O16-13 CRUSTAL TEMPERATURE DISTRIBUTIONS IN THE WESTERN TURKEY

M. SALK, **G. GOKTURKLER**, M. OZEL, I. H. KARAMANDERESI and C. SARI.
D.E.U. Muh. Fak. Jeofizik Bol. 35100 Izmir , Turkey.

Using the available data in the western Anatolia, we calculated temperature distributions in the some parts of the crust. As known, a localised extensional tectonic regime prevails in the western Anatolian where the lithosphere stresses are mostly related to continental collision of the Alpine-Himalayas zone. From the late middle Miocene, the region experienced an extension, and a thick and partially melted crust (probably lower parts only) began stretching to form a thin and brittle crust. This brittle crust deformed in a complex manner to form an East-West trending horst-graben system. The magmatic plume, which is still hot at some depths, radiates the heat causing temperature increases. The geothermal fields of western Turkey are related mainly with the extensional graben system. Available heat flow measurements in the western Turkey give a mean heat flow value of 107± 45 mWm^{-2} , which is approximately 60 % higher than the world average (Alptekin et al., 1990). Seismic activity in the western Turkey is diffused, suggesting a complex deformation in the crust. The deep active fault zones which caused the graben structure, readily transfer the heat to the shallower depths. The major portion of heat generation is in the uppermost 10-15 km of the crust. This implies that the asthenosphere is rather shallow in this region. The major geothermal fields in the western Anatolia are the Aydin-Germencik-Omerbeyli, Aydin-Salavatli, and Denizli-Kizildere fields of the Buyuk Menderes Graben. The Salihli geothermal field is situated in the Gediz Graben. The Kaynarca geothermal field is situated in the Dikili- Bergama Graben, and the Eynal geothermal field is situated in the Simav Graben. Also, there are some other geothermal fields in the area such as Balcova, Seferihisar, Kula-Emir, Sandikli, Gonen, etc. (Figure 1).

To model the temperature distribution in the crust, a two-dimensional steady-state heat conduction equation in a heterogeneous medium was solved numerically by using finite-difference method:

$$\partial / \partial x (k \partial T / \partial x) + \partial / \partial z (k \partial T / \partial z) + A = 0$$

where k(x, z) is thermal conductivity; T(x, z) is temperature; A(x, z) is heat production; and x, z are coordinates. Two-dimensional steady-state heat equation defines a two-dimensional boundary-value problem. The solution of such a problem is to find the temperature values inside a bounded area by using the values along the boundaries. Numerical solution is an attempt to calculate the temperature at nodal points of numerical grid by finite difference approximation. We employed the relaxation methods treating the problem in an iterative manner for solution. We calculated the temperatures in the vertical sections running N-S, NW-SE, and NE-SW directions. Our two-dimensional models with approximately 200 km lateral and 30 km vertical extensions have no-flow conditions along the vertical boundaries; a constant temperature distribution on the surface and again a constant temperature distribution on the lower boundary. We used the Bouger gravity data to model the geometry of the geological units and used the values measured on the cores taken from the wells drilled in the grabens for geothermal explorations for the thermal conductivities.

In addition to the modeling studies, we mapped the wells drilled by General Directorate of Mineral Research and Exploration (MTA) in the Menderes and Gediz Grabens for geothermal explorations using their depths, flow rates and temperatures.

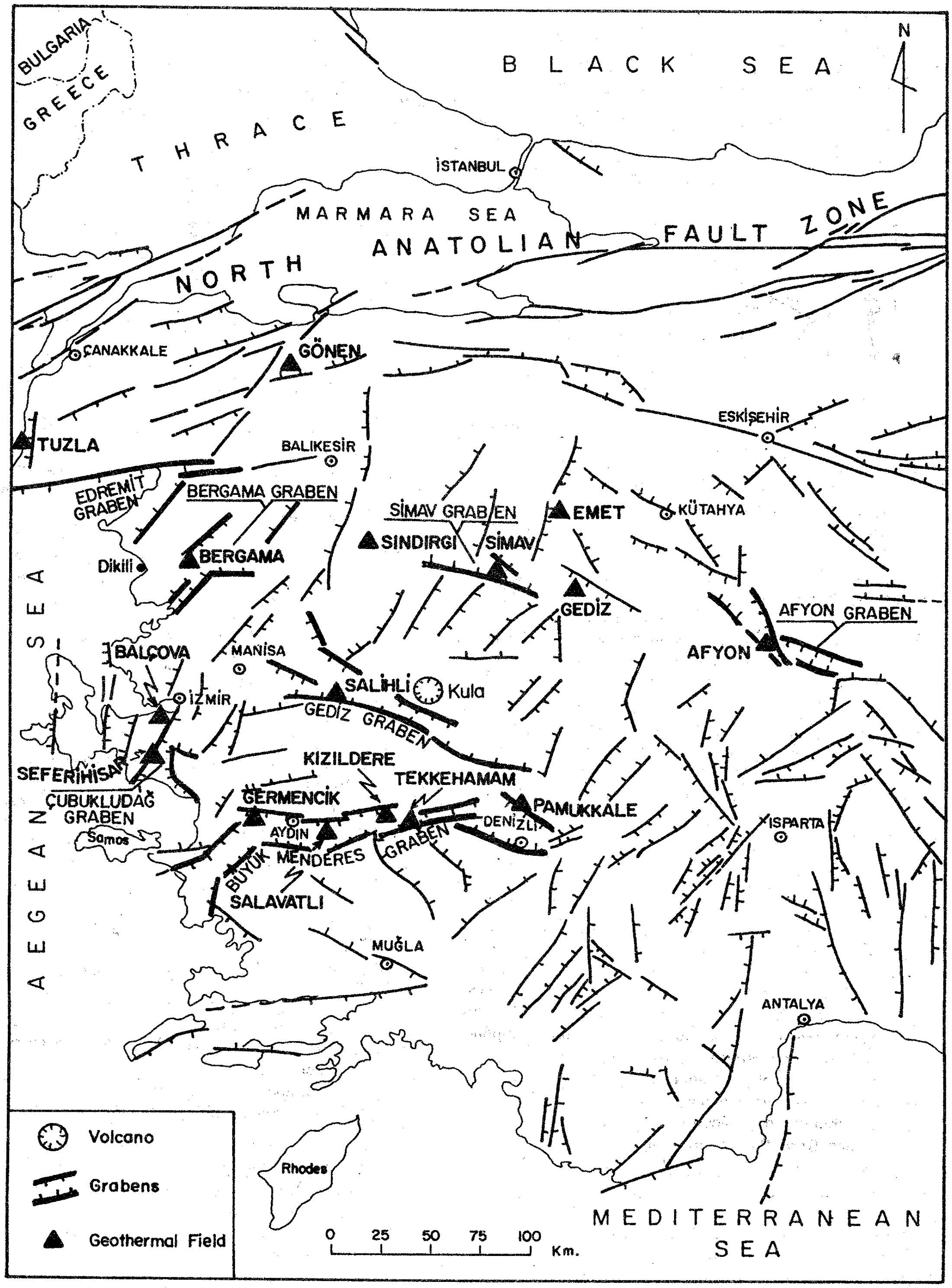

Fig. 6. Geothermal fields of Western Anatolia (faults are drawn - by B. Rojay - from the Landsat images of the region).

Figure 1. Geothermal Fields of Western Anatolia

Reference

Alptekin, O., Ilkisik, O. M., Ezen, U., and Ucer, S. B., 1990, Heat Flow, Seismicity and the Crustal Structure of Western Anatolia, IESCA Proceedings.