Geophysical Research Abstracts
Vol. 12, EGU2010-12797, 2010
EGU General Assembly 2010


# Formation of medial moraines on a temperate Alpine valley glacier

Richard Farnell (1), Michael Hambrey (2), and Duncan Quincey (3)

(1) Institute of Geography and Earth Sciences, Aberystwyth University, Aberystwyth,UK, (2) Institute of Geography and Earth Sciences, Aberystwyth University, Aberystwyth,UK, (3) Institute of Geography and Earth Sciences, Aberystwyth University, Aberystwyth,UK

Medial moraines are distinctive englacial and supra-glacial transport pathways for debris and sediment in the glacial system. At the Morteratsch Glacier, comprising the Vadret da Morteratsch and Vadret da Pers glaciers, Switzerland, medial moraines have been investigated to (i) identify the medial moraine formation processes occurring at this location, (ii) determine the level of influence of large scale deformation on medial moraine formation, and (iii) devise an up to date, multi-disciplinary conceptual model of medial moraine formation.

Structural investigation of strike, dip, plunge of folds, foliations and fractures, combined with remote sensing, has rendered structural maps of the ice surrounding medial moraines. Debris was sampled from supraglacial, englacial, basal and proglacial locations and subjected to clast morphology and sediment texture analysis. Similarity between particle size distributions were investigated via a cos- similarity index. Meltwater from ice sources was retrieved for stable isotope (18O, D) analysis to discern variations in isotopic composition laterally and throughout the length of the medial moraines.

Results indicate that supraglacial and basal debris sources contribute to the formation of medial moraines at this glacier. Supraglacial debris sources originate from rock fall at the lateral margins of the glacier, rendering a surficial cover of this debris that increases in width (ranging from 10 m to 100 m) with increasing distance down-glacier. However, we find that the majority of sediment incorporated within the medial moraines is basally derived, forming sub-vertical layers (< 0.2 m thick) of alternating debris-rich and debris-poor ice, aligned parallel to longitudinal foliation. Isotopic signatures in these debris bands reflect enrichment of 18O relative to surrounding glacier ice. Structural analysis of the glacier revealed no evidence of large-scale folding surrounding medial moraines.

This study concludes that medial moraine formation at this glacier is heavily influenced by debris incorporated at the ice-substrate interface by sub-glacial melting, refreezing processes, and not associated with large scale deformation.