and **Utting**, D.J., Canada-Nunavut Geoscience Office, P.O. Box 2319, Iqaluit, NU, X0A 0H0.

Bluegoose Prairie is located at the northeast corner of the Foxe Peninsula, Baffin Island, Canada. Field work to map the surficial geology and ice flow history occurred in the summer of 2006 as part of the South West Baffin Integrated Geoscience Project. Initial results and preliminary analysis of this field work are presented. The objectives of the Bluegoose Prairie project are to: 1) construct a surficial geology map, 2) determine the late Wisconsinan ice flow history, 3) reconstruct a chronology and pattern for deglaciation, and 4) develop a relative sea level curve.

Bluegoose Prairie was fully glaciated during the late Wisconsinan (Marine Isotope Stage 2). It is located between two ice dispersal centers of the Laurentide Ice Sheet, the Foxe Dome and the Amadjuak Ice Divide. These two features, and the Hudson Strait Ice Stream to the south, controlled ice flow in the area. Ice movement and the pattern of subsequent deglaciation in this area are complex. Two main ice flow directions have been determined from a combination of aerial photograph mapping and fieldwork. The earlier ice flow came southwest from the Foxe Dome, transporting ice across the Foxe Peninsula and into the Hudson Strait Ice Stream. Deglaciation was strongly influenced by calving, resulting in marine incursion of the northwest coast. This incursion caused the collapse of the Foxe Dome and ice movement in the area shifted to the northwest, controlled by the Amadjuak Ice Divide. Both flow events left behind streamlined landforms and distinctive till plumes visible in satellite images and air photos.

Marine limit in the area is just over 100 m. Mollusc samples from raised beach surfaces and from within sections have been radiocarbon dated, showing deglaciation of Bluegoose Prairie occurred ~7000 ^{14}C BP (7185 ± 20 ^{14}C BP, UICAMS 33282). Deglaciation and the subsequent isostatic rebound were rapid, as exemplified by the narrow range of mollusc ages (7185 to 6810 ^{14}C BP from 100 to 60 m asl). One paired sample of an articulated mollusc and terrestrial twig have been dated, yielding an estimate for the marine reservoir effect of ~1000 ^{14}C years. The remains of several species of aquatic plants, terrestrial shrubs and willows, and some insects were associated with the terrestrial twig, indicating a productive ecosystem at the time of deglaciation. Stratigraphy in the area shows glacial sediments underlying marine and littoral sediments. A second field season in Bluegoose Prairie is planned for the summer of 2007. It will focus on further resolving the sea level history and environmental reconstruction for deglaciation.

* kaylav@sfu.ca Student Presenter