Geophysical Research Abstracts,
Vol. 11, EGU2009-13060-2, 2009
EGU General Assembly 2009

Valley Evolution and Controls on Present-Day Rock Slope Processes in the Matter and Saas Valleys, Switzerland

K. Leith, A Kos, S Löw, and J Moore
ETH Zurich

Landforms in the Matter and Saas Valleys (Kanton Valais, Switzerland) indicate a progressive upstream transition from fluvially dominated to glacially dominated terrains. Large glaciers currently reside in the headwaters of both valleys, and the region was a major ice contributor to the Rhone Valley during the LGM. Characteristic geomorphic indicators linked to morphology, extent of glacial sediments and ice-rock contact surfaces, as well as river and terrace profiles within the two valleys suggest a parallel temporal evolution, despite variations in catchment size, lithology, and glacial input.

Slope morphology and fan deposits indicate a concentration of high-energy rock slope activity (such as rock falls, topples, and slides) within a transitional geomorphic domain in the lower 1/3 of both valleys. This transitional domain is defined by a characteristic moderate gradient, linear, river profile. It separates a downstream detachment-limited fluvial domain from a transport-limited domain upstream, where a broad alluvial plain forms a thick infill in the relict glacial valley. Hillslope erosional processes appear considerably less developed and active in these neighboring domains.

While the rock slope activity in the transitional domain initially seems to be a clear process response to renewed Holocene fluvial incision in the lower section of the valleys, mapping of glacial landforms indicates only limited incision may have taken place. Activity is concentrated on steep valley walls which extend up to 700m above the current valley floor. These are buttressed by significant talus deposits, which combined with the topography, mean there is likely to be little direct connection from the post-glacial fluvial activity to the erosional hillslope processes.

Initial investigations suggest that a combination of repeated glacial erosion and debuttressing, as well as fluvial processes during interglacials may have lead to a significant, consistent differences in post-glacial stress redistribution in each domain. Large deviatoric stresses associated with high relief, and the removal of sedimentary buttresses in the transitional domain, may have induced fracturing of the rock mass through exfoliation and static fatigue, and conditioned rock slopes for ongoing failure.