DRAINAGE FROM THE LAURENTIDE ICE SHEET 11.5-9.5 ka, A REVIEW

Lewis, C.F.M., Geological Survey of Canada, Box 1006, Dartmouth, Nova Scotia B2Y 4A2.

Drainage to the oceans occurred by 1) seasonal meltwater and precipitation runoff, 2) episodic subglacial meltwater release, and 3) iceberg calving. Subglacial meltwater flows are difficult to quantify and date. Syntheses of regional geology and calculations of ice volume reduction during deglaciation show a fairly constant average surface water outflow of 4000 km^3yr^{-1} from 11.5 to 9.5 ka with modulations arising from jokulhlaups and subglacial outflows. Average discharge increased at 11 ka to Arctic (+160 km^3yr^{-1}) and N. Atlantic (+970 km^3yr^{-1}) Oceans, but decreased to Gulf of Mexico (-1080 km^3yr^{-1}) due to ice margin retreat and capture of Agassiz basin outflow by St. Lawrence drainage. At 10 ka, ice margin advance restored the former discharge routing, with increases to Gulf of Mexico (+500 km^3yr^{-1}), and slight decreases to North Atlantic (-100 km^3yr^{-1}) and Arctic (-180 km^3yr^{-1}) Oceans. The Agassiz diversion has been verified by isotopic evidence in Gulf of Mexico and the Great Lakes. The added meltwater input evidently induced climatic cooling in the latter area. The extra Agassiz discharge apparently did not disrupt estuarine circulation in the Champlain Sea; the freshwater influence must have been constrained to surface water layers in the downstream Gulf of St. Lawrence and North Atlantic. Some Agassiz discharge to Arctic Ocean has been conjectured. From 10.5 to 8 ka, strong summer outflow from the northern Laurentide margin cleared the Arctic Islands of sea ice seasonally, possibly providing a source of light $\delta^{18}O$ water vapor in high latitudes.

Discharge of large icebergs from the eastern Laurentide margin was probably common, shown by ubiquitous relic seafloor scour marks on the eastern Canadian continental margin down to 700 m. A buildup of iceberg flux from Hudson Strait beginning just prior to 11 ka probably provided an additional 300-2400 km^3yr^{-1} of meltwater and potential cooling to the coastal areas of Labrador, Newfoundland and Nova Scotia.

STRUCTURAL AND STRATIGRAPHIC SETTING OF MINERAL DEPOSITS OF THE EASTERN ISKUT RIVER AREA, NORTHWESTERN BRITISH COLUMBIA

***Lewis, Peter D.**, Mineral Deposit Research Unit, Department of Geological Sciences, University of British Columbia, 6339 Stores Road, Vancouver, British Columbia V6T 1Z4 and **Henderson, Jack R.**, Geological Survey of Canada, Continental Geoscience Division, 601 Booth Street, Ottawa, Ontario K1A 0E8.

A variety of precious and base metal deposits occur in Upper Triassic (Stuhini Group) and Lower to Middle Jurassic (Hazelton Group) volcanic and volcaniclastic sedimentary rocks of the eastern Iskut River area. Stratigraphic and intrusive relationships and lead isotopic data indicate that most deposits formed in Early to Middle Jurassic time.

Regional and localized deformation played an important role in ore deposition and subsequent disruption of deposits. Earliest deformation is recorded by a regional angular unconformity, separating tight upright folds in the Stuhini Group from broad warps and recumbent folds in the overlying Jack Formation and Hazelton and Bowser Lake groups. The Hazelton Group sequence above the unconformity varies from a few hundred metres to several kilometres in thickness; porphyritic volcanic flow sequences, typical of the lower Hazelton Group in adjacent areas, are usually absent.

