

Relation of fault maturity with surface rupture occurrence and topographic expression in the Tottori-ken Seibu earthquake area

Yuichi Sugiyama[1]; Yukari Miyashita[1]; Kenta Kobayashi[2]; Yuichiro Fusejima[1]; Katsutoshi Iemura[3]; Akiko Miyawaki[4]; Kayo Shintani[3]

[1] Active Fault Research Center, GSJ/AIST; [2] Grad. Sch. Sci. & Tech., Niigata Univ.; [3] Hanshin Consultants Co.,Ltd.; [4] Hanshin Consultants co.,Ltd

Our topographic and geologic study in and around the 2000 Tottori-ken Seibu earthquake area proved that mode of coseismic surface rupture occurrence and topographic expression of active faults have a close relationship with the maturity of fault, which is roughly inferable from width of gauge zone or strongly sheared zone.

The 2000 Tottori-ken Seibu earthquake occurred along an NW-SE-trending seismogenic fault without evident topographic expressions. Surface ruptures with a left-lateral slip of several millimeters to 35 cm were identified intermittently over 6 km along the NW-SE-trending aftershock area. Trenching survey of surface ruptures in the Lake Ryokusui area, about 4 km northwest of the main shock, revealed that the surface ruptures in the area were formed by mm- to cm-order coseismic slips on minor faults or shear plains with gauges only several mm to several cm wide. Geodetic survey covering the Lake Ryokusui area shows that about 70 cm left-lateral coseismic movements occurred in the 600-m-wide surface rupture zone (Fusejima et al., 2003). This result suggests that the 70 cm horizontal movements are accommodated by smaller slips on several minor faults that lack clear topographic expressions.

About 5 km west of the NW-trending aftershock area of the Tottori-ken Seibu earthquake, there is a single, 8-km-long lineament (the Lake Nichinan lineament). We excavated this lineament at two localities in order to compare its fault-zone characteristics with those of the recent surface ruptures in the Lake Ryokusui area. The trenching survey revealed that the Lake Nichinan lineament possesses a strongly sheared fault zone around 50 to 100 cm wide. One rupture event between 60 (-80) ka and 30 ka was identified for the fault zone at the Yobiko site on the northern part of the lineament. Apparent vertical displacement associated with the late Pleistocene faulting event is around 50 cm. In the fault zone, the slip associated with this event is concentrated in a soft gauge zone, less than 10 cm thick, along the eastern margin of the fault zone.

The comparative study of the two active faults suggests that low fault maturity causes a small amount of slip and resultant unclear topographic expressions of the faults that were reactivated during the Tottori-ken Seibu earthquake in the Lake Ryokusui area.