EFFECTS OF GLACIAL AND FLUVIAL EROSION ON RELIEF HISTORY, TETON RANGE, WYOMING

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Topographic relief is dependent on the interaction between tectonics, climate change, and erosional processes. Uplift in the Teton Range explains movement along the normal fault defining the eastern front of the range, but other forces contribute to the high topographic relief that is preserved within the canyons of these mountains. This study attempts to quantify and compare the efficacies of glacial and fluvial erosion in landscape evolution in the Teton Range through the use of detrital apatite (U-Th)/He thermochronology, cosmogenic radionuclide exposure ages, and morphometric analyses with Geographic Information Systems (GIS) and field mapping.

The apatite (U-Th)/He thermochronology technique will be used to determine the age-elevation gradient along a vertical transect in Garnet Canyon. This gradient will be combined with the stream catchment hypsometry calculated in the same canyon. The distribution of detrital apatite ages measured with (U-Th)/He thermochronology from sediments in the mountain stream and glacial moraines will be compared with the gradient-hypsometry relationship (probability density function) to estimate the vertical distribution and disequilibrium of erosion within the canyon. Comparing the results from the glacial and fluvial sediments will provide a means to observe the spatial variation in erosion caused by these two processes. In addition, cosmogenic radionuclide analyses will allow us to estimate a rate of erosion since the last glaciation. This will provide another means to estimate the extent to which the landscape has been influenced by fluvial or mass wasting processes since the last glacial retreat in the canyons.

A morphometric analysis with GIS will allow us to measure and compare the difference in shapes between the canyons to see if there is any relationship between the size of the canyons and their glacial influence. This will be done with long and across valley profiles in the canyon stream catchments. With area and distribution of elevation in the digital elevation models, we will also be able to estimate approximately how much material was removed by erosional processes since uplift began.

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