ACCELERATED LATE-PLIOCENE HIMALAYAN EROSION FROM FISSION-TRACK AND ^{40}AR/^{39}AR THERMOCHRONOLOGY AND THE POSSIBLE ROLE OF CLIMATE CHANGE

RUHL, Katharine[1], **BLYTHE, Ann E.**[2], **and HODGES, Kip V.**[1], (1) Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139, kruhl@mit.edu, (2) Univ Southern California, 3651 University Ave, Los Angeles, CA 90089-0740

A long-standing debate in the Earth sciences is the relative importance of climate and tectonics in influencing erosional processes in orogens. One approach to this problem is to determine the timing of a major change in erosional rate or pattern within an orogen and search for temporal correlations with changes in climate or tectonic activity to assess which forcing factor has had a major influence on erosion. While typically <3 Ma apatite and zircon fission-track (FT) ages from the Higher Himalaya imply extremely rapid recent erosion, published muscovite 40Ar/39Ar ages from similar positions are much older, suggesting that the period of rapid erosion recorded by the FT ages does not extend far back into the geologic past. In order to pinpoint the timing of this transition, we determined apatite FT and muscovite 40Ar/39Ar dates for a suite of samples collected along the southern flanks of the Himalaya in Nepal near the confluence of Marsyandi and Nyadi Rivers.

A comparison of the patterns of FT (Tc~140°C; 0.5±0.4 Ma to 0.9±0.4 Ma) and 40Ar/39Ar (Tc~350°C; 2.46±0.22 Ma to 5.10±0.23 Ma) bedrock ages with elevation indicates a factor of four increase in apparent erosion rate between 2.5 and 0.9 Ma. Whether or not the 2.3 km/My (r=0.75) FT or 0.54 km/My (r=0.99) 40Ar/39Ar gradients can be taken as actual measures of the erosion rate averaged over the closure interval for each system depends on the geometry of the closure isotherms and the geometry of exhumation during that time frame. Nevertheless, this difference in apparent rates is a robust indicator of rate change, as long as the same kinematic framework has been in place since the age of the oldest sample. Our conclusions are bolstered by detrital muscovite 40Ar/39Ar age-elevation data from the Nyadi catchment and by the observation that the youngest bedrock muscovite sample was at a temperature of ~350°C as recently as 2.5 Ma and is now exposed at the surface.

The time frame for this striking rate change corresponds to that of an important destabilization of global climate, suggesting a climatic effect on exhumation at the Himalayan range front. Coupled with evidence for Late Pliocene to Recent faulting in the area of accelerated erosion, our results indicate a direct relationship among climatic, tectonic, and erosional processes in the evolution of orogenic systems.

Meeting: 2005 Salt Lake City Annual Meeting (October 16–19, 2005)
Selection: Thermochronology: Techniques, Applications, and Interpretations