Characterizing ESR signal in calcareous gouge along an active fault: Case study of Ushikubi Fault in Central Japan

Emilia Fantong[1]; Akira Takeuchi[2]; Ryosuke Doke[2]

[1] Earth Science, Univ. Toyama; [2] Grad. Sch. Sci. Eng., Univ.Toyama

The Ushikubi fault is a 52km long NE-SW trending dextral strike slip structure which belong to the Atotsugawa fault system. The Atotsugawa fault system is within a complex tectonic zone consisting of the pacific plate, the Philippine Sea plate, the Amurian plate and the okhotsk plates. Geologic, geophysical, geomorphological and radiocaroban investigations have been done on this fault to clarify its activities. ESR signal intensities of fault gouge in such a neotectonic system may throw more light on the geodynamics of the system. This study therefore uses ESR method to characterize signal in the young (700-1000 years old) and active Ushikubi fault. The geology of the Ushikubi fault consists mainly of the Hida metamorphic rocks, Funatsu granites, sedimentary rocks of Tetori group, andesites of Iwaine Formation, Shomyodaki pyroclastic flows and terrace deposits. The fault displaces the Hida metamorphic rocks, Funatsu granites and the Tetori group. From lithological observation of a fresh outcrop at the eastern segment, the rocks become finer laterally towards the major slip plane and vertically from ground surface to deeper levels indicating that the crushing was more intense towards the major plane and at depth respectively.Gouge samples were collected from ground surface in the central Ushikubi fault and at deeper level (29.5m from the Eastern Ushikubi fault) as cores. The core samples form part of a crushed zone along the surface trace of the active Ushikubi fault. At a depth of 27-29.5m, an alternation of coarse grained gouge and fine grained gouge (fault clay) seams occur. The matrix consists of quartz, feldspars, micas, and calcite grains, and clay with oxides of iron and greenish chlorite. Considering the lithological mixture of carbonates and granites and also the layering fabric, the core samples can be located as a boundary fault between the Tetori group and the basement ”Hida Metamorphic Rocks”. The entire core sample show a variation of cataclastic sizes from finest at the bottom to coarsest at the top.

ESR analysis resulted in g-factors for SO_2^- = 2.0056, SO_3^-= 2.0038 and CO_2^- = 2.0007 from surface gouge samples of the Ushikubi fault and different from g- factors for SO_2^- = 2.0057, SO_3^- =2.0022, CO_2^- = 2.0003 from deeper ones. Despite of the depth dependent difference in g-factors, both the shallow and deep gouges show signals that are indicative of radicals A (SO_2^-), B (SO_3^-), and C (CO_2^-). The highest intensity is the B (SO_3^-) signal of the deep core samples, probably indicating the presence of a signal which is related to SiO_2 (E'_1 center) from the quartz grains in the gouge. Signals of samples close to the major slip plane are lower in intensity than signals further from the plane. The general low intensity of the signals may be indicating that the fault is an active and young fault because the intensity of the signals has been reduced by the fault activity.