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Tectonic Geomorphology along the eastern margin of the Ou Backbone Range using ALOS image

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Boundary between the Ou Backbone Range and the eastern lowlands shows obvious topographic contrast. Active faults uplifting the Ou Backbone Range are distributed in some areas. However, in the other area, evident active faults are not distributed despite existence of obvious topographic contrast. In this study, we extracted possible tectonic landforms based on analysis of satellite image, and estimated deformation style of these structures.
We used pan-sharpened stereo images (2.5 m spatial resolution) made from data taken by PRISM and AVNIR-2 sensors of Advanced Land Observing Satellite (ALOS). Interpretation using ALOS images has advantage in that landforms of various scales can be observed while changing the scales of images. First, we extract areas of possible active structures by observation of large-scale topography using small scale images. Second, we recognize active tectonic landforms by observation of small-scale topography using large scale images. We can do such a series of observation at the same time using ALOS images.
1) Source area of the Iwate-Miyagi Nairiku Earthquake
In the source area of the Iwate-Miyagi Nairiku Earthquake, large active fault which uplifts the Ou Backbone Range is not known, though small active faults are distributed. Boundary between the Range and eastern lowland shows sharp escarpment. A depressed zone developed at the foot of the escarpment, and most of small active faults are distributed in this zone. Erosional low-relief surfaces located in the east of the depressed zone is seemed to tilt to the east. Based on these topographies and deformation pattern estimated from height of fluvial terraces (Tajikara and Ikeda, 2009), we inferred that broad (~10 km wide) flexural deformation occurred in this area. Depressed zone and small active faults are probably secondary deformations due to broad flexural deformation.
2) East of the Towada Lake
Eastern margin of the Ou Backbone Range near the Towada Lake shows sharp linear escarpment. Depositional surfaces of pyroclastic flow deposits are widely distributed at the east of the escarpment. Antithetic active faults which deform the depositional surfaces are recognized, and these faults form a depressed zone at the foot of the Range. Since these topographies are similar to those in the source area of the Iwate-Miyagi Earthquake, we inferred that similar active deformation occur in this area.
3) Western margin of the Senboku Plain
Eastern margin of the Ou Backbone Range near the Senboku Plain, shows little gentler escarpment than that of the source area of the Iwate-Miyagi Earthquake. Fluvial terraces and depositional surfaces of pyroclastic flow deposits seem to be tilted to the east. Uplift rates estimated from height of fluvial terraces (Tajikara, 2004MS) decreases gently to the east. These facts imply broad flexural deformation occurred in this area.
4) Western margin of the Aobayama Hills
Eastern margin of the Ou Backbone Range near the Aobayama Hills shows sharp escarpment. Though some active faults are developed at the foot of the escarpment, displacement of these faults is small. The Togatta Fault uplifts eastern side and forms depressed zone between the Ou

Backbone Range. In the east of the depressed zone, fluvial terraces and summit level of the Aobayama Hills seem to be tilted gently to the east. Since these topographies are similar to those of the source area of the Iwate-Miyagi Earthquake, similar crustal deformation may occur in this area.

As we stated above, we recognized possible broad flexural deformation and small-scale active faulting in the areas where no evident large active faults have been mapped previously. Although evident large active faults are not recognized, we inferred that blind faults which can generate earthquakes as large as the Iwate-Miyagi Earthquake exist in these areas.

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Keywords: ALOS, satellite image, tectonic geomorphology, active fault, inland earthquake, fluvial terrace