Mesoproterozoic Basins Project

Annual Summary Report for NRI 2011 Science Research Licence 02-118011R-M

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This project's field activity in 2011 focussed on the origin of a set of 1.1 billion year-old dolostone rocks on northern Baffin Island. The dolostone was deposited in an ancient ocean during a time when Earth's crust in what is now eastern Nunavut was stretching and forming a low area filled by sea water, which spans what is now northern Baffin Island. These dolostone masses were deposited in deep water only where regional fractures in Earth's crust reached the sea floor; the fractures facilitated stretching and faulting of the crust and emitted fluids that promoted dolostone formation. These dolostone rocks are of interest for two reasons. (1) The area is known to contain metal deposits (Nanisivik and other related deposits). The set of fractures along which the mounds are located controlled the later formation of the metal deposits. Finding more such deposits will be easier if the geologic history of the area is better understood. (2) Dolostone mound formation may have been related to communities of bacteria (organisms more complex than bacteria did not exist at the time). Bacterial communities were abundant in shallow-water seas 1.1 billion years ago, but are not well known from deeper-water environments. This study will identify and describe these as-yet undocumented early life forms.

Field work in 2011 consisted of examining and describing outcrops of the dolostone, and collecting about 250 fist-sized samples of rocks for later analysis. The project was based out of two-person field camps with all travel done by foot over a span of 5 weeks; a helicopter was used to move the camps twice. Similar work is planned for summer, 2012. We hope to produce a paper on this study for publication by March 2012.

The Mesoproterozoic Basins project is a multi-year endeavour of which the 2011 work is only one part. Analytical work based on previous years' field work resulted in the publication of one journal paper in 2011 and one that is 'in press'. One BSc thesis and one MSc thesis were produced in 2011. The BSc and MSc theses yielded a paper delivered at a major international conference in October, 2011. Several other papers were delivered at the Geological Association of Canada's annual meeting in May 2011.

Turner, E.C., 2011. Structural and stratigraphic controls on carbonate-hosted base-metal mineralization in the Mesoproterozoic Borden Basin (Nanisivik District), Nunavut. *Economic Geology*, v. 106, p. 1197-1223.

Long, D.G.F. and Turner, E.C., in press. Tectonic, sedimentary and metallogenic re-evaluation of basal strata in the Mesoproterozoic Bylot basins (NU): are unconformity-type U concentrations a realistic expectation? *Precambrian Research.*

Hnatyshin, D., Morden, R., Turner, E., Kontak, D., and Creaser, R.A., 2011. Re-Os and fluid inclusion constraints on the timing and nature of sulfide mineralization at Nanisivik and Hawker Creek, Baffin Island, Nunavut. Geological Society of America Abstracts with Programs (Minneapolis October 9-12, 2011), v.43, no. 5, p. 633.

Kamber, B.S., and Turner, E.C., 2011. Black shale, metal content and ocean ventilation – results and caveats from the ca. 1.1 Ga Arctic Bay Formation, Borden Basin, NU. GAC-MAC Annual Meeting, Ottawa, May 25-27

Long, D.G.F.L. and Turner, E.C., 2011. Tectonic, sedimentary and metallogenic re-evaluation of basal strata in the Mesoproterozoic Bylot basins (NU): Are unconformity-type U concentrations a realistic expectation? GAC-MAC Annual Meeting, Ottawa, May 25-27.