Late Jurassic to Cretaceous folding and thrust faulting shortened the Triassic-Jurassic sequence by approximately 50%. This deformation resulted in megascopic stratigraphic repetition, inversion, folding, penetrative flattening fabrics, and stacked thrust sheets within the Hazelton Group. Prospective stratigraphic intervals, including the upper part of the Hazelton Group, are structurally repeated at some localities, and intrusive-related mineralization in the Sulphurets area is displaced by thrust faults. Folds and faults verge strongly westerly along the Unuk River; to the east in the Sulphurets region, structures verge southeasterly. Similarities in amounts of shortening, structural geometry, and ages of units affected suggest that this deformation is related to regional contractional deformation within the Skeena Fold Belt to the east. West vergent features along the Unuk River may be back-thrusts associated with the more regionally persistent easterly vergence.

Youngest structures are steep north, northwest, and northeast striking faults with tens to hundreds of metres of probable dip-slip displacement. These faults are not consistent in spacing, orientation, and displacement sense, complicating predictive mapping of key stratigraphic intervals.

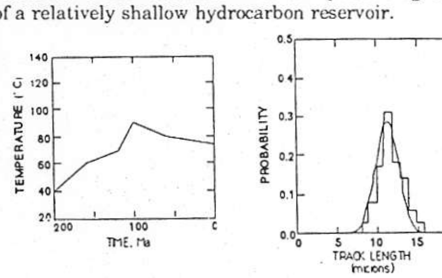
THERMAL HISTORY OF THE SCOTIAN BASIN: A FISSION TRACK STUDY

***Li, Guodong; Grist, Alexander; Zentilli, Marcos; Reynolds, Peter H.**, Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 3J5; and **Williamson, Mark A.**, Atlantic Geoscience Centre, Bedford Institute of Oceanography, Dartmouth, Nova Scotia B2Y 4A2, and Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 3J5.

Fission track ages and confined track length distributions are being measured in apatite samples that have been obtained from sandstone drillcores taken at depths of from 1 to 5 km in 19 hydrocarbon exploration wells in the Scotian Basin. The data are being interpreted in terms of the thermal history of the basin and the provenance of its sediments.

Because fission tracks fade as a function of temperature-time, apatite fission track ages are generally younger than depositional ages, and approach zero at a depth of ca. 4 km (corrected bottom-hole temperature ca. 120°C). Fission tracks in shallower samples are partially annealed. These samples contain broad distributions of confined track lengths and include some very short tracks. Samples from wells in the northeast part of the basin are much more annealed than would be predicted based on present interval temperatures, suggesting that these rocks have been exposed to higher temperatures in the past. Track length and temperature-time models (lines) compatible with the data (histogram, Figure) show that a discrete thermal event occurred in these wells at 80-100 Ma. One hypothesis being tested is that this thermal event coincides with overpressuring and subsequent venting of a relatively shallow hydrocarbon reservoir.

Fission track analysis on zircons provides data on sediment provenance and extends the time-temperature restrictions to depths greater than 4 km.



MICROSTRUCTURAL CHEMICAL CHANGES DURING METAMORPHISM OF THE MOBRUN MASSIVE SULPHIDE DEPOSIT, NORANDA DISTRICT, QUÉBEC

***Liaghat, S., Brown, Alex C.**, Department of Mineral Engineering, Ecole Polytechnique, Box 6079, Sta. A, Montreal, Québec H3C 3A7; **Hubert, C.**, Department of Geology, University of Montreal, Box 6128, Sta. A, Montreal, H3C 3J7.

The Mobrun Cu-Zn-Au massive sulphide deposits occur in Archean metavolcanic rocks of the Abitibi Greenstone Belt in northwestern Québec. The Main Lens is enclosed within brecciated and tuffaceous rhyolites. Hydrothermal alteration in both footwall and hangingwall rocks consists of sericitization, silicification and partial chloritization. During metamorphism, the rocks were deformed and foliated subparallel to the orebody.

The specific relationship between microstructural deformation patterns and the distribution and chemical characteristics of minerals indicates that solution-precipitation creep had a major role in mass transfer during deformation. The abundance of sericite in dissolution (film) domains, together with other resistant minerals (e.g., rutile), provides evidence of solution-transfer (mainly quartz) and volume loss. The precipitation (interfilm) domains contain fibrous quartz, pyrite and overgrowths of sericite and chlorite minerals.

