SEDIBUD OBJECTIVE

(October 26, 2011; revised by A.A. Beylich, S.F. Lamoureux, A. Decaulne, J.C. Dixon & Z. Zwolinski)

To address the question: What are the contemporary sediment fluxes in cold environments?

RATIONALE:

The focus of SEDIBUD is the analysis of source-to-sink fluxes and sediment budgets in changing high latitude and high altitude cold environments. Explicit in this goal is the need to understand how processes and environments will respond to changing climate. Space-for-time substitution offers the opportunity to predict future changes, but ONLY if the baseline we use is sound. At present we lack full understanding of contemporary sediment fluxes in cold environments. Establishing contemporary sediment fluxes in a diversity of cold environments can form a baseline from which modeling can operate. Baseline information should consist of measures of mean annual temperature, total annual precipitation, total annual runoff, annual bed load yield, annual suspended sediment yield, annual solute yield (atmospherically corrected), and dominant slope processes.

In establishing firm baselines several overarching issues must be considered [*]:

- Up-scaling issues from source to sink.
- Coupling periglacial and glacial systems to establish holistic sediment budgets.
- Assessment of the significance of changing ground ice conditions on sediment fluxes.
- Development of innovative field methods for cold environment sediment flux and budget investigations.
- Modeling future sedimentary fluxes.

SEDIBUD HYPOTHESES:

1. Changing winter snowfall will be a significant driver of nival and glacial processes and will change catchment fluxes of all types.

2. Glacial, nival and pluvially induced catchment fluxes will respond to different climatic forcings, and hence may demonstrate divergent flux responses.

3. Both snowmelt in spring and major rainfall events in summer or fall represent the dominant periods of fluxes.

4. Chemical processes and solute fluxes are comparably important in cold environments.

5. Active permafrost degradation or reduction of seasonal ground frost will have an indirect role during the nival freshet, but should increase fluxes over multi-year scales.

6. Inter-annual variability in fluxes will continue to be the dominant form of change in catchment fluxes despite ongoing global climate changes.

* Warburton, J. (2007). Sediment budgets and rates of sediment transfer across cold environments in Europe: A commentary. *Geografiska Annaler,* 89A: 95-100.