The Sumatra great earthquake sequence of 11 April 2012

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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 Mw=8.6 earthquake, followed two hours later by another Mw=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 Mw=8.6 mainshock reveals a remarkable rupture complexity and indicates a large centroid depth (~30km). 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 Mw=8.5 and Mw=8.3. To analyze the Mw=8.2 aftershock, we removed the perturbation due to large surface-wave arrivals of the Mw=8.6 mainshock by subtracting the corresponding synthetics. Our results suggests that the Mw=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.