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Audio-frequency magnetotelluric surveys across the Yasutomi and Kuresaka-touge faults (2)

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The Yamasaki Fault System consists of the Ohara, Hijima, Yasutomi, and Kuresaka-touge Faults (northwest active faults group) and the Biwako ,Miki, and Kusatani Faults (southeast active faults group).The total length of the fault system is about 90 kilometers long. The Nagisen Fault zone is a reverse fault system that runs between southern foot of the Mt. Nagisen and the Tsuyama Basin. The general strike of the zone is EW and about 32 kilometers long.

Headquarters for Earthquake Research Promotion (2003) classified the Yamazaki Fault zone into three seismogenic faults, the Nagisen Fault zone, main strand of the Yamasaki Fault zone (the Ohara Fault - the Miki Fault), and the Kusatani Fault. The main strand of the Yamasaki Fault zone is divided into the northwestern part and the southeastern part. They evaluated the probability of earthquake occurrence within 30 years will be 0.07-0.1% for the Nagisen Fault zone, 0.06-0.8% for the northwestern part of the main strand of the Yamasaki Fault zone, 0.03-5% for the southeastern part of that, and about 0% for the Kusatani Fault. Audio-frequency magnetotelluric (AMT) surveys were undertaken along three lines (E-, C-, and W-line) across the Yasutomi and Kuresaka-touge Faults in 2009-2011 in order to reveal subsurface structure beneath the fault system. In this presentation we will show the results along W-line and E-line.

The survey was made at eight stations in 2010 and at four in 2011 along the E-line. Ueda et al. made observations at six stations to the north of the Yasutomi Fault and five to the south of the Kuresaka-touge Fault in 2009 along the W-line. Additional AMT survey was made at two stations in the area between the Yasutomi and Kuresaka-touge Faults in 2011.

MT responses of the frequency range between 10,400-0.35Hz were obtained at each site using the remote reference processing (Gamble et al., 1979). We determined dimensionality and strike direction of each line using the phase tensor analysis (Caldwell et al., 2004). Both of two lines showed the dominant two-dimensional nature. Then, we determined strike directions of each line; N60W-S60E for the E-line and E-W for the W-line.

Qualitative insights from pseudo-sections of the apparent resistivity and phase data of the TM and TE modes as follows.

E-line

In both modes, the apparent resistivity value is <100 ohm-m to the south of the Yasutomi Fault and >1000 ohm-m to the north of this Fault. But, in TE mode, a slightly high resistivity is recognized in the frequency range lower than 500 Hz beneath the surface trace of the Kuresaka-touge Fault and beneath 3km south of this fault.

Phase values between 30 - 40 deg. are widely recognized in both modes with a slightly high phase value of 45 deg. in the frequency range of 100-1000Hz beneath the Yasutomi Fault.

W-line

Low apparent resistivity (<100 ohm-m) region covering from the highest to the lowest frequency is recognized to the north of the Yasutomi Fault. Another low apparent resistivity region is recognized in the frequency range higher than 1000 Hz to the south of this fault. High apparent resistivity (>1000 ohm-m) in the frequency range lower than 1000Hz is found to the south of this fault, this high resistive zone is divided into two in TE mode.

Phase value is 50 - 60 degree to the north of the Yasutomi Fault in both modes. To the south of the Yasutomi Fault low phase value of 30 - 40 deg. covering from the highest to the lowest frequency is recognized in TM mode. In TE mode, low phase value of about 30 deg. is found in the frequency range higher than 500 Hz and it is about 45 deg. in the frequency range lower than that.

In this presentation we will also show the resistivity models of E-line and W-line across the Yasutomi and Kuresaka-touge Faults.

Keywords: conductivity, active fault, magnetotelluric