## Thermal effects of warm fluid circulation associated with the rise of evaporite diapirs in the east-central Sverdrup Basin, Canadian Arctic Archipelago

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Upper Mississippian to Middle Pennsylvanian evaporites (Otto Fiord Formation) in the Sverdrup Basin have risen diapirically through 6–9 km of Mesozoic and Cenozoic strata of the Sverdrup Basin, Canadian Arctic Archipelago, and participated in the structural deformation of the Eurekan orgeny in the Paleocene – Eocene. It is also clear that diapirs interacted with Mesozoic mafic magmas at depth, and many diapirs include rafts of intrusive and extrusive basalt. Because evaporite minerals are better conductors of heat than other sedimentary rocks, geothermal heat is preferentially funnelled by deeply rooted diapirs. Although some of this heat is transmitted by conduction, it is apparent that warm fluids have circulated within, peripherally, and in structures associated with diapirs, thus transmitting heat by convection. The evidence for fluid circulation includes various generations of brine fluid inclusions within anhydrite-gypsum, some with hydrocarbons, and crystalline calcite-quartz veins and cemented breccia bodies, some containing sulphides. During field work in 2004, we identified pyritiferous mounds and chimneys where basaltic flows intersect faults at the periphery of evaporite structures, indicating that hydrothermal activity was focused therein. The anomalous thermal effects of diapirs have been recorded in the vicinity of the McGill Arctic Research Station at the head of Expedition Fiord, Axel Heiberg Island in the form of: 1) relatively young apatite fission track ages, for which inverse time-temperature models indicate that the Mesozoic rocks now at the surface may have been at temperatures of nearly 100°C as late as the Miocene, long after the Eurekan orogeny; and 2) the presence of springs where the thick permafrost has melted and brines discharge year round at 5°C irrespective of air temperature. These warm springs host microbial life, and their habitat has been investigated by the McGill group as analogs of potential environments in which to search for evidence of past life on the frozen Mars surface. During the 2005 campaign, a large (>100 × 50 m) exposure of calcite (± pyrite) vein network and calcite-cemented breccia was recognized west of the Thompson Glacier. Their geomorphology, mineralogy and texture suggest that the veins represent the remnant roots of ancient (pre-glacial) springs similar to the presently active ones. We speculate that its warm fluids were in part responsible for the persistent geothermal anomaly recorded in the area by the apatite fission track thermochronology.