Geophysical Research Abstracts
Vol. 15, EGU2013-11633, 2013
EGU General Assembly 2013

Relative importance of fluvial and glacial erosion in shaping the Chandra Valley, western Himalaya, India

Patricia Eugster (1), Rasmus C. Thiede (1), Dirk Scherler (2), Alexandru T. Codilean (3), and Manfred Strecker (1)

(1) University of Potsdam, Earth and Environmental Science, 14476 Potsdam, Germany, (2) Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA, (3) GFZ German Research Center for Geosciences, 14473 Potsdam, Germany

Although glaciers are often believed to be the principal erosional agents and the cause for increasing the relief of mountain belts, quantifying their contribution to long-term erosion and exhumation is challenging. This is particularly true for the Himalaya, where present-day ice coverage is relatively high, but evidence for extensive glaciations in the past more limited, presumably due to high erosion rates that quickly remove the depositional and geomorphic evidence of glacial impacts. Previous work indicates that the Chandra Valley, in the headwaters of the Chenab River, was strongly glaciated during the Quaternary. In addition, existing thermochronological data suggest a large change in exhumation rates along the valley. This change spatially corresponds to a major fluvial knickpoint, the joining of several large glaciers, a lithological break, and a steep precipitation gradient.

In this study we determine spatial and temporal variations in valley incision through fluvial and glacial erosion on different timescales by using cosmogenic radionuclide (CRN) dating of glacially-carved and striated surfaces, various low-temperature thermochronometers, and morphometric analysis. Knickzones are found at elevations of $\sim$3900 m asl along several tributaries of the Chandra/Chenab valleys and other valleys throughout Lahul, potentially indicating a causal relationship with glacial processes. Our field observations and preliminary CRN data suggest major glacial occupation of the Chandra Valley, particularly by the Bara Shigri Glacier, prior to 14 ka. Our data also confirm former CRN measurements in that area.

We hypothesize that these observations coincide with the glacially carved surface of the valley, which indicates a minimum altitude of $\sim$4100 m asl for glaciation in the lower Chandra Valley. Here, glacial carving has been the first-order erosional agent during the Quaternary. Furthermore, published AFT cooling ages are young below an elevation of 4100 m asl and increase strongly in the upper part of the valley above this elevation and the observed knickpoints, suggesting slower erosional exhumation in the more arid upper Chandra Valley.

The ultimate goal of this study is to better understand the regional erosion pattern within the Chandra Valley, and to possibly determine whether glaciers influenced by local conditions (tectonics, climate), impede or accelerate erosion.