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Bedload transport from a glacially-fed river in Greenland

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As the climate warms, increases in glacier melt and altered glacier dynamics will result in changes to the dynamics of the Greenland Ice Sheet, impacting the sediment delivery in these rivers. In turn, examining the processes by which proglacial rivers transport sediment delivered by the ice sheet has important implications for the delivery of sediment to the oceans. Applying current knowledge of sediment transport from glacially-fed catchments in alpine regions is difficult, given several pronounced differences compared to glacially-fed catchments in the Arctic. These differences include elevated water discharge and reduced amplitude in diurnal variations of water discharge. Thus, it is imperative that we understand the differences in sediment dynamics between these two regions and evaluate the processes responsible for sediment transport between the ice sheet and ocean. To pursue this understanding, we installed seismic stations to measure bedload transport near the terminus of Russell Glacier during the summer of 2021.

We convert the seismic signal from these stations to a bedload transport rate by evaluating several environmental variables, including the transported grain size and ground properties near the river. One station was close to the glacier, whilst the other is 1.5 km downstream. The distance between the stations allows us to evaluate the timing of proglacial sediment transport and deposition. Additionally, the operation of the instruments from early June through mid-August allows us to evaluate seasonal characteristics in sediment discharge. Lastly, we compare these results to the current knowledge of sediment transport from glacierized catchments in mountain regions.