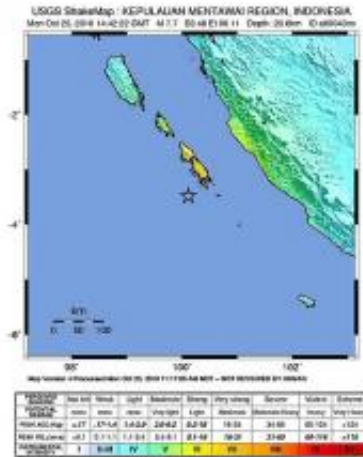


Sumatra earthquake mysteries examined

May 11 2012, by Lin Edwards



Topographic map of Sumatra. Image: Wikipedia.

(Phys.org) -- An earthquake in the Indian Ocean off the coast of Sumatra, Indonesia on 11th April was unusually powerful, at magnitude 8.6, for a “strike-slip” type of quake, and a new analysis of the earthquake and its 8.2 magnitude after-shock has proposed that some of the assumptions made about earthquakes may need re-thinking.

A strike-slip [earthquake](#) is one in which there is an almost vertical rupture, leading to two plates sliding horizontally past each other. The San Andreas Fault in California produces strike-slip earthquakes, and the most powerful earthquake along this fault was the San Francisco quake of 1906, which measured 7.8.

Events as powerful as the [Sumatra](#) earthquake are usually caused by ruptures in subduction zones, in which the edge of one tectonic plate slips underneath the edge of the adjoining plate. An earthquake of this type on the sea bed can cause massive tsunamis because of vertical displacement of water above the point of slippage. A recent example was the [magnitude 9](#) earthquake off Japan last year.

The Sumatra earthquake's magnitude surprised scientists because it was the most powerful strike-slip earthquake ever recorded. The quake was also unusual in that the rupture was in the middle of an oceanic plate rather than at the boundary between two plates. The slippage distance was surprisingly large; the 1906 San Francisco earthquake produced a slippage of 4.5 meters, while in Sumatra the distance was 21.3 meters.

Seismologists Jeffrey McGuire of the Woods Hole Oceanographic Institution, and Gregory Beroza of Stanford University's Department of Geophysics discuss the Sumatran earthquake in the May 10th issue of *Science*. McGuire said that many large earthquakes have occurred away from the edges of oceanic plates in the last few years, but they generally do not cause damage or threaten lives because they are at sea and are unlikely to cause large tsunamis unless they result in submarine landslides.

The lack of monitoring networks on the sea bed makes understanding these earthquakes difficult, but the researchers said the seismology readings from the Sumatra earthquake suggest the quake was unusually deep at 40-53 km (25-33 miles). At this depth the rock could reach up to 800 degrees Celsius and become viscous in places, and melting of fault zones is also possible, leading to the release of enormous amounts of energy.

Professor Beroza said analyzing the Sumatran earthquake could shed some light on earthquakes occurring in the middle of continental plates

as well as oceanic plates, and the findings suggest this type of earthquake could be of greater magnitude in continental plates than scientists had previously thought.

Sumatra lies on the “Ring of Fire” around the Pacific Basin, a particularly active region for seismic and volcanic events.

More information: A Rogue Earthquake Off Sumatra, *Science* [DOI: 10.1126/science.1223983](https://doi.org/10.1126/science.1223983)

Abstract

A magnitude 8.6 strike-slip earthquake within an oceanic plate raises fundamental questions about earthquake physics.

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