Geophysical Research Abstracts
Vol. 12, EGU2010-2896, 2010
EGU General Assembly 2010

Ice insulation by rock avalanche debris: the Mt. Cook (1991) and Beatrice (2004) rock avalanches, Southern Alps, New Zealand

Natalya V. Reznichenko (1), Tim R. Davies (1), James Shulmeister (2), Stefan Winkler (1,3)

(1) Department of Geological Sciences, University of Canterbury, Private Bag 4800, Christchurch, New Zealand (nre28@student.canterbury.ac.nz), (2) Geography, Planning and Environmental Management, University of Queensland, Brisbane, Australia, (3) Department of Geography, University of Würzburg, Am Hubland, D-97074 Würzburg, Germany

The formation of terminal moraines mainly results from glacier changes in response to climate variations. But glaciers may also react sensitively to increased debris cover caused by large-scale failure of bedrock slopes. Catastrophic rock avalanches are a major source of sediment in active orogens like e.g. the Southern Alps, New Zealand (Shulmeister et al., 2009). They often occur as a result of earthquakes, and also due to slope failure driven in the longer term by regional uplift. Rock avalanche deposits can drastically alter glacier mass balance through reduced ablation and consequential altered flow rates, and can contribute to glacier moraine formation (see e.g. Hewitt, 2005, 2009; Shulmeister et al., 2009). Consequently, the frequently-assumed linkage between terminal moraine formation and climate forcing may need to be reconsidered. Especially for the investigation of the regional Holocene glacier and climate chronologies it is essential to separate and assess the tectonic/coseismic impact on terminal moraine formation.

In order to investigate the role of catastrophic landslide events in moraine formation, Ground Penetrating Radar (GPR) surveys of rock avalanche deposits on the Tasman and Hooker Glaciers, Southern Alps, New Zealand, were compared with laboratory experiments of the debris cover effect on underlying ice ablation. The 1991 Mt. Cook rock avalanche deposit on the Tasman Glacier is up to 10 m thick and has caused a 25 m high ridge to form at the upvalley edge of the deposit. The smaller 2004 Mt. Beatrice rock avalanche onto Hooker Glacier has formed an elevated plateau with similar raised edges because of reduced ice melting under the rock avalanche deposit. The reduction of ice-surface ablation on the glaciers is compared with laboratory data on ice ablation rates under various thickness of debris-cover, under controlled conditions with replication of diurnal temperature, radiation cycles and rainfall conditions. The latest results are presented, accompanied by some remarks on related future research activities.

Hewitt, K. (2005): The Karakoram Anomaly? Glacier expansion and the 'elevation effect', Karakoram Himalaya. Mountain Research and Development 25, 332 – 340.

Hewitt, K. (2009): Rock avalanches that travel onto glaciers and related developments, Karakoram Himalaya, Inner Asia. Geomorphology 103, 66 – 79.

Shulmeister, J.; Davies, T.R.; Evans, D.J.A.; Hyatt, O.M. & Tovar, D.S. (2009): Catastrophic landslides, glacier behaviour and moraine formation – a view from an active plate margin. Quaternary Science Reviews 28, 1085 – 1096.