A global murmur, then unusual silence

April 19 2013

In the global aftershock zone that followed the major April 2012 Indian Ocean earthquake, seismologists noticed an unusual pattern. The magnitude (M) 8.6 earthquake, a strike-slip event at intraoceanic tectonic plates, caused global seismic rates of M≥4.5 to rise for several days, even at distances thousands of kilometers from the mainshock site. However, the rate of M≥6.5 seismic activity subsequently dropped to zero for the next 95 days.

This period of quiet, without a large quake, has been a rare event in the past century. So why did this period of quiet occur?

In his research presentation, Fred Pollitz of the U.S. Geological Survey suggests that the Indian Ocean earthquake caused short-term dynamic stressing of a global faulting system. Across the planet, there are faults that are "close to failure" and ready to rupture. It may be, suggests Pollitz and his colleagues, that a large quake encourages short-term triggering of these close-to-failure faults but also relieves some of the stress that has built up along these faults. Large magnitude events would not occur until tectonic movement loads stress back on to the faults at the ready-to-fail levels they reached before the mainshock.

Using a statistical model of global seismicity, Pollitz and his colleagues show that a transient seismic perturbation of the size of the April 2012 global aftershock would inhibit rupture in 88 percent of their possible M≥6.5 earthquake fault sources over the next 95 days, regardless of how close they were to failure beforehand.

More information: Presentation: "The profound reach of the M8.6 11 April 2012 Indian Ocean earthquake: short-term global rate increased followed by a long-term global rate drop" by Fred Pollitz

Provided by Seismological Society of America