

GEOPHYSICAL EXPERIMENTS IN CENTRAL BAFFIN ISLAND

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Geophysical experiments are taking place on Baffin Island as part of the 4-D Central Baffin geoscience project. The project's principle aim is to understand the northern margin of this northeastern exposure of the 1.8 Ga Trans-Hudson Orogen. A primary objective of the gamma-ray spectrometry sub-component is to document the radioelement characteristics of the major lithologies as an aid to bedrock mapping, whereas the electromagnetic and teleseismic sub-components are tasked with establishing the 3-D architecture of this Himalayan-scale collisional belt.

Preliminary analyses of the gamma-ray spectrometry data from the 2000 season were published in Ford (2001). These analyses showed that the radioelement compositional differences within the supracrustal rocks of the Piling Group can be accurately and efficiently determined using a portable gamma-ray spectrometer thus providing an effective mapping and sampling technique at local, detailed scales. During the 2001 field season in excess of 400 additional ground gamma-ray spectrometry measurements were made. These were concentrated on the Archean orthogneiss's and various Archean and Proterozoic intrusions north of the Piling Group. Analysis of these measurements is still in progress.

The teleseismic experiment began in July, 2000 with the installation of three solar- and wind-powered stations. Two of these were subsequently relocated in 2001, and a further three stations installed. All six sites will record seismic waves from distant earthquakes until August, 2002. Early results from two of the stations indicate unusually thick (or low velocity) crust beneath the central and southwest part of the mapping area (40-42 km). Also, seismic waves arriving at these stations from the northwest sense a different crustal structure from those arriving from the south.

The first phase of the magnetotelluric (MT) experiment took place during July-August 2001 with fifteen sites along an ~300-km-long NNW-SSE profile, and a sixteenth site located at the GSC Camp for instrument testing and for three-dimensional control. The MT sites were located to be optimally positioned as far from seawater as possible, within helicopter range, and to obtain a profile that crossed the major geological structures in the mapping area. The most significant conclusion reached from preliminary analyses and modelling is that the highly conductive iron, sulphide and graphite-rich Astarte River formation, a distinctive stratigraphic marker horizon within the Paleoproterozoic Piling Group, is electrically disconnected to similar rocks found in the south. This could suggest that Archean rocks to the south are not related to Rae craton rocks to the north, or that tectonic imbrication has disconnected northern and southern segments. Either way, the results indicate that the Piling group rocks do not sit within a synformal basin structure.

Ford, K.L., 2001. Reconnaissance gamma-ray spectrometry studies of the Paleoproterozoic Piling Group and adjacent Archean basement rocks, central Baffin Island, Nunavut. Geological Survey of Canada, Current Research 2001-E4, 12 p.