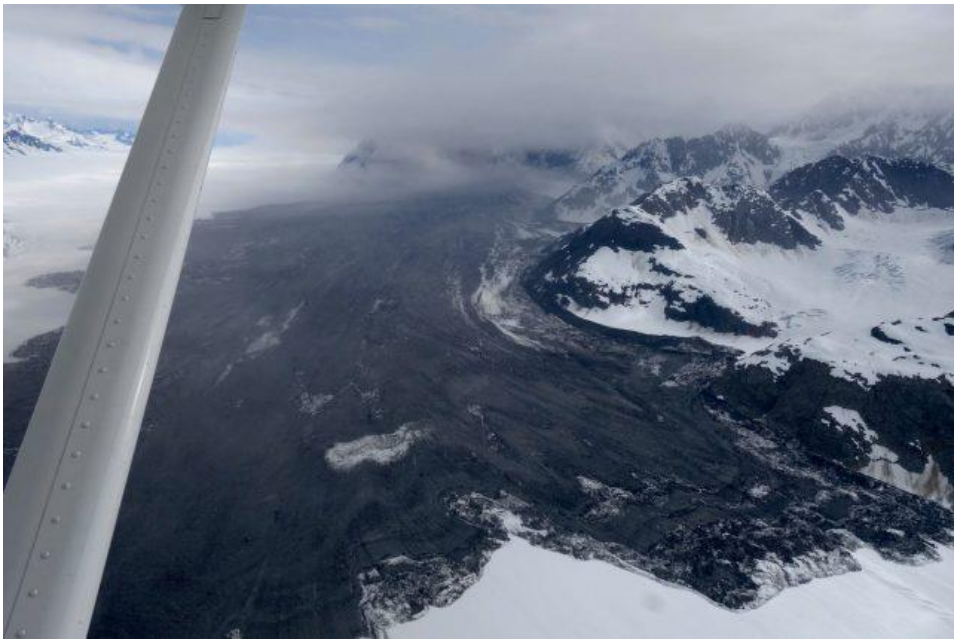
Master theses: Detecting rock avalanches on glaciers

Massive rock slope failures can generate high-speed, long-runout rock avalanches onto glaciers (RAGs) in high mountains. This additional load of supra-glacial debris can change glacier flow velocities, and ultimately govern the mass losses of affected glaciers from atmospheric warming. Travel over glaciers can even increase the speed and length of runout of rock avalanches, putting communities downstream at risk. However, the hazard from RAGs has been largely disregarded in the past because of few historically documented cases. Globally documented cases in the past three decades mainly cluster in the Coast Mountains along the North-western Pacific (USA, Canada), while other mountain ranges such as the Himalaya-Karakoram suggest a remarkably lower RAG frequency. Whether differences in rock avalanche activity between mountain ranges originate from selective reporting or from a different response to atmospheric warming remains an open question, however.



Rock avalanche on Lamplugh Glacier, Alaska. Source: https://blogs.agu.org/landslideblog/

The working group for natural hazards offers

two Master thesis

to systematically analyse the distribution of rock avalanches on glaciers in Alaska and the Himalaya-Karakoram.

Master thesis 1 will focus on extending the inventory of RAGs in the Himalaya-Karkaroam using visual search in multitemporal Landsat imagery since the late 1980s. The ideal candidate will bring advanced expertise in a GIS environments (ArcGIS, QGIS, SAGA-GIS, or equivalent) for mapping RAGs. She or he should also have advanced knowledge in a statistical programming language (R, Python, Matlab, or equivalent) to study the frequency-size distribution of RAGs.

Master thesis 2 aims at generating an automatic workflow for detecting RAGs from satellite imagery and topographic datasets in Alaska, where a sufficient catalogue of test cases exists. The ideal candidate will have basic expertise in (or willingness to learn) the GoogleEarthEngine for time series analysis of satellite imagery. She or he will also bring advanced knowledge machine learning using a statistical programming language (R, Python, Matlab, or equivalent).

Interested Master candidates may contact Georg Veh per mail (georg.veh@uni-potsdam), telephone (+ 49 331 977 5875) or personally (House 1, Room 1.20) for further questions. Work on the theses can start immediately.

Potsdam, 25 Sep 2019

Further readings:

Deline, P., Hewitt, K., Reznichenko, N., and Shugar, D. (2015): Rock Avalanches onto Glaciers. In: Landslide Hazards, Risks, and Disasters. Chapter 9, Elsevier, Amsterdam, 263-319.

Coe, J. A., Bessette-Kirton, E. K., and Geersema, M. (2018): Increasing rock-avalanche size and mobility in Glacier Bay National Park and Preserve, Alaska detected from 1984 to 2016 Landsat imagery. Landslides, 15, 393-407.