

Toward an understanding of the fault segment boundary (2)-Determinations of source parameters along Atotsugawa fault

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Many observations indicate that segment structures of active faults are closely related to the initiation and termination of faulting and complex source processes such as multiple shocks. Therefore, it is important to investigate natures of the fault segment boundary in relation not only to generation processes of large earthquakes but also to prediction of strong ground motions.

In order to understand the nature of fault segment boundary, we carried out dense seismic observations around the Atotsugawa fault from July through November, 2002. We deployed 8 seismometers around the boundary of creeping section and locked section, that are inferred from repeated optical distance-meters surveys (Geographical Survey Institute) and hypocenter distributions (DPRI, Kyoto Univ.). The spacing of the seismometers is about 5 km. Seismometers were fixed on hard rock surface with plaster of Paris. The events were continuously recorded at a sample rate of 250 Hz by off-line recording. In 1998, Geological Survey of Japan installed a borehole seismometer at a depth of 300 m at the fault segment boundary and the events have been recorded at sample rates of 500 Hz by trigger mode and telemeter observation system. Since July 2002, we are continuously recording data with a sample rate of 10 kHz by off-line recording to enhance resolutions. During the period, about 300 earthquakes occurred around the fault (DPRI, Kyoto Univ.). We observed about 1/3 events whose signal to noise ratios are high.

Using these data, we tried to determine focal mechanism solutions only with P polarities. However, it was difficult to obtain a unique solution for many earthquakes. Therefore, we added information of P-wave amplitudes to obtain focal mechanism solutions stably. The solutions obtained for the events near the segment boundary show right lateral strike slip or dip slip faulting whose directions of P-axis are consistent with the stress field in this region. We then estimated static stress drops for those earthquakes. For each earthquake, we rotated the seismograms into P, SV, and SH components. We solved long period amplitude and corner frequency, while simultaneously correcting for path-averaged attenuation by fitting body wave spectra with omega square source model. Using estimated parameters, we obtained seismic moment, source dimension, and static stress drop. Although there are several scatters, the estimated stress drops are several hundred MPa, being relatively high. Since it might be insufficient to correct the propagating effects even in the better recording environment of a borehole, we only analyzed earthquakes whose hypocentral distances are less than 10 km. In order to analyze events occurring at further distances, we are planning to apply the empirical Green's function method that cancels path and site effects.

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