

Rupture process of 2004 Sumatra mega quake by Earth's free oscillation analysis: Performance of real time Ocean Hemisphere Network

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Tele-seismic body wave analysis is one of most efficient method to study source rupture process for ordinary earthquake. However in case of 2004 West coast off Northern Sumatra earthquake, excited seismic wave is dominant of long period component and shows long duration P and S wave records. Therefore we can't extract pure direct body wave records for contamination of other seismic phases. It is difficult to analyze the overall rupture process. According to tsunami generation analysis and aftershock distribution, rupture zone is seemed that extend to northern area. The macroscopic image of earthquake is basic information and constraint for detail analysis of rupture process.

2004 Sumatra mega quake excites large amplitude earth's free oscillation which amplitude depends on its source size. The free oscillation is recorded by broadband global seismic network. In this study, we analyze ultra long period oscillation modes whose periods are greater than 1000 sec and evaluate macroscopic source image.

OHP seismic network, operated in Western Pacific region, also records ultra long period seismograms and detects oscillation mode. We examined the quality of seismic records and excluded off-scale and/or non-linear behaving seismograms. By this screening, Inuyama(INU, Japan) and Jayapura (JAY, Papua) stations' data have enough quality for free oscillation analysis. We used 0.1Hz sampling data and width of data window is about 1 week. We performed FFT and picked up amplitude of each mode after preprocessing and exclusion filter for earth's tide.

We aimed at OS0 mode firstly. The OS0 mode is recorded same amplitude theoretically elsewhere and its amplitude depends on dip-slip amount on the fault. It is convenient to evaluate lower limit of total seismic moment. When we supposed 10 degree of fault dip angle, seismic moment is greater than twice of Harvard CMT solution. The comparison for amplitudes of ultra long period modes shows moment magnitude is 9.3 in case of fault mechanism obtained Harvard CMT. The amplitude pattern suggests that source time is 800 to 1000 sec. The discrepancy between free oscillation and body wave analysis is important information for later part of rupture process of Sumatra quake.