Microprobe analyses of interfilm sericite reveal a range in compositions different from the sericite within cleavage film domains. Interfilm sericite is characterized by higher Si, K, Fe and Mg, and by lower Al, Na and Ti. These chemical variations show that the growth of new phyllosilicate grains was controlled by the behaviour of elements interacting with water during metamorphism. Therefore, part of the silica, as well as the calcium and iron in syn-deformational veins (crack-seal features) containing quartz, carbonate and pyrite, could be attributed to pressure-solution mass transfer. This process was characterized by high pressures and large volumes of fluid, requiring fluid migration over distances greatly exceeding the dimensions of dissolution-precipitation domains.

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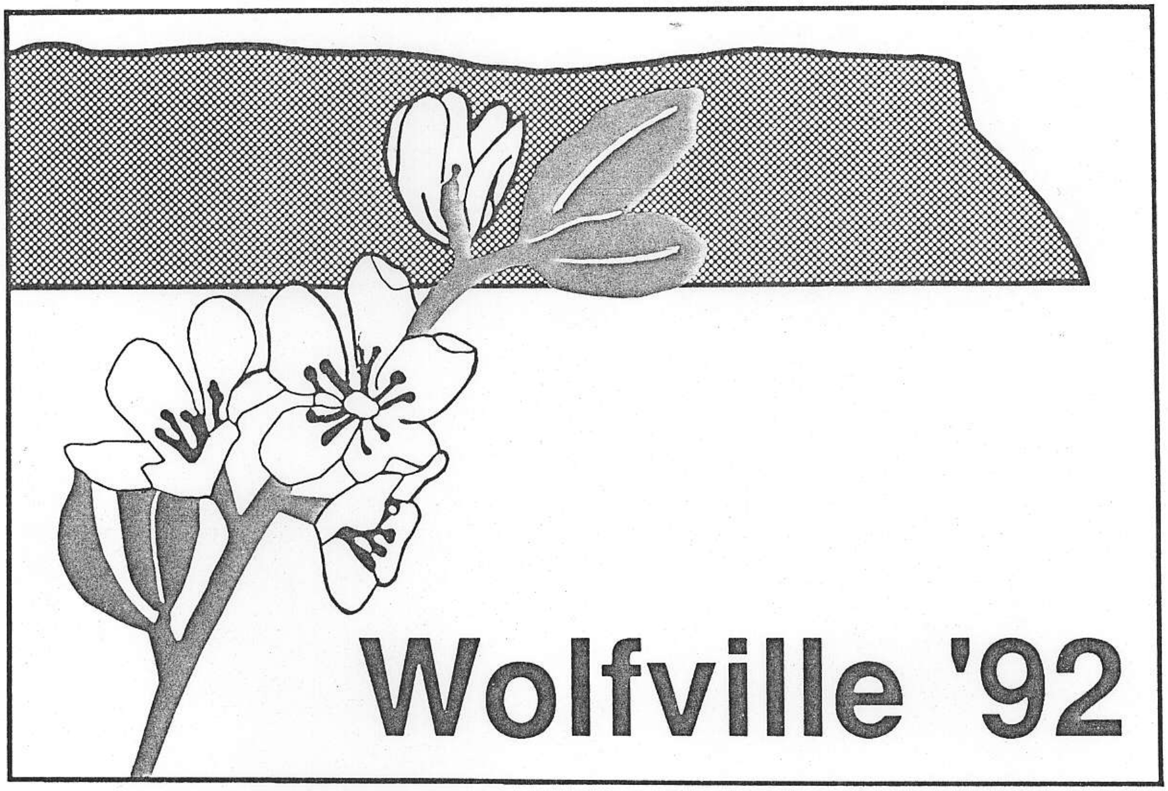

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