Recent surface-faulting events along the southern part of the Itoigawa-Shizuoka Tectonic Line: Part 1

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Our study provides detailed recent faulting events at southern three active faults in the ISTL, are as follows. 1) Hakushu fault: Recent event (RE) was present at ca. 6000 yBP and penultimate event (PE) was at ca. 10000 yBP. A minimum recurrence interval is 4,000 ys. Offset at RE is ca. 1 m and average slip rate is 0.2mm/y. 2) Shimotsuburai fault: The RE was at duration 2400-1400 yBP and the PE was at 8400-4900 yBP. The offsets of the deposit reach ca. 1.2 m at the RE, and ca. 3m at the PE, respectively. Average recurrence interval (ARI) is 4,700 ys and average slip rate (ASR) is 0.5-1.2mm/y. 3) Ichinose fault: The RE was at 6100-4100 yBP and the PE was at 11000-9600 yBP. The offset is ca. 2m at the RE and up to 3m at the PE. The ARI is ca. 5,000 ys and the ASR is 0.4-0.5 mm/y.

The Itoigawa-Shizuoka Tectonic Line Active Fault System (ISTL) ca. 140 km long is one of longest fault system in Japan and is currently active through historic periods. Recent trenching studies at north and middle parts of ISTL exhibit that a large segment linkage of north-middle ISTL was present at AD762 or 841 (ca. 1,200 yr. BP), producing ca. M 8.0 earthquake, and suggest that future earthquake reaching M 8.5 will occur at ISTL as a whole. To confirm such large-quake model, respective faulting histories of the segments in ISTL should be clarified; in particular, south part of ISTL segments exhibits less information of such linkage event rather than the north and middle parts. Our study provides detailed recent faulting events (younger than ca. 10,000 yr. BP.) at Hakushu, Shimotsuburai, and Ichinose faults in the south part of ISTL, where there were less information in support of the model.

The Hakushu fault, ca. 10 km long, locates at north region of the south part of ISTL and shows piecemeal lineament and westward low-angle dipping structure. Both geologic studies at Kamikyoraiishi and Daibo trenches exhibit the most recent event of this fault. These and 14C ages of the deposits suggest that the rupturing occur at ca. 6,000 yr. BP. Penultimate event is present at Daibo site and it possibly took place at ca. 10,000 yr. BP.. The displacement along fault plane at recent event is ca. 1 m. A minimum recurrence interval between recent and penultimate events is 4,000 years. Consequently, in a case of 5,000 interval, average net-displacement rate of the fault is 0.2mm/year.

The Shimotsuburai fault, 12 km long, locates between the Hakushu and the Ichinose faults and also shows westward dipping structure but continuous sharp lineament is evident rather than piecemeal. At Tozawa and Asahimachi-Yamadera trenches, detailed observation and 14C dating of deposits revealed the most recent event of the fault at duration from 2,400 to 1,400 yr. BP., and penultimate event took place at from 8,400 to 4900 yr. BP.. Offsets of the deposit along several fault planes reach ca. 1.2 m at the recent event, and that at the penultimate event is estimated as ca. 3m. The recurrence interval ranges from 7,000 to 2,500 years and is 4,700 years in average, respectively. Thus, the average displacement rate of the fault ranges from 0.5 to 1.2mm/year, which is coincide with uprising rate of the fault presented previously.

On the other hand, 8 km long, eastward-extended arcuate lineaments, westward dipping thrust structure, and large bending of deposits of the Ichinose fault are particularly distinct to other southern ISTL faults. This fault locates at the western margin of the Kofu basin where is most southern region of the whole ISTL. Observation and 14C dating of deposits at Kamimiyaji A, B, and C trenches exhibit the most recent faulting at from 6100 to 4100 yr. BP.. Penultimate event is also identified and it took place at from 11,000 to 9,600 yr. BP.. The estimated offset of the deposits is ca. 2m at the recent event and up to 3m at the penultimate event. The recurrence interval is 3,500 years in minimum, 6,900 years in maximum, and ca. 5,000 years in average, respectively. Therefore, the resulting average displacement rate ranges from 0.4 to 0.5 mm/year and is small than from 6.0 to 8.0 mm/year of previous estimate.

These results imply that the south part of ISTL is less active than the north and middle part, and the large linkage of ISTL as a whole including these faults could not occur in AD762 or 847.