

Morphological characteristics of the surface rupture associated with the 2004 Mid Niigata Prefecture earthquake

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On October 23, 2004, a shallow earthquake sequence with maximum magnitude of MJMA6.8 (Mw6.6) struck the mid-Niigata region, northern central Japan. The recent crustal deformation of the epicentral region is characterized by active thrust faulting and folding, thus this earthquake sequence may provide insight into understanding of relationship between the earthquake faulting and growing process of geologic structures.

An urgent field investigation team was organized immediately after the earthquakes in Active Fault Research Center, GSJ/AIST, for the purpose of checking whether or not the surface ruptures associated with the earthquakes are appeared and understanding the deformational mechanisms of faulting in active fold-and-thrust zones. As a result of one-month-long fieldwork, ca. 1-km-long surface rupture is found along the previously unmapped fault at the Obiro area, Uonuma City, eastern part of the epicentral region.

The surface rupture has a general strike of N-S to NNW-SSE and west-side-up vertical component. The maximum vertical displacement is measured to be 20 cm. The topographic and geometric features of the surface rupture are indicative of reverse faulting with dip to the west, which is consistent with focal mechanisms solutions and aftershock distribution. Along the pre-existing major active faults and folds that form the framework of landforms in the epicentral region, no systematic surface ruptures occurred. Exceptional small rupture dimension and offset amount of the surface rupture compared with those of the modeled fault suggests that the fault slip appears to have been accommodated by both internal deformations in thick Neogene-Quaternary deposits and growth of the folds and blind thrusts around the epicentral region.