Submitted Abstract

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Abstract

Glacier and snow-melt in High Mountain Asia (HMA) play an important role in the water supply for the densely populated regions in the surrounding area. Despite the climatic heterogeneity of the region, ice mass loss has been observed over the entire area including the retreat of glaciers and the thawing of permafrost. This leads to the exposure of unconsolidated moraine debris and sediment deposits, the development of new glacial lakes, and the expansion of existing lakes. These changes in the state of the high mountain cryosphere increase landslide, debris flow, and flood hazards. In this study, we aim to detect and explain spatial differences within HMA in the past occurrence of these hazards. We select different regions with distinct climatic and geomorphological conditions. We disaggregate each region in small drainage basins and for each basin, we derive a number of hazard predictors. These data include static morphometric parameters of the catchments derived from elevation models, and dynamic climatic features, such as precipitation indicators, freeze-thaw cycles, and glacier changes. Using a machine learning approach, these data are used to identify explanatory mechanisms and responsible triggers. The algorithm is trained by using satellite observed sediment deposits and alluvial fan properties. Preliminary results show large differences between different regions in the occurrence and drivers of debris flows and floods.