

## Paleoseismic and topographic evidence for latest Pleistocene to Holocene repeated surface-rupturing earthquakes on the Sone Hills fault zone, central Japan

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Our paleoseismic trenching and detailed topographic analyses and surveying reveal evidence for multiple large earthquakes accompanied with distinct surface ruptures during the latest Pleistocene to Holocene on the Sone Hills fault zone, central Japan. The ENE-striking Sone Hills fault zone, extending for 32 km, lies southern margin of the Kofu basin which hosts over 200,000 population. Although this fault zone is proximal to well-studied Itoigawa-Shizuoka Tectonic Line active fault zone, its recent rupture history and deformation style are less understood. For properly evaluating the future probability of earthquake occurrence and potential magnitude of ground displacement, paleoseismic information is vital. In order to derive paleoearthquake history we excavated three trenches across the two sub-parallel small scarps on the southern slope of a series of ENE-trending narrow ridges developed at leading edge of the fault zone at Otsuka, Ichikawa-Misato Town, western part of the fault zone. Furthermore, to measure the amount of vertical offset associated with each of possible last two faulting events, we performed detailed topographic analysis of faulted fluvial terraces at Kokubun, Fuefuki City, central part of the fault zone. Trench walls at Otsuka exposed the mid-Pleistocene to Holocene sediments, which are deformed significantly by numerous faults with both the reverse and normal slip components. Such coexisting of reverse and normal slip faults may suggest that the fault zone has a substantial strike-slip component. Based on sedimentary and structural features such as truncation and capping of faulted strata and angular unconformity combined with age controls using radiocarbon dating and tephrochronology, we identified and constrained timing of multiple event horizons, of which two events occurred since the Holocene. Analysis of lidar derived high-resolution DEMs and in-situ topographic surveying using a total station at Kokubun shows that two levels of fluvial terrace surfaces with ca. 10 ka old for its higher one exhibit a ENE-trending linear scarp. The vertical offset of the higher terrace is estimated to be ca. 2.5 m, while that of the lower terrace is less than 1.5 m, suggesting that multiple events occurred during the Holocene period at Kokubun, which is consistent with the results from trenches at Otsuka, and that the vertical offset of the lower terrace shows slip during the last event. This research was carried out as a commissioned research project by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

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