Geologist helps identify dangerous earthquake fault

17 January 2014, by Ursula Rothrock

(Phys.org) —The discovery of a previously unknown active fault in Nepal means that the Himalayan country's most populated region is at greater risk for life-threatening earthquakes and catastrophic flooding than previously thought, according to newly published research co-authored by a University of Kansas geologist.

The work also calls into question long-held views about how the Himalaya and mountain belts in general behave and evolve.

Published this month in *Nature Geoscience*, the research identified and mapped an earthquake rupture more than 63 kilometers (40 miles) long in the high elevations of the western Himalaya. The newly identified Tibrikot fault is approximately 100 kilometers (62 miles) northwest of Tansen, Nepal, a town of nearly 30,000 people, and about 230 kilometers (143 miles) west of Nepal's capital of Kathmandu. About 2.5 million people live in and around Kathmandu.

The Tibrikot fault is part of a much larger fault system that the researchers identified and named the Western Nepal Fault system, which is more than 350 kilometers (217 miles) long. This system connects active faults in the Himalaya with faults in southern Tibet – a connection the scientists had not expected.

"A large earthquake occurring along the newly identified faults could transfer stresses from western Nepal towards densely populated Kathmandu to the east," said Mike Taylor, an associate professor of geology at KU who collaborated with five other researchers on the project.

"Intense land sliding could also occur," Taylor said, "or intense ground shaking could breach glacially dammed lakes at higher elevations. This would cause catastrophic flooding of the more highly populated areas downstream."

The research changed geologists' understanding of the evolution of the tallest mountains in the world.

"We previously thought the mountains formed because the front of the range was shortened as it collided with India, much like what happens when you compress an accordion," Taylor said. "Our findings indicate that the mountain belt is not only shortening, but is also simultaneously being stretched lengthwise at higher elevations along the newly identified fault systems."

The researchers used radiocarbon dating to show that at least two earthquakes occurred along the fault and shifted the surface of the region by 5 meters each (16.4 feet) between 1165 and 1400 A.D. The quakes were probably of magnitude 7.9 or greater. That is the same magnitude as the earthquake that devastated Sichuan, China, in 2008, killing nearly 70,000 people and leaving more than 18,000 missing.

The paper, "Limit of Strain Partitioning in the Himalaya Marked by Large Earthquakes in Western Nepal," was co-authored with M.A. Murphy and C.R.P. Silver of the University of Houston, J. Gosse and C. Beaumont of Dalhousie University in Canada, and D.M. Whipp of the University of Helsinki in Finland.

More information: "Limit of strain partitioning in the Himalaya marked by large earthquakes in western Nepal." M. A. Murphy, M. H. Taylor, J. Gosse, C. R. P. Silver, D. M. Whipp, C. Beaumont. *Nature Geoscience* 7, 38–42 (2014) DOI: 10.1038/ngeo2017 Received 22 February 2013 Accepted 29 October 2013 Published online 01 December 2013

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