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Quantification of landslide-induced changes in glacier dynamics – project outline

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The response of glacial masses to climate change is well documented. However, the impact of landslides on glacier dynamics and stability requires greater research. Landslides in glacierized mountains can be caused by climate change (e.g. permafrost thawing), intense precipitation, paraglacial response of slopes or earthquakes and can, in turn, limit ablation, increase meltwater production and alter glacier velocities. Besides, landslides can be hazardous to life and infrastructure. Permafrost degradation, de-buttressing of slopes, extreme precipitation and freezing and thawing cycles make mountain glaciers susceptible to instability and cascading hazards. Our project thus focuses on identifying the research gaps associated with landslide-glacier dynamics and related hazards. The two components of our project are 1) Remote sensing and GIS and 2) Modelling. Different spatial scales (landform, catchment, global) will be considered for our research.

This presentation aims to outline PhD project and discuss proposed approaches with the glaciological, geomorphological, and remote sensing community. A literature review aimed at generating an inventory of landslide-affected glaciers globally is the first step. This will be complemented by detailed analyses and quantification of landslide-induced changes in glaciers' behaviour by selecting benchmark case studies across different glacial systems representing different environmental conditions. Acquiring UAV data (0.05-0.10 m), high resolution (0.3-1.0 m) (Pleiades, WorldView, etc.), and medium resolution (10-50 m) satellite imagery (Landsat, Sentinel, Aster) will be essential for the quantification of changes in glaciers velocity and mass balance. We also plan field visits to benchmark glaciers to ground-truth remote sensing data and collect information about sedimentological and geomorphological characteristics of landslide deposits.

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