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Coordinated quantitative studies on sediment fluxes and sediment budgets in changing cold environments – examples from three SEDIBUD key test areas in Canada, Iceland and Norway

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The new I.A.G./A.I.G. Working Group SEDIBUD (Sediment Budgets in Cold Environments) (http://www.geomorph.org/wg/wgsb.html) builds up on activities which were started within the European Science Foundation (ESF) Network SEDIFLUX (Sedimentary Source-to-Sink Fluxes in Cold Environments, 2004–2006)
(see: http://www.ngu.no/ sediflux,
http://www.esf.org/ sediflux).

Changes in climate have a major impact on Earth surface systems, especially in high-latitude and high-altitude cold environments. Such changes have a major impact on sediment transfer processes. The major aim of I.A.G./A.I.G. SEDIBUD is to provide an integrated quantitative analysis of sediment transfers, nutrient fluxes and sediment budgets across a range of key cold environments. Such an analysis has so far been lacking. The primary focus is on the impact on sediment transfer processes in response to a variety of climate change scenarios at a scale, which incorporates sediment flux processes from source to sink. In order to perform a fully integrated study of source to sink sediment fluxes and sediment budgets in cold environments, SEDIBUD analyses the key components of weathering, chemical denudation, erosion, aeolian processes, mass movements, fluvial transfers/transport, glacial sediment transfers, and sedimentation in lakes, fjords and coastal areas. SEDIBUD is also considering the impact of human activity on the environmental sites being studied and how this might relate to climate change.

Results from ongoing quantitative geomorphologic studies on sediment fluxes and sediment budgets in selected SEDIBUD key test sites in Arctic Canada, sub-Arctic Iceland and sub-Arctic Norway are presented and discussed in the context of possible effects of projected climate change on present-day process frequencies, intensities, process rates and sediment budgets in sensitive cold environments.

Cape Bounty is located in the Canadian High Arctic Archipelago and is representative of the low-relief, unglacierized landscape found in much of this region. Research is underway in paired watersheds with emphasis on suspended sediment delivery processes and fluxes, particulate and dissolved car-

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bon and nutrient fluxes, and linkages between fluxes and periglacial slope processes, active layer disturbances, and hydrological routing. Additionally, each watershed drains into similar lakes that contain annually-laminated sediments that will provide long term measures of sediment and particulate organic material delivery.

Fnjóskadalur is a representative U-shaped valley in sub-Arctic Northern Iceland and is characterized by a wide range of different denudative surface processes. Current research in this key test area is focused on:

- (i) the analysis and quantification of sediment fluxes from slope processes, especially snow avalanches and debris flows, and
- (ii) the investigation of the magnitude-frequency relationship of snow avalanches and debris flows. Currently applied methods cover topographical and geomorphologic (underlining erosion and accumulation areas, extreme reach of slope dynamics as well as their lateral spreading) purposes. The used dating techniques (phytogeographical techniques: vegetal cover, lichenometry, dendrochronology; weathering; tephrochronology) reveal the rhythms of present-day slope activity as well as during the Upper Holocene period.

Erdalen is a very steep U-shaped valley in the fjord landscape of western Norway (Nordfjord). The sub-Arctic Erdalen catchment is connected to the Jostedalsbreen ice cap and is in its uppermost areas glaciated. Current investigations include the analysis of storage elements by using different geophysical techniques, the year-round monitoring of meteorological parameters, ground temperature, permafrost, runoff, fluvial solute and sediment transport as well as the analysis of slope processes like rock falls, avalanches and debris flows by combining different monitoring and dating techniques.

The potential and expected benefit generated by coordinated data exchange and the unification of methods and techniques applied to long-term process monitoring/analysis, the quantitative investigation of storage elements and for sediment budget studies in cold environments is presented.