

How radial modes can help with constraining source of relatively weak vertical acceleration generated by strike-slip earthquakes

Eliška Zábřanová and Ctirad Matyska

Charles University Prague, Geophysics, Czech Republic (eliskazabranova@centrum.cz)

On April 11, 2012 the two strike-slip earthquakes with moment magnitudes higher than 8 occurred off the west coast of northern Sumatra on a fault within the oceanic lithosphere of the Indo-Australia. Since these earthquakes generated strong horizontal motions, the determination of the moment tensor components producing vertical motions is relatively uncertain if only body and surface waves are inverted. However, the radial free-oscillation modes, which are generated only by the M_{rr} components, can be used as independent constraints. There are also uncertainties in centroid times but the time shift between the events was approximately 124 minutes. In order to determine the signal of radial modes we employ superconducting gravimeters as they provide less noisy records than seismometers in submillihertz frequency range. Amplitude-spectrum inversion is robust enough but we are not able to determine the M_{rr} components uniquely and thus we can only estimate the intervals of admissible M_{rr} values for both events. In the case of inverting both the amplitude and phase spectra, centroid times need to be considered as independent parameters. Since the fundamental radial mode ${}_0S_0$ has its period of about 20.5 minutes and the period of the first overtone ${}_1S_0$ is about 10.22 minutes, there is approximately a zero phase shift between the fundamental radial oscillations generated by these two events. This fact complicates determination of the centroid times but the trade-off between the M_{rr} components is reduced.