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Are Large Earthquakes Linked Across The Globe?

The past decade has been plagued with what seems to be a cluster of large earthquakes, with massive quakes striking Sumatra, Chile, Haiti and Japan since 2004. Some researchers have suggested that this cluster has occurred because the earthquakes may be "communicating" across large distances, possibly triggering each other. But a new analysis by Tom Parsons and Eric Geist concludes that the cluster could just as well be the result of random chance.

Each of the devastating quakes in the 2000s drew huge media coverage and required extensive rebuilding and economic restoration. The intense interest in the earthquakes has led some to wonder if we are living in the middle of an "age of great quakes," similar to a global cluster of quakes in the 1960s. It's important to know whether these clusters occur because big earthquakes trigger others across the world, Parsons and Geist say, in order to predict whether more severely destructive quakes might be on the way.

To determine if the quake clusters in the 1960s and 2000s could be attributed to random chance, the researchers looked at the timing between the world's largest earthquakes--magnitude 8.3 and above--at one-year intervals during the past 100 years. They compared simulated lists of large quakes and the list of real quakes during this time with the between-quake intervals expected from a random process. The intervals between the real-life large quakes are similar to what would be expected from a random process, they found. In other words, the global hazard of large earthquakes is constant in time. Except in the case of local aftershocks, the probability of a new large quake occurring isn't related to past global quakes.

This could be disappointing news for researchers who thought global communication between quakes might offer a way to predict the most severe seismic activity. But there also may be some good news after a decade of destruction. If global great earthquakes are occurring at random, the authors say, then a specific number of quakes that cluster together within a short time is unlikely to be repeated in a similar way over a 100-year span.

"Were Global M≥8.3 Earthquake Time Intervals Random between 1900 and 2011?" by Tom Parsons and Eric Geist of US Geological Survey.

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For a copy of the paper, please write nan0604@msn.com

Homing In On A Potential Pre-Quake Signal

Changes in seismic velocity--changes in the speeds at which seismic waves move through the Earth's crust--have been identified during and after many earthquakes. But do these changes also happen before an earthquake, and could they be measured as a way to predict a quake on the way? The search for a clear and measurable pre-quake signal has been called "the holy grail of seismology."

In a new analysis of the 2004 magnitude 6.0 Parkfield earthquake in California, David Schaff suggests some limits on how changes measured by ambient seismic noise could be used as a pre-earthquake signal. Ambient seismic noise refers to the "background hum" of the Earth--the surface waves found all over the planet's crust that are caused mostly by wind and ocean waves. Changes in seismic velocity can be measured using seismic noise observations, which are often recorded continuously at seismic stations and therefore can provide a detailed record of a pre-earthquake time period.

Using a complete set of noise data from the Parkfield earthquake, Schaff was able to search for a pre-seismic signal to the quake. He was unable to detect any pre-seismic velocity change for Parkfield using the noise data, but he notes that any pre-seismic signal may have been too small, too short in duration, or in a different area outside of the network of seismic monitors. The analysis did allow Schaff to place an upper limit on how large such a signal might be, depending on how many days it might be observed before the main quake.

The paper, "Placing an Upper Bound on Preseismic Velocity Changes Measured by Ambient Noise Monitoring for the 2004 Mw 6.0 Parkfield Earthquake (California)" will appear in the August issue of the Bulletin of the Seismological Society of America.

"Placing an Upper Bound on Preseismic Velocity Changes Measured by Ambient Noise Monitoring for the 2004 Mw 6.0 Parkfield Earthquake (California)" by David P. Schaff, Columbia University.

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