

A potential marine paleo-earthquake record from Pond Inlet, Nunavut, Canada

CALVIN CAMPBELL¹, J. ROBBIE BENNETT¹, KIMBERLY A. JENNER¹, AND LISEL CURRIE²

1. *Natural Resources Canada, Geological Survey of Canada (Atlantic), Bedford Institute of Oceanography, 1 Challenger Drive, Dartmouth, >Nova Scotia B2V 2A4, Canada <calvin.campbell@nrcan.gc.ca> ¶ 2.*

Geological Survey of Canada-Calgary, 3303-33 Street NW, Calgary, Alberta T2L 2A7, Canada

The area offshore Baffin Island is one of the most seismically active regions in Canada with an earthquake hazard similar to coastal British Columbia. One of the largest measured passive margin earthquakes (M 7.3) occurred off northeast Baffin Island in 1933 and many measurable earthquakes happen each year in that vicinity. A primary issue for assessing earthquake hazard in the region is estimating the recurrence of large earthquakes. Instrumented records only go back to the early 1900s and large earthquakes, such as the 1933 event, may have a recurrence of 100s to 1000s of years. In this study, the marine geological record was used in an attempt to improve the estimation of regional earthquake recurrence.

Pond Inlet forms part of the waterway that separates northern Baffin Island from Bylot Island. Multibeam bathymetry from the inlet, collected as part of ArcticNet activities, shows that the seabed consists of exposed bedrock and deep sediment-filled basins. The basin sediments provide a record of late glacial and post glacial processes. In some cases, the bathymetry data reveal faults and fractures in the bedrock that coincide with lineaments and escarpments on the basin floors. In 2013, a piston core was collected in 1035 m water depth from the floor of one of the basins near the base of an interpreted fault escarpment. The purpose of the core was to test the hypothesis that the sedimentary succession at the foot of the escarpment would provide a record of movement along the fault through the deposition of debrites and turbidites. The core recovered 8 m of brown mud. There was no obvious indication of the 1933 event in the core, however eight potential 'earthquake events' are interpreted; two debrites and six lamina sets comprising muddy turbidites. At this time, only one radiocarbon result is available for the core indicating a sedimentation rate of 69 cm/kyr in the upper part of the core. Two additional radiocarbon results from a nearby core taken in the same basin suggest sedimentation rates of 73-160 cm/kyr. Therefore, the core likely represents a record of the last 5 to 10 thousand years. Based on these results, sediment failure occurs along the escarpment every 600–1200 years. Although other failure trigger mechanisms are not discounted at this time, this rate potentially provides insight into the recurrence of regionally significant earthquakes in northern Baffin Bay.