Electrical resistivity structure from the surface to the seismogenic zone below the Gomura fault zone, Kyoto, Southwest Japan

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The Gomura Fault Zone in the Tango Peninsula, Kyoto, consists of three fault segments, the Go-seihou, Gomura, and Chuzenji Faults. They show different features in fault activity (average slip rates, the latest events etc.). The Go-seihou Fault is a very short in length (~2.8km long) with no clear displacement. Along the Gomura Fault, a clear surface rupture has appeared at the 1927 Kita-Tango earthquake. Cumulative geomorphological displacement is well recognized along the Chuzenji Fault, but no surface rupture appeared at the 1927 Kita-Tango earthquake. Conductivity structure can be one of the crucial elements to clarify subsurface structure of active faults. Furthermore, the Gomura fault zone is especially suitable for studying the relationships between conductivity structure and fault activity because three faults run nearly parallel within about 3km in simple geological setting.
We proposed the conductivity models of the Gomura Fault Zone combining the two conductivity models; one is the shallow model (0 –1.5 km in depth) and the deep model (0 -12 km in depth). The shallow model is determined based on the result obtained using an audio-frequency magnetotelluric (AMT) method which is excellent in shallow part resolution. While, the deep model is determined based on the result using a wide-band magnetotelluric (WBMT) method which is suitable for wide- and deep-range survey.
The final model is characterized and interpreted as follows.
(1) The final model covers from the surface to a depth of 12 km including the epicenter of the 1927 Kita-Tango earthquake and three faults (the Go-seihou, Gomura and Chuzenji Faults).
(2) The final model is characterized by six conductive zones and one resistive zone.
(3) The fault plane of the Gomura Fault starts the hypocenter of the 1927 Kita-Tango earthquake, goes through seismogenic and conductive region, and reaches to the Gomura Fault.
(4) The clear conductive zones were detected below both the Gomura and Chuzenji Faults in the shallow model. The conductive zone below the Gomura Fault is wider and more conductive than that below the Chuzenji Fault. We interpreted these differences reflect the latest faulting event age: that of the Gomura Fault (~90 yrs. ago) is much younger than that of the Chuzenji Fault. The conductive zones are formed by intruding groundwater into a damage zone around the faults.
(5) No conductive zone is recognized below the Go-seihou Fault and the result indicates that the fault is a secondary fault.
(6) The bottom of the resistive zone can be interpreted as that of the Miyazu granite.

Keywords: Gomura fault, Electrical conductivity, active fault, Magnetotellurics

