6.10 GEOELECTRICAL CHARACTERIZATION OF GEOTHERMAL RESERVOIRS – CASE STUDIES FROM GEDIZ GEOTHERMAL AREA (TÜRKIYE)

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ABSTRACT

The extensional tectonics in western Anatolia result in the development of grabens oriented in an approximately east-west direction and low-to-high enthalpy geothermal systems along the margins of the grabens, large-scale detachment surfaces, normal faults, and high heat. The convection-dominated geothermal systems in this area are primarily controlled by the deformation zones, namely faults and fracture zones. We acquired wide-band magnetotelluric data in different parts of the Gediz basin, western Anatolia, to derive upper crustal electrical resistivity models of the geothermal prospects. The resistivity models provide significant implications for a better understanding of the deep structural image of the subsurface and, therefore, the structure of geothermal reservoirs and flow pathways for the geothermal environment. Accordingly, the circulation of geothermal fluids in reservoirs is dominantly controlled by normal faults, namely the low-angle detachment fault and main graben-bounding fault. Besides, fracture zones developed under north-south extensional stress within the metamorphic basement play an important role in locally trapping of fluids to form geothermal reservoirs. We classify the reservoir types taking into account the zones exhibiting low resistivity anomalies, namely i) reservoirs in the shallow sedimentary layers, ii) reservoirs underlying alteration zones consisting of smectite and illite minerals, and iii) reservoirs in the metamorphic basement that the fractures and faults filled with conductive fluids.

KEYWORDS: Geothermal systems, normal faults, extensional tectonics, Gediz, magnetotellurics, 3D inversion