Investigation of a Holocene marine sedimentary record from Pond Inlet, Nunavut, Canada

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Fjords often have high sedimentation rates which gives them the potential to preserve a high resolution sedimentary record of the local and regional environment. Newly acquired sediment cores and geophysical data from Pond Inlet, a fjord in northwestern Baffin Bay, provide the first opportunity for a thorough investigation of the Holocene marine sedimentary record in this region. The dataset includes high resolution multibeam bathymetric data, 3.5 kHz sub-bottom profiler data, and five piston cores. Baffin Bay is within a seismically active zone and experienced the largest measured earthquake (Mw = 7.3) north of the Arctic Circle in 1933. Earthquakes and other processes in the region have the potential to trigger tsunamis either directly or indirectly with slope failures. A detailed analysis of the marine sedimentary record is necessary to establish if mass movement events are preserved in Pond Inlet and to begin to evaluate their frequency and locations along Baffin Island. Seabed mapping, analysis of core physical properties, shallow lithologic and acoustic stratigraphy, and geochronology are underway.

Initial results indicate that a record of mass transport deposits (MTDs) and turbidites are preserved within the fjord which represent periods of local instability. While the seabed reveals little evidence of slope failures, sub-bottom profiler data reveal that the basinal sediments are composed of hemipelagic sediments interrupted by multiple acoustically chaotic sediments—representing MTDs—along with high amplitude reflectors interpreted as turbidites. The piston cores show evidence of deformed mud and mudclast conglomerate deposits up to 5 m-thick interpreted as mass transport deposits, as well as centimetre thick sandy-silty turbidites. Our first radiocarbon dates (n = 6) from mixed foraminifera assemblages and benthic colus shell fragments indicate that over the last 3 ka at least four mass movement events have been recorded in the fjord and that basinal sedimentation rates are approximately 1.8 mm/yr. This is the first opportunity to establish an MTD chronology in northern Baffin Bay which will help improve the assessment of the geological hazards in the region and their potential impact on northern communities on Baffin Island.

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