Detailed Source Processes of Megathrust Earthquakes during Past 300 Years along the Sagami and Nankai Troughs

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It is necessary to model a detail source process for predicting strong ground motion from a future earthquake. A method of modeling has not been established yet and an actual procedure had to be based on the source processes of past earthquakes. Along the Sagami trough and the Nankai trough, megathrust events have occurred repeatedly in the historical age.

Along the Sagami trough, the 1703 Genroku-Kanto earthquake and the 1923 Taisho-Kanto earthquake occurred. According to the data of damages due to tsunamis and the crustal deformations at Boso Peninsula, the seismic fault of the Genroku-Kanto earthquake was estimated to more extend far off Boso Peninsula. However, the seismic intensity distribution was similar to the Taisho-Kanto earthquake. Recently, it has been found from old seismograms that the largest aftershock of the Taisho-Kanto earthquake, which occurred SE off Boso Peninsula, was a low frequency event. Source process of the largest aftershock is one of the key of the investigation of the source fault SE off Boso Peninsula of the 1703 Genroku-Kanto earthquake.

Along the Nankai trough, three great earthquakes (the Showa in 1944 and 1946, the Ansei in 1854, and the Hoei in 1707) have occurred during the recent 300 years. The Showa and Ansei earthquakes consisted of two events occurring separately in the Tokai and Nankai areas at a short interval. The fault rapture of the Hoei earthquake took place in both the areas at the almost same time. Recently, Kanda et al. developed a new technique of seismic intensity inversion and estimated locations of the short-period wave radiation area on the fault plane for each earthquake. 4 or 5 common areas of radiating strong short-period seismic waves were found in the Nankai and the Tokai areas. But some discrepancies among three events were found simultaneously. A typical discrepancy was between the Hoei and the other events in the Nankai area. A portion of the high radiation of short-period seismic waves of the Hoei earthquake locates on a subducted seamount off Cape Muroto, where there is little seismic energy radiation at the Showa and Ansei earthquakes. Kodaira et al. suggested that the subducted seamount might play a role of the barrier to the propagation of fault rapture at the Showa earthquake. We suggest that the similar rapture process might occur at the Ansei earthquakes, but the accumulated stress at the subducted seamount might be released at the Hoei earthquake. It is deduced from this result that the intensity of radiated short-period seismic waves was very high in the case of the Hoei earthquake. That is consistent with the difference of seismic intensity distributions between the Hoei and the Ansei earthquakes in Southwestern Japan.

These results are very effective to model a detail source process of the predicted future earthquake and they owe a great deal to the constant efforts in research of historical earthquakes, which is one of the most important field in seismology to prevent the earthquake disaster from the future earthquake.