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Fault outcrop and tectonic landform of the western margin fault zone of the Kitakami lowland, northeast Japan

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The western margin fault zone of the Kitakami Lowland (KLFZ) is a 70-km-long, reverse faults that consist of mulitiple faults that run parallel to mountain front of northeast Japan. The older paleoseismic events are difficult to explain by only a single trench investigation. Understanding the distribution and activity of the branched faults is important to identify the older paleoseismic events in the KLFZ. We describe paleoseismic events and distribution and activity of the branched faults based on two fault outcrops and the tectonic landform.

Paleoseismic events are identified in the first fault outcrop of the Uwandaira fault group (UFG). We identified at least 4 late Pleistocene-Holocene paleoseismic events, based on the upward termination of fault and angular unconformity, in the fault outcrop. Studies of tectonic landform of fluvial terraces indicate 8-20 late Pleistocene-Holocene paleoseismic events, assuming slip per event obtained from the fault outcrop and the minimum height of the scarplet. The pronounced disparity of paleoseismic events between the fault outcrop and tectonic landform suggests that multiple events have been recorded beneath each angular unconformity. The results imply that the study of the tectonic landform is indispensable to interpretation of paleoseismic events in the region where unconformities have been formed in the footwall of the active thrust.

Distribution and activity of the branched faults are identified in the second fault outcrop of the Nanshozan active fault group (NFG; F1 fault, F2 fault), based on geomorphic feature and surface geology (Plio-Pleistocene Siwa Formation), including the active reverse fault passing through the second fault outcrop (F3 fault). The Miocene strata have been thrust over the Siwa Formation along the mountain front (F1 fault). Distribution of fluvial terraces indicates that the F1 fault has been inactive. The F2 fault deforms fluvial terraces in the footwall of the F1 fault. Deformations of fluvial terraces and arrangement of valley spread of alluvial terraces provide that the F3 fault runs through east side of the hills on the footwall of the F2 fault.

Keywords: Paleoseismic event, angular unconformity, branched fault