A segmentation model for the co-seismic events at the central to southern parts of Itoigawa-Shizuoka Tectonic Line, Central Japan

Daisuke Miura[1], Ryuta Hataya[1], Shintaro Abe[1], Yasuhira Aoyagi[1], Katsuyoshi Miyakoshi[1], Daiei Inoue[1]

[1] CRIEPI

According to the governmental seismic potential assessment, the 150km long Itoigawa-Shizuoka Tectonic Line active fault system (ISTL), Central Japan is the most dangerous active fault system in Japan causing great earthquake in near future. In account for the earthquake segmentation on the ISTL, there is in need of information for timing and nature of seismological event. A series of our paleoseismological study has clarified the co-seismic faulting events and is used to evaluate a potential for dynamic rupture involving multiple segments of the fault system. With lots of trench excavations, 14C datings, and careful geological observations along the fault system, we discuss the possible segmentation model in the central to southern parts of the ISTL. In particular, we focus on the timing of the recent event. The fault system consists of strike-slip (S), reverse (R), and both (S-R) of surface rupturing natures. We excavated along the central to southern parts (ca. 100 km long) of the fault system, which is subdivided into the following faults (fault groups): from north to south, the Gofukuji (S), the Okaya (S), the Kamanashiyama (S), the Hakushu (S-R), the Houohzan (S), the Shimotsuburai (R), and the Ichinose (R).

Distribution of average slip rate along the ISTL was used to estimate the geometric segmentation, and it suggests that two geometric structures as long-term seismic barriers are present between the Gofukuji and the Okaya (compressional step: 7km) and between the Hakushu and the Shimotsuburai (dilational step: 7km). Results from the empirical and numerical models in account for the stepover structure suggest that the dynamic rupturing is possible for the width less than 3-5 km. The stepover width of these structures is ca. 7 km and this is suitable as the character of the geometric segmentation. In addition to these, reappraisal of a period of each co-seismic event, amount of co-seismic offset, average slip rate, recurrence interval, and characteristics of geometric segments suggest that the estimated earthquake segment occurred in duration of more or less than 1700 yr.B.P., and it likely corresponds to the multiple segments from the Okaya to the Houohzan regions, where the surface fault length is ca. 65km. This is considered as the largest earthquake of M 7.8-7.9. We found out that the geometric segment plays an important role for determining the size of the maximum earthquake.

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