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Relationship of the surface slip plane ruptured by the earthquake in eastern Fukushima on April 11, 2011 and element dis

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Mineralogical and geochemical studies of the recently slipped fault gouges might enable us to specify the recently slipped fault gouges in basement rocks. Usually it is difficult to specify the recent slip plane precisely within a thick fault zone. The surface rupture with the fault gouge has appeared along the Idosawa fault in the M7.0 earthquake in eastern Fukushima on April 11, 2011. The mineralogical and geochemical characteristics of this fault gouge are studied, and their relations to the slip plane are discussed.

The studied site is Kuroda-Betto of Iwaki city in Fukushima prefecture. The Abukuma metamorphic rocks are distributed in this area. The surface rupture has appeared across the road. The slip plane with the fault gouge strikes N6W and dips 80W. This is a normal fault with 1.7m vertical displacement. Four samples of fault gouges have been collected; slip plane to 7mm deep, 7 to 15mm, 15 to 20mm, 20 to 55mm. An intact gneiss sample has been collected outside of the fault zone to compare with the fault gouge samples.

Thin section observation, XRD, XRF, ICP and SEM-EDX analyses were performed using the fault gouge and gneiss samples. Thin section observation and SEM-EDX analysis show that ferropseudobrookite is included in the fault gouge and gneiss samples. Smectite is detected in all fault gouge samples by the XRD. The XRF and ICP results show the decrease of SiO_2 and increase of MnO, MgO, As, Sb and Ge toward the slip plane. The increase of MnO, As and Sb is also recognized in the latest slip plane of the Neodani fault (Kutsuna *et al*., 2011). The increase of MnO in the latest slip plane is interpreted as follows. The Mn^{2+} ions in the groundwater of saturation and reduction zone would rise to unsaturated and oxidation zone along the smectite-rich fault gouge by capillary action. Ikeda *et al*. (2004) revealed that cation exchange capacity and pH on shear plane of smectite become higher by the repeated shear experiment. This suggest that the pH of the slip zone becomes higher due to the seismic slip and the Mn^{2+} ions are precipitated and concentrated in the latest slip plane. The reason of As concentration is that the condition of As precipitation is similar to that of Mn (Yamaguchi *et al*, 2011). As previous seismic slips would be occurred in saturation zone, Mn concentration is not recognized in the fault gouge samples except that near the latest slip plane. The latest slip plane of the Idosawa fault indicates clear relationship between the slip plane and element concentration. This phenomenon expects to apply to the other faults that the paleoseismic records are unknown.

References

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