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Crustal heat flow in Western Anatolia from borehole temperature-depth measurements

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Determination of magnitude and distribution of crustal heat flow in Western Anatolia is important from both scientific and economical perspective. Previously, heat flow of the region was estimated using bottom-hole-temperatures from deep wells without any sampling of rock thermal conductivities. For determination of crustal heat flow, temperature-depth data were collected from abandoned water wells between 1995 and 1999. Thermal conductivities were also measured from surface outcrops using the known lithologic logs of the wells. The nominal depth of these well are 100-150 m so the gradients are generally contaminated with near surface hydrologic activity. The temperature-depth curves from 119 wells collected in southern Marmara and Aegean regions were investigated, and their qualities were determined using conventional heat flow quality classification techniques. As a result, 33 sites were chosen to be appropriate for calculating crustal heat flow with various levels of quality. These data were further terrain corrected if necessary. Although the resulting heat flow values have generally moderate to low quality, they are significant as the first direct measurements of conductive heat flow in the region. The new heat flow data as well as data from previous studies were combined and a new heat flow map of the region was generated. The new heat flow map reveals unprecedented short range variations of the crustal heat flow in the region. Certain areas including the South Marmara coast, Biga Peninsula, Izmir Peninsula, and around Menderes region show significantly high heat flow values ($\sim$100 mW/m2). Part of the central Aegean region shows heat flow values near the continental averages (55-65 mW/m2). We conjecture that this is due to some shallow effects rather than a continuation of deep crustal temperatures. In this study, we compared the heat flow values with detailed earthquake solutions for three localities in order to see the correlation of heat flow and the maximum depth of seismicity. We also compared the heat flow map with active deformation of the region using the results of a dense GPS network.