

The Sumatra great earthquake sequence of 11 April 2012

Zacharie Duputel

Seismological Laboratory, California Institute of Technology

Great strike-slip earthquakes are very uncommon and it is known that many of them involve remarkable rupture complexity. On 11 April 2012, the equatorial Indian Ocean was hit by a $M_w=8.6$ earthquake, followed two hours later by another $M_w=8.2$ event. These two earthquakes are the largest strike-slip events ever observed and also among the largest intraplate earthquakes instrumentally recorded. Our analysis for the $M_w=8.6$ mainshock reveals a remarkable rupture complexity and indicates a large centroid depth (~ 30 km). To further resolve the rupture process, we developed a method to invert very long period seismic data for multiple-point-source parameters. The current optimum source model at long period consists of two point sources separated by about 209 km with magnitudes $M_w=8.5$ and $M_w=8.3$. To analyze the $M_w=8.2$ aftershock, we removed the perturbation due to large surface-wave arrivals of the $M_w=8.6$ mainshock by subtracting the corresponding synthetics. Our results suggests that the $M_w=8.2$ aftershock had a large centroid depth between 30 km and 40 km. This major earthquake sequence brings a new perspective to the seismotectonics of the equatorial Indian Ocean and reveals active deep lithospheric deformations.