

Source Process of the 2004 Sumatra-Andaman Earthquake

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We collected the long-period waveform data for the great Sumatra-Andaman earthquake of December 26, 2004 from IRIS Data Center, and selected 22 stations whose epicentral distances are between 27° and 90° . By means of inverting moment tensor, retrieving source time functions and imaging the spatio-temporal rupture process, we obtained the source parameters from the waveform data which help very much in understanding the complexity of the 2004 Sumatra-Andaman earthquake rupture process. The analysis of the data suggests that the 2004 Sumatra-Andaman earthquake has a seismic moment of 8.5×10^{22} Nm and a moment magnitude of MW9.2; that those for nodal plane I are 340° , 14° and 110° , respectively, and the strike, dip, and rake for nodal plane II are 149° , 77° and 85° , respectively; that the rupture length is around 1300 km, with 400 km in the south of the epicenter and 900 km in the north of the epicenter; that the width of the rupture plane is around 400 km, which yields a maximum rupture depth of about 90 km; that most of the slip is concentrated in the southern half of the rupture zone; that the maximum slip amplitude is around 22 m, and the maximum slip-rate is 2.2 m/s; that the duration time is about 450 s, with the first 100 s being a phase of bilateral rupture, the second 50 s being a phase of unilateral rupture to south, and the rest of the time being a phase of unilateral rupture to north; that the rupture velocity is variable in the rupture process, with a maximum value of 5.5 km/s; that the average rupture velocity over the entire rupture process is 2.65 km/s.