Long-term landscape evolution of Hall Peninsula, Baffin Island, Nunavut: insights from low-temperature (U-Th)/He thermochronology

C. Gabriel Creason and John C. Gosse
Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 1N5, Canada <creason@dal.ca>

The northern coast of Hall Peninsula, Baffin Island, comprises a portion of the eastern Canadian Arctic Rim, an extensive physiographic feature with high relief spanning from southeastern Ellesmere Island to northern Labrador. Much of the high relief (> 1000 m) on Hall Peninsula has been attributed to incision during rift-flank uplift associated with Baffin Island separating from Greenland; however, the mechanisms for maintaining this high relief are poorly understood. In the nearby Torngat Mountains to the south, geophysical and thermochronologic data indicate the presence of a crustal root that induced rapid rift flank uplift. Conversely, thermochronologic data from Cumberland Peninsula to the north does not support the presence of a crustal root, suggesting other mechanisms responsible for the generation of its high relief.

In the summer of 2012, 50 low-temperature thermochronology (e.g., apatite and zircon (U-Th)/He) samples were collected along three strategically positioned transects to determine the regional cooling history of the rocks on Hall Peninsula. Spatial distributions of the cooling ages of samples from two horizontal transects, one oriented parallel and one perpendicular to the Baffin rift-margin, will provide insight to the role (if any) of pre-existing drainage systems in the development of the high relief on eastern Hall Peninsula. Data from a vertical transect will be used to determine the rate of exhumation, if it varied with time, and the total amount of rock exhumed. Furthermore, the results from this study will link together previous thermochronologic studies on Cumberland Peninsula, North-Central Baffin, and Torngat Mountains by testing for thermochronologic evidence of a crustal root below Hall Peninsula, and serve to enhance our understanding of the geomorphic evolution of eastern Canada. Cenozoic sediment fluxes to Baffin Bay and an exhumation history derived from a 3D thermokinematic model (Pecube) will benefit ongoing efforts to evaluate petroleum potential in the region.

Atlantic Geology, 2013, Volume 49, Number 1