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Imaging Fluid-Rich Zones by Magnetotelluric Method at South Marmara Region, Turkey

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After the mainshock of 1999 İzmit (Turkey) earthquake, scientists have undertaken various kinds of observations in the Marmara region in order to increase understanding of crustal properties of North Anatolian Fault Zone (NAFZ). Most of these studies focused on the east Marmara region since the destructive earthquakes were occurring there. Considering the westward migration of significant earthquakes on the North Anatolian Fault (NAF), the next destructive earthquake is likely to occur beyond the westernmost part of 1999 İzmit earthquake epicenter, in or around Marmara Sea. For this reason, south of Marmara Sea was chosen as the survey area.

Wide-band (320-0.0005 Hz) magnetotelluric (MT) data at sixteen sounding locations along two parallel profiles at south Marmara region were collected to improve the understanding of the crustal electrical conductivity structure. Both profiles are crossing several branches of North Anatolian Fault. The results were achieved by performing two-dimensional (2D) inversions of MT data with the transverse electric (TE) and transverse magnetic (TM) modes. These results show a relatively complex structure down to 4 km depth. The electrical resistivity pattern below this depth indicates a simpler structure with conductors (10 Ωm) beneath the northern ends of both profiles. While these deep conductive zones are attributed to partially melting in the crust, the highly resistive zones are associated with low fluid condition and high rigidity. In addition, the features characterized in geo-electric models correlate well with known faults in the survey area. The South Marmara Fault (SMF) possibly corresponds to a lateral resistive-conductive interface between Manyas-Karacabey basin and Bandırma-Karadağ uplift on the west (PW) and Uluabat uplift and Mudanya uplift on the east (PE) profiles.