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The Electrical Resistivity Structure of the Eastern Anatolian Collision Zone, Northeastern Anatolia

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The Northeastern Anatolia is located at the intensely deformed Eastern Anatolian Collision Zone (EACZ), and its tectonic framework is characterized by the collision of the Arabian plate with Eurasian. Although extensive attention is given to understand the crustal and upper mantle processes at this convergent boundary, there is still an ongoing debate over the geodynamic processes of the region. In this study, we were specifically interested in the geoelectric properties and thus geodynamics of the crust beneath the EACZ. Magnetotelluric (MT) measurements were made on two profiles across the north of the EACZ in 1998 as part of a national project undertaken by the Turkish Petroleum Corporation (TPAO). MT data in the frequency range of 300-0.001 Hz were collected from 168 stations located along 78 km north to south and 47 km west to east profiles where direct convergence occurs between Arabian and Eurasian plates. Two and three-dimensional inversion algorithms were used to obtain resistivity models of the study area. According to these models, the upper crust consists of low resistivity sedimentary rocks (<30 Ωm) that are underlain by highly resistive (∼500-1000 Ωm) crystalline basement rocks of the Eastern Anatolian Accretionary Complex and Pontides. While the upper and lower crustal resistivity at the northern part of the study area shows a layered structure, significant horizontal and vertical variations for the rest of the EACZ exists on resistivity models. The broad low resistivity zones (<50 Ωm) observed at mid and lower crustal levels throughout the EACZ. These fluid-rich regions along with high temperatures could indicate weak zones representing the locations of active deformation induced by continent-continent collision and correlate with volcanic centers in the region. The variation in the resistivity structure supports the southward subduction model with the resistive continental block and the deep conductive zones presumably corresponding to the oceanic crust.