Geological control on rockfall volume

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Project description

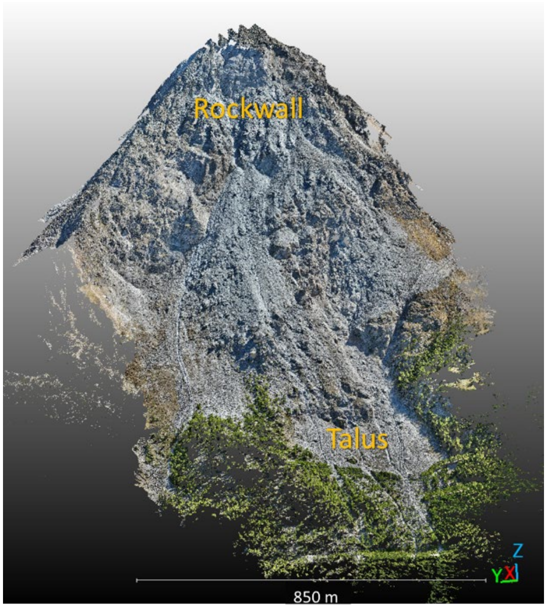

Fig. 1 Exemplary point cloud from Taeschgufer (CH).

Rockfall processes are one of the most hazardous mountain processes causing a large number of accidents and fatalities in steep environments. Rockfalls are characterized by rock fragment release from a rockwall, followed by transport including falling and bouncing, and accumulation on a debris slope called talus (Fig. 1). The hazard potential depends on the volume of the released rockfall, which is controlled by rockwall geology, and rockwall and talus topography that affects transport length and deposit location. To quantify and mitigate rockfall risk, a detailed knowledge about rockfall volume is required as larger rockfall have in general a longer transport length, potentially travelling down to populated valley floors.

Standard procedures to quantify rockfall volume are either manually measurements of fracture properties at the releasing rockwall or quantifying rockfall block sizes on the talus. However, these measurements are usually restricted to small numbers reduced to accessibility and safety issues. In this project, we propose a novel approach to quantify geology controlled rockfall volume. The student will develop a relationship between rockwall properties (e.g., fractures) and talus properties (e.g., rockfall deposit size) by using data from Uncrewed Aerial Vehicles (UAV) campaigns. We collected data from several rockwall-talus systems with different geology in Norway, Switzerland, and New Zealand. The student will quantify fracture properties based on point clouds with tools integrated in Cloud Compare and quantify rockfall deposit size using machine learning approaches on UAV orthophotos.

Job requirements

You should have participated in a remote sensing course and have an affinity for coding with Python (or a different language). You will process point clouds with Cloud Compare following well-documented workflows and will apply published machine-learning approaches on orthophotos. Knowledge in statistics would be suitable for development of statistical relationships between rockwall and talus.