Large Himalaya earthquakes may occur sooner than expected

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While the rupture zones of recent major earthquakes are immune to similar-sized earthquakes for hundreds of years, they could be vulnerable to even bigger destructive temblors sooner than scientists suspect, according to analysis by University of Colorado seismologist Roger Bilham.

Bilham and his research colleagues explained that the magnitude 9.3 Indian Ocean earthquake of December 2004 showed scientists that a giant earthquake can rupture through a region with a recent history of quakes with magnitudes as large as 7.9 on the Richter Scale.

"Following what we learned in 2004, we believe that regions of the Himalaya that have recently experienced magnitude 7.8 earthquakes - like the Kangra district, a hundred years ago - may not be immune to a future larger earthquake," he said.

Bilham's research of Himalayan earthquakes in the last 1,000 years is part of findings presented in an invited talk, "Unprecedented massive earthquakes in the Himalaya driven by elastic strain stored within the Tibetan Plateau?" Dec. 7 at the American Geophysical Union's fall meeting in San Francisco.

Bilham recently returned from Kashmir, where he conducted a series of measurements along with Pakistani scientists to assess subsurface fault slip and damage in that region's October earthquake.

"The Kashmir event released almost 100 times less energy than the Sumatra-Andaman quake in 2004," he said. "The Kashmir rupture was about 16 times smaller in length and five times smaller in width, yet it flattened whole cities in its path."

The Kashmir earthquake was the deadliest earthquake ever in the Indian subcontinent, mostly because of the poor construction quality in the area, Bilham said. "Most of the buildings that collapsed had been constructed in the past two decades.

"It is distressing to see how little attention has been focused on this earthquake by news media in the United States," he said.

Bilham believes medieval earthquakes beneath the Himalaya may have been larger than any in the past 300 years. Bilham and his colleagues are trying to determine what governs the recurrence interval and the size of these historically much larger earthquakes.

"We postulate that a giant reservoir of elastic energy exists not just in the Himalaya but also beneath southern Tibet," he said. "This reservoir of energy is tapped by Himalayan earthquakes more efficiently if ruptures are geographically long."

Bilham and his colleagues developed a "theoretical law" linking earthquakes of different size to their geographic length and repeat time. They concluded that recent earthquakes require about 500 years to repeat, but the medieval ones require almost 2,000 years.

"We suggest that these rare events must have exploited much longer ruptures than any we have seen recently, like those that slipped in the Kangra and Kashmir earthquakes," he said. "We find also that these rare great events can re-rupture parts of the plate boundary that slip in modest earthquakes up to magnitude 7.6. As a result, recent rupture

zones could be vulnerable to greater destruction sooner than one might suspect from India's rate of approach toward Asia."

The tremendous Indian Ocean earthquake in 2004 gave seismologists an unprecedented look at the mechanics of the world's largest earthquakes. Using data recorded by digital seismometers all over the world, scientists were able to determine that the rupture propagated 1,000 miles from south to north at 5,000 miles per hour during the first 10 minutes of the earthquake.

Source: University of Colorado at Boulder