Researcher says the next large central US earthquake may not be in New Madrid

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This December marks the bicentennial of the New Madrid earthquakes of 1811-12, which are the biggest earthquakes known to have occurred in the central U.S.

Now, based on the earthquake record in China, a University of Missouri researcher says that mid-continent earthquakes tend to move among fault systems, so the next big earthquake in the central U.S. may actually occur someplace else other than along the New Madrid faults.

Mian Liu, professor of geological sciences in the College of Arts and Science at MU, examined records from China, where earthquakes have been recorded and described for the past 2,000 years. Surprisingly, he found that during this time period big earthquakes have never occurred twice in the same place.

"In North China, where large earthquakes occur relatively frequently, not a single one repeated on the same fault segment in the past two thousand years," Liu said. "So we need to look at the 'big picture' of interacting faults, rather than focusing only on the faults where large earthquakes occurred in the recent past."

Mid-continent earthquakes, such as the ones that occurred along the New Madrid faults, occur on a complicated system of interacting faults spread throughout a large region. A large earthquake on one fault can increase the stress on other faults, making some of them more likely to have a major earthquake. The major faults may stay dormant for thousands of

years and then wake up to have a short period of activity.

Along with co-authors Seth Stein, a professor of earth and planetary sciences at Northwestern University, and Hui Wang, a Chinese Earthquake Administration researcher, Liu believes this discovery will provide valuable information about the patterns of earthquakes in the central and eastern United States, northwestern Europe, and Australia. The results have been published in the journal *Lithosphere*.

"The New Madrid faults in the central U.S., for example, had three to four large events during 1811-12, and perhaps a few more in the past thousand years. This led scientists to believe that more were on the way," Stein said. "However, high-precision Global Positioning System (GPS) measurements in the past two decades have found no significant strain in the New Madrid area. The China results imply that the major earthquakes at New Madrid may be ending, as the pressure will eventually shift to another fault."

While this study shows that mid-continent earthquakes seem to be more random than previously thought, the researchers believe it actually helps them better understand these seismic events.

"The rates of earthquake energy released on the major fault zones in North China are complementary," Wang said. "Increasing seismic energy release on one fault zone was accompanied by decreasing energy on the others. This means that the fault zones are coupled mechanically."

Studying fault coupling with GPS measurements, earthquake history, and computer simulation will allow the scientists to better understand the mysterious mid-continent earthquakes.

"What we've discovered about mid-continent earthquakes won't make forecasting them any easier, but it should help," Liu said.

Provided by University of Missouri-Columbia