



Are postglacial sediment yields of mountain headwaters out of pace?

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Many high mountains have been sculpted by strong glacial erosion during the Pleistocene that resulted in valley widening and overdeepening and the formation of glacial cirques, U-shaped valleys, and widespread glacial deposits. The retreat of glacial ice exposes oversteepened hillslopes that are susceptible to rockfalls, deep-seated landsliding, gully erosion, and debris flows, and can also result in valley aggradation and reworking of valley deposits through debris flow activity and fluvial processes. It has been argued that sediment fluxes caused by these processes remain elevated even several thousand years after the retreat of valley glaciers. Yet, our knowledge on the response times of postglacial mountain systems to Pleistocene glacial erosion remains insufficient.

Here I represent an approach to calculate the response times of postglacial geomorphic systems to Pleistocene glacial erosion based on reservoir theory and the compilation of postglacial sediment budgets in alpine systems. The study is conducted in the Kananaskis Country in the Canadian Rocky Mountains, in which sediment budgets of 5 headwater basins have been compiled. The sediment budgets show that sediment delivery from formerly glaciated headwaters is limited indicated by average postglacial sediment delivery ratios (SDR) ranging between 0 and 0.3. The low SDRs are controlled by the glacial history of the headwater and suggest that the response times of sediment flux in alpine headwater basins is in the order of 100-500 kyr. Thus postglacial adjustment of alpine sediment flux exceeds the recurrence interval of the large ice ages during the Pleistocene suggesting that mountain headwaters in the Canadian Rockies are out of pace with respect to glacially-induced changes.