

Analysis of high-mountain environmental dynamics and emerging glacial hazards in the Pamir (Tajikistan)

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The high-mountain areas of Central Asia have experienced pronounced environmental dynamics during the past decades, most likely caused by climate change. These dynamics include both permafrost retreat and the retreat of glaciers. The research presented concentrates on the analysis of evolving glacial hazards in the Pamir of Tajikistan. A multi-scale approach is used, the regional-scale investigations largely build on medium-scale satellite imagery (ASTER, Landsat) and DEMs (ASTER GDEM, SRTM V4). Based on extensive multi-temporal mapping, the development of potentially hazardous lakes in the forefields of the retreating glaciers is explored. It is observed that the emergence and growth of glacial lakes (see figure) has shifted towards more elevated catchments in the past decade. Furthermore, glaciers retreating over steep rock cliffs possibly producing rock/ice avalanches are identified. The impact areas of possible lake outburst floods and rock/ice avalanches are delineated on the regional scale, using a model framework built on GRASS GIS. The validity of the regional-scale model is evaluated for selected areas where high-resolution satellite imagery and DEMs are available. The model results are combined with datasets of populated zones in order to prioritize areas for mitigation measures and to facilitate the identification of safe heavens.