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Profile Curvature Analysis of Bouguer Gravity Anomalies: A Case Study from Aegean Region, Western Anatolia, Turkey

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As is well known, determining the parameters of causative bodies such as location, extension and depth is the most important key in the interpretation of gravity data. Computation of directional derivatives and special filters are extensively used for enhancing the gravity anomalies of causative source bodies. These algorithms successfully help geologic interpretation by locating abrupt lateral changes in density and may also shed light on subtle details in the data without specifying any prior information about nature and type of the causative sources. Therefore, some parameters of source bodies may be estimated.

In this paper it was aimed to investigate the subtle details in Aegean Graben System (Western Anatolia, Turkey), located at western part of the West Anatolia Extensional Province, by analysing Bouguer gravity anomalies. In the study area the most evident neotectonic features are E-W trending horsts and their basin-bounding active faults. The less evident ones are NE-SW trending basins and their interposing horsts. Profile curvature method was used for the analysis of Bouguer gravity anomalies. The method measures the rate of change of the slope in the direction of steepest gradient and therefore it may determine maxima and minima values in the curvature amplitudes which can be used to locate the lateral edges of source bodies on the grid plane. The resulting profile curvature anomaly map showed that the traces of the normal faults through the grabens were clearly enhanced and curvature operator dramatically improved the resolutions of the details even in the areas where the field does not show strong anomaly patterns in Bouguer gravity anomaly map such as normal fault systems bounding the basins and the ductile detachment fault located in the Menderes Massif. Thus it can be concluded that the use of profile curvature method proved useful in delineating the subtle details in gravity data dealing with geological contacts and alignments.

Keywords: Bouguer Gravity Anomalies, Aegean Graben System, Profile Curvature Analysis