Static shift correction with geostatistics and its application to AMT Data at Kumamoto Earthquake region

Nagi Yamashita[2], *Tada-nori Goto[1], Satoru Yamaguchi[3]

1. Graduate School of Life Science, University of Hyogo, 2. School of Science, University of Hyogo, 3. Graduate School of Science, Osaka City University

Fault damage zone is developed along active faults due to its fault movement. It often has low resistivity because the groundwater is filled in the highly-fractured damage zone. However, previous studies have not clarified the relationship between surface ruptures during earthquakes and the low resistivity zones along the damage zone.
In this study, we conducted audio-frequency magnetotelluric (AMT) survey in 2018 across the Futagawa fault, where a clear surface rupture appeared at the 2016 Kumamoto earthquake. Using this data, we estimated the subsurface resistivity structure across the Futagawa fault at Mashiki city, Kumamoto Prefecture. A two-dimensional resistivity model was obtained. Before the modelling, a new static shift correction method using the spatial filtering was applied for implying more accurate subsurface structure. The relationship between the active fault and the subsurface resistivity structure is discussed while comparing the resistivity structure with a drilling data in Mashiki city.
By our static shift correction, the near-surface resistivity heterogeneities were reduced and more accurate resistivity structure was estimated to the depth of about 1.5km. As a result, the lowest resistivity value was found just beneath the surface rupture. This low resistivity zone was not exposed on the surface, existed at depth below 400 m, and had a resistivity of 3 to 10 Ωm. Judging from the relationship between location of the surface rupture and the low resistivity body, we concluded the low resistive zone as the core of fault damage zone. we suggest, at this survey line, that the position of the surface rupture at the Kumamoto earthquake was determined by the presence of the low resistivity zone considered to be mechanically weak with a high degree of fractures.

Keywords: static shift, surface rupture, resistivity