Geophysical Research Abstracts
Vol. 19, EGU2017-14420, 2017
EGU General Assembly 2017

Enigmatic mounds in 'Subglacial Meltwater Corridors' on the Canadian Shield: a record of channelised, subglacial meltwater drainage during Laurentide deglaciation

Anna Haiblen (1), Brent Ward (1), Philippe Normandeau (2), and Janet Campbell (3)

(1) Department of Earth Sciences, Simon Fraser University, Burnaby, Canada, (2) Northwest Territories Geological Survey, Yellowknife, Canada, (3) Geological Survey of Canada, Ottawa, Canada

Esker networks have traditionally been invoked to represent the channelised subglacial drainage system in shield terrains. However, eskers are only one landform found within 'subglacial meltwater corridors' (SMCs) on the Canadian Shield. SMCs are tracts where till has been eroded, bedrock is exposed, and glaciofluvial sediments have been deposited. SMCs are regularly spaced, parallel deglacial ice-flow directions, have undulating longitudinal profiles, and cross modern drainage divides.

Our lidar- and field-based mapping near Lac de Gras, Northwest Territories, west of the Keewatin Ice Divide (KID), reveals that eskers are not present in the majority of SMCs. Instead, enigmatic mounds are commonly the dominant landform type. Enigmatic mounds typically occur in groups of 20 to 200. They are commonly composed of sandy diamicton that is coarser grained and better sorted than regional till. This diamicton is occasionally draped with well-sorted, stratified glaciofluvial sediments. Some enigmatic mounds have a single highpoint (individual mounds) while others have a complex, irregular form (complex mounds). Individual mounds have an average long-axis length of 43 m and an average height of < 2 m, however, their size is highly variable: the largest mounds are 170 m long and 15 m high. Complex mounds are typically larger than individual mounds. Our morphometric analysis shows that individual mounds have a mean length-to-width ratio of 1.8. The average mound elongation direction parallels the final ice flow that affected the area. However, where meltwater- and ice-flow directions differ, mound long-axis orientations typically cluster about meltwater flow directions. We have also observed SMCs and enigmatic mounds in the South Rae region of Northwest Territories, $\sim$ 450 km SE of Lac de Gras. Multiple types of enigmatic mounds are present in this area: some are similar to those near Lac de Gras, some are composed of till, and some are composed of sorted and stratified sediments.

SMCs likely formed late during deglaciation because the enigmatic mounds and eskers that they contain do not appear to have been significantly affected by ice flow following their deposition. We suggest that transient, sheet-type subglacial meltwater flow events resulted in erosion and transport of basal till. Meltwater was likely sourced from supraglacial lakes that formed and drained catastrophically when the ablation zone of the Laurentide Ice Sheet affected the area. The enigmatic mounds that we have observed near Lac de Gras may have been deposited from a slurry-type flow. Eskers likely formed later, after a channelised drainage system was established. It is possible that SMCs are the Quaternary landscape record of lake-drainage events similar to those that occur in Southwest Greenland today.

The hydraulic conditions required to create enigmatic mounds are different to those required for esker formation. Thus, SMCs, not just the eskers that they sometimes contain, should be considered when parameters are developed for numerical models relating to subglacial drainage systems in shield terrains. Determining the genesis of landforms found within SMCs will improve our understanding of hydraulic conditions in the subglacial, channelised drainage system during ice-sheet retreat and decay.