

A high-resolution Holocene marine sedimentological record from Pond Inlet, Nunavut, Canada: is there a paleoseismicity signal?

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Arctic fjords often have sedimentation rates sufficient to preserve a high resolution record of the local and regional environment. Baffin Bay is one of the most seismically active areas in Canada with a seismic hazard similar to coastal British Columbia. Pond Inlet, a fjord in Northern Baffin Island, has had high sedimentation rates since deglaciation (0.8 mm/a), which gives it the potential to preserve a paleoseismic record for the region. Relatively little is known about what depositional processes are responsible for the stratigraphic record preserved in Pond Inlet. Newly acquired submarine geological data from sediment cores and seabed and sub-seabed geophysics reveal deposits interpreted as mass transport deposits (MTD) and turbidites. The processes responsible for these deposits could include local glacial outbursts, storms or flood events, or earthquakes.

Detailed sedimentology on the cores, radiocarbon geochronology, grain size analysis, multibeam bathymetry, and seismic stratigraphy of 3.5 kHz data will help test if these deposits are related to regional paleoseismicity, or if climate or storms are more likely triggers. This will involve (1) comparing the sedimentology and grain size patterns of the MTDs with each other and with other MTDs that have been related to modern or paleoseismicity, and (2) determining if deposits are approximately synchronous across the basin based on relative or radiocarbon dating, or, alternatively, if the MTDs were deposited during known Arctic Holocene paleoclimate anomalies. If linked to seismicity, the recurrence interval of large earthquakes may be evaluated, which will improve understanding of the seismic risk for the hamlet of Pond Inlet. Detailed study of this system will contribute to improved assessment of the geological hazards in Baffin Bay and help to understand the changes in strain and seismic risk along passive continental margins.