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Geothermal Energy Potential of Turkey: Inferred from the Aeromagnetic data

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Geothermal energy potential of Turkey is well known. There are lots of hot springs with over 30° C water temperatures. However, the significance of these geothermal energy potential of Turkey is not adequately understood. We believe that the main reason for this; is the lack of exploration methods and tools in a wide area as large as Turkey. We exploited a well known physical property of rocks to estimate the geothermal energy potential. Physically, substances lose their magnetization above a temperature known as the Curie that is the 580° C for magnetite. Properties of the Curie temperature have been exploited to observe the bottom depth of the magnetization. That is the depth where the heat reaches to 580° C. In another word, there is no magnetization below this depth. In normal crust this depth is about 22-24 km. Thus, investigation of the bottom depth of magnetization by using aeromagnetic anomalies can lead to information that if there are any anomalous regions well above the normal crust. The aeromagnetic anomalies of whole of Turkey were surveyed by the Mineral Research and Exploration (MTA) of Turkey. The survey was completed during late 1980's. Five kilometers grid data were available and used for regional exploration purposes. Exploration of the geothermal energy potential of Turkey was done from west to east in the similar way to search for shallow high temperature regions. These are from west to east; i.) Western Turkey: Two major shallow depth regions were determined at the west of Kutahya and the north-east of Denizli. The Curie Point Depths (CPDs) were calculated as about 7 km and about 9 km in Kutahya and Denizli, respectively. Also, high heat flow values and crustal thinning (about 32 km from gravity anomalies of western Turkey) were calculated for western Turkey. ii.) Central Turkey: A CPD depth of 8 km was calculated. This gives us a temperature gradient of 0.073° C/m. Geothermal energy potential was studied using water chemistry and isotopic research borehole called SHK-1. Thermal gradient is about 0.75° C/m (Borehole depth is 1677 m). These independent researches are indicative of high geothermal potential of the region. iii.) Eastern Turkey: The CPD was calculated as the same way as in the west and centre. It was suggested that the individual sources of volcanic regions exhibit geothermal energy source. As a conclusion; Turkey has several important high geothermal rich areas. These thermal regions can also be well correlated with the hot spring areas of the country. Temperatures obtained from the available wells provide additional contribution to understand the geothermal potential. In future, these potential high thermal regions should be explored in detail to utilize the energy potential before hydrocarbon sources becoming scarce.