2007 GSA Denver Annual Meeting (28–31 October 2007)

Paper No. 66-3

Presentation Time: 8:35 AM-8:55 AM

COUPLING OF ROCK UPLIFT AND RIVER INCISION IN THE NAMCHE BARWA-GYALA PERI MASSIF, TIBET

FINNEGAN, Noah J.[1], HALLET, Bernard[2], MONTGOMERY, David R.[2], ZEITLER, Peter[3], STONE, John[2], ANDERS, Alison M.[4], and YUPING, Liu[5], (1) Earth and Atmospheric Sciences, Cornell University, Snee Hall, Ithaca, NY 14853, njf7@cornell.edu, (2) Earth and Space Sciences & Quaternary Research Center, University of Washington, 63 Johnson Hall, Box 351310, Seattle, WA 98195, (3) Earth & Environmental Sciences, Lehigh University, 31 Williams Drive, Bethlehem, PA 18015, (4) Department of Geology, University of Illinois at Urbana-Champaign, 245 Natural History Building, 1301 West Green Street, Urbana, IL 61801, (5) Chengdu Institute of Geology and Mineral Resources, 2 Beisanduan, Yihuanlu, Chengdu 610081, Sichuan Province, China

Numerical modeling shows the strong potential for patterns in erosion to influence the style and distribution of deformation in active mountain ranges. However, field studies aimed at exploring the coupling between tectonics and erosion yield conflicting views of the importance of erosion in influencing rock uplift. We compare patterns in river power, inferred excess fluvial transport capacity, topographic relief, precipitation, and mineral cooling ages to assess the coupling between surface erosion and rock uplift within the vicinity of the Namche Barwa-Gyala Peri massif, an active antiformal structure located within the eastern Himalayan syntaxis. The rich and dense data set reveals a tight spatial correspondence of fluvial incision potential, high relief, and young cooling ages. The spatial coincidence is most easily explained by a sustained balance between rock uplift and denudation driven by the incision of the Yarlung Tsangpo-Brahmaputra River over at least the last ~ 1 Ma.

The Yarlung Tsangpo-Brahmaputra River is the largest and likely most erosive river in the Himalaya, and two lines of evidence point to its active role in the dynamic interaction of local erosion, rock uplift, thermal weakening of the lithosphere, and deformation: (1) Whereas along the rest of the Himalayan front, high relief and high rock uplift rates are essentially continuous, the high relief of the syntaxis is restricted to a “bullseye” pattern exactly where the largest river in the Himalaya, the Yarlung Tsangpo-Brahmaputra, has the most energy per unit area available to erode its channel and transport sediment. (2) The location of rapid incision on the Yarlung Tsangpo-Brahmaputra has been pinned for at least 1 million years, and without compensatory uplift of the Namche Barwa-Gyala Peri massif during this time, the river would have eroded headward rapidly, incising deeply into Tibet.

2007 GSA Denver Annual Meeting (28–31 October 2007)
General Information for this Meeting

Session No. 66
Deformation and the Landscape: Quantitative Approaches to Tectonic Geomorphology I
Colorado Convention Center: 407
8:00 AM-12:00 PM, Monday, 29 October 2007

Geological Society of America *Abstracts with Programs*, Vol. 39, No. 6, p. 183