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A Comparison of Gravity Anomaly Separation Techniques: Synthetic Examples and Real Anomaly Case from Nemrut Volcano, Bitlis, Eastern Turkey

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Potential field anomaly maps present the effects of both shallow (residual) and deeper (regional) geological sources. Thus, the major issue in potential field data interpretation is to separate the anomalies into two components. In order to remove the regional or residual trends from the composite anomaly map, some mathematical procedures are utilized. Polynomial fitting and filtering procedures are the oldest and also the most commonly used techniques for the separation. Additionally, these techniques can be performed in most of the commercial software packages used for geophysical potential field data interpretation (e.g. Geosoft, WinGlink, GeoModeller etc.). However, there has not been any remarkable progress with regard to the mathematical background of these techniques. During the past decades, high technological developments of computers have enabled to design fast and efficient techniques which may be alternative to those conventional techniques. Hence new procedures have been suggested by some researchers for potential field anomaly separation.
In this study, it is aimed at comparing the efficiency of conventional and some other recent techniques on gravity regional/residual anomaly separation. A finite element method based on the use of element shape functions and optimum upward-continuation height techniques are addressed for this purpose. The performance of those above-mentioned techniques is tested using synthetically produced gravity data with different scenarios. Additionally, a real gravity anomaly observed over Nemrut Volcano (Bitlis, Eastern Turkey) is used for the test studies.

Keywords: Gravity anomaly, Regional/residual separation, Finite element method, Upward continuation, Nemrut volcano