Deep electrical conductivity structure of Eastern Marmara, Turkey by long period magnetotellurics

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The electrical resistivity structure of a 100 km x 100 km region at northwestern Anatolia was examined by using long period magnetotelluric data with the aim to image the geo-electrical features at the lower crust and upper mantle. The electromagnetic impedance tensor elements were obtained for eighteen sounding locations within a period range of 20-13000 seconds. The soundings were distributed over the epicentral region of the 1999 Izmit earthquake and its vicinity including the Pontides in the north, Intra-Pontid transition zone and Sakarya Continent in the south. Three-dimensional data-space inversions of the long period magnetotellurics data were performed iteratively to achieve the electrical resistivity structure. In order to determine and overcome the complexities caused by the coast effect that arise due to presence of the conductive Black Sea, the dimensionality of the magnetotellurics data were examined in detail by means of induction arrows and phase tensor ellipses. These complexities may have transpired due to the seismically active branches of the North Anatolian Fault and presence of the Intra-Pontide Suture, too. The final resistivity models revealed a low resistivity zone trapped between two highly resistive blocks of Istanbul Zone in the north and Sakarya Continent in the south. This low conductivity zone coincides with the two main branches of the North Anatolian Fault and may be promoting the seismic activity in both of the branches.

Keywords: Magnetotellurics, North Anatolian Fault, Izmit earthquake, Fluids

