Geophysical Research Abstracts
Vol. 12, EGU2010-9528, 2010
EGU General Assembly 2010

Using erosion associated with glaciovolcanic features to document the existence of pre-LGM ice-sheets: examples from the Kawdy Plateau, northern British Columbia

Gwen Dunnington (1), Benjamin R Edwards (1), Chanone Ryane (2), James K Russell (2), and Gregory K Lasher (1)

(1) Department of Geology, Dickinson College, Carlisle, PA, USA (edwardsb@dickinson.edu), (2) Earth and Ocean Sciences, The University of British Columbia, Vancouver, BC, Canada

One of the most significant difficulties with understanding terrestrial Pleistocene climate change is that the depositional record of ancient ice sheets is frequently destroyed by successive glaciations. Given their resistance to erosion, glaciovolcanic features provide unique opportunities at which to look for evidence of multiple glaciations. Evidence from the Kawdy Plateau (KP) region of northern British Columbia is consistent with the presence of multiple ice sheets covering the Canadian Cordillera over the past 2 Ma and derives from two sources: features interpreted as having formed by glacial scouring of bedrock, and the state of preservation for six glaciovolcanic edifices (Kawdy Mountain, Tutsingale Mountain, Nuthinaw Mountain, Meehaz Mountain, Tanker tuya, Horseshoe tuya) located on the plateau.

Detailed measurements of glacial mega-grooves/striations on bedrock in the eastern part of the plateau, along with similar features on two different edifices (Tutsingale Mountain and Tanker tuya), are consistent with ice movement in three distinctly different azimuths: 21-59 degrees; 60-88 degrees; 88-92 degrees. The scours may indicate the presence of at least three separate glaciers flowing in different directions over the KP, separated by enough time to allow the previous glacier to melt entirely and expose the plateau floor to continued erosion. Cross-cutting relationships and quality of preservation indicate that the group trending between 88-92° across the plateau and tuyas is the oldest, the group trending 21-59° is younger than that, and a group trending 60-88° is the youngest, presumably related to ice flow during the Last Glacial Maximum (LGM). Drumlinoid features on the plateau floor and on top of Horseshoe Tuya indicate that despite this 71° variation in orientation direction of scours across the entire area, the general direction of ice movement across the plateau has always been in an east-to-west or northeast-to-southwest direction.

The states of erosion for all six of the KP glaciovolcanic edifices are consistent with extensive glaciation. Besides the glacial features noted above, at least three of the edifices (Kawdy Mountain, Tanker tuya, Horseshoe tuya) show evidence for extensive morphological modification. Although the core of Kawdy Mountain is made of erosion-resistant palagonitized volcanic breccia and intrusions, its core has been eviscerated and now has a long, northeasterly trending cirque-like valley. Horseshoe tuya appears to have lost almost half of its original volume into a north-facing, cirque-like feature. The aerial footprint of Tanker tuya is consistent with erosion of more than half of the original edifice, and its lower stratigraphy may contain at least one pre-LGM glacial diamicton.

We believe that these observations indicate that the Cordilleran Ice Sheet (CIS) did not remain constant and intact during the Pleistocene, but fluctuated between periods of thick, low-elevation ice cover and more sparse, high-elevation cover. Evidence for multi-stage continental glaciation has important implications for the reconstruction of the history of the Cordilleran ice sheet, correlation with the marine Pleistocene climate record, and constraints on the paleoclimate factors which influenced terrestrial ice sheet development.