Electrical resistivity survey of subsurface structure of an active fault - A case study of the Gomura fault in Kyotango, Kyoto -

*Satoru Yamaguchi[1], Yuhei Ouchi[2], Yusuke Oda[1], Toshiaki Mishima[1], Hideki Murakami[3], Shigehiro Katoh[4]

1.Department of Geosciences, Graduate School of Science, Osaka City University, 2.Department of Geosciences, Faculty of Science, Osaka City University, 3.Natural Sciences Cluster - Science Unit, Kochi University, 4.The Museum of Nature and Human Activities, Hyogo

The relationship between earthquake magnitude and displacement accompanying an earthquake was first proposed by Matsuda (1975) for Japanese Inlands. This formula has been widely used to estimate the magnitude of a large earthquake which will occur at a given fault-segment. However, many papers recently pointed out the generation of earthquakes with larger magnitudes than the estimated ones. Revealing subsurface structure of an active fault is not only an important key to overcome the inconsistency (The Earthquake Research Committee, 2010) but also an interesting academic theme. Clear electrical conductivity variation is expected to be identifiable in the vicinity of an active fault as a result of enriched and interconnected fluid (meteoric waters and/or groundwater) in fractures and/or uneven fluid distribution across the fault because of impeded cross-fault fluid flow (e.g., Ritter *et al.*, 2005). The electrical conductivity distribution can provide a new image of the subsurface structure of an active fault.
A clear surface earthquake fault appeared associated with the 1927 Kita-Tango Earthquake in the Tango Peninsula of the northwestern part of Kinki district, Japan. This fault is named the Gomura fault and is one of the fault segments of the Yamada fault system.
We made an audio-frequency magnetotelluric (AMT) survey at twelve stations along a transection across the Gomura fault and obtained two-dimensional resistivity model (GMR model) along the line. The model is characterized by four conductive regions.
(1) Shallow sub-horizontal conductive layer (C1) between 160m and 300m in depth.
(2) Deep sub-horizontal conductive layer (C2) between 750m and 1200m in depth.
These layers are located to the east of a surface trace of the Gomura fault.
(3) Sub-vertical conductive zone (C3) beneath a surface trace of the Gomura fault.
(4) Weak and local conductive zone (C4) beneath a surface trace of the Go-seihou fault.
In this presentation, first we show MT responses for some typical resistivity structures which are expected to exist beneath an active fault, second explain some features of the GMR model, and finally interpret the GMR model with referring to the 1,300m-long borehole data.

Keywords: active fault, Magnetotellurics, Gomura fault

