

## **A possible cause of low resistivity zones along an active fault by small scale physical measurements at an outcrop along the Atera fault**

Yasuhiro Sugitani<sup>1</sup>, Tada-nori Goto<sup>1</sup>, Riki Kondo<sup>1</sup>, Kenji Hagiya<sup>1</sup>  
Koki Kashiwaya<sup>2</sup> and Katsuaki Koike<sup>2</sup>

<sup>1</sup>University of Hyogo

<sup>2</sup>Kyoto University

### **SUMMARY**

The magnetotelluric surveys have found kilometers-wide low resistivity zones along active faults. Causes of the low resistivity are possibly recognized as 1) “high water content in the rock due to fracturing” and/or 2) “electrically conductive minerals in and around fractures”. Both causes result from the fault movement. However, few researches have reported the major cause of the low resistivity zones. We investigate the small-scale physical measurement at an outcrop of a fault including magnetic property, resistivity, and X-ray analysis of minerals to discuss the major causes of subsurface low resistivity in active faults. Our target area is the Kawae outcrop of the Atera fault in Gifu, Central Japan. Our measurements of the outcrop showed that extremely high magnetic susceptibility and they were concentrated only at the fault core zone. In contrast, the whole outcrop showed the low resistivity. Furthermore, we estimated the mass distributions of clay minerals and magnetic minerals by the X-ray diffraction (XRD) analysis. Electrically conductive minerals found by the XRD analysis also aggregated only in the fault core zone. These results suggest that the electrically conductive minerals can be generated by fault movement. According to laboratory experiments by Tanikawa et al (2007), magnetic susceptibility is generated proportionally to frictional energy added to the fault gouge. The high magnetic susceptibility in this study implies that the fault core zone may have an experience a fault slip at a depth (more than several km).

Our physical measurements suggest that the clay minerals and other electrically conductive minerals are concentrated only along the major fault core with width of a few meters, so that the kilometers-wide low resistivity zones may be primarily due to the pore waters along the damage zones in the minor fractures.

**Keywords:** Atera fault, low resistivity zones, XRD

---