

Old fractures caused rare 8.6 magnitude earthquake

August 31 2012

On 11 April 2012, an 8.6 magnitude earthquake occurred 100 kilometers (62 miles) off the coast of Sumatra. This earthquake was unusual in that it originated within the plate rather than at a plate boundary. In fact, it is the largest such earthquake in observed human history. The quake originated under the Wharton Basin in the Indian Ocean, where hundreds of kilometers of rock were under crushing tension, causing the plate to deform at its base. But this deforming zone was also absorbing tension as two plates, the Indian and Australian plates, rotated toward each other.

One month after the earthquake, Satriano et al. revisited the Wharton Basin to reconstruct the rupture history of the events of 11 April to gain a better understanding of the general nature of these rare large within-plate earthquakes. They used a comparatively new tool known as back projection analysis, which tracks radiation that emanates as new locations along a rupture path become active.

Calibrating the back projection analysis with [aftershocks](#), which scientists use to calculate the travel time and distance of seismic P and S waves that originate at the [epicenter](#), the authors find that the events of 11 April had their roots in the old fabric of the Wharton Basin, the floor of which is littered with old fractures. Tension deep within the deformation zone had reactivated one of the north-south aligned fractures. That rupture in turn triggered a series of ruptures of old fractures, generating a slew of strike-slip faulting that traveled westward and ended at the Ninety East Ridge, the north-south oriented seamount chain that bounds the basin, 370 kilometers (230 miles) from the

epicenter and 120 seconds later-the timing of the last rupture event.

More information: The 2012 Mw 8.6 Sumatra earthquake: Evidence of westward sequential seismic ruptures associated to the reactivation of a N-S ocean fabric, *Geophysical Research Letters*, [doi:10.1029/2012GL052387](https://doi.org/10.1029/2012GL052387) , 2012

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