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The Evaluation of Gravity Anomalies Based on Global Models by Land Gravity Data

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Abstract : The Earth system generates different phenomena that are observable at the surface of the Earth such as mass deformations and displacements leading to plate tectonics, earthquakes, and volcanism. The dynamic processes associated with the interior, surface, and atmosphere of the Earth affect the three pillars of geodesy: shape of the Earth, its gravity field, and its rotation. Geodesy establishes a characteristic structure in order to define, monitor, and predict of the whole Earth system. The traditional and new instruments, observables, and techniques in geodesy are related to the gravity field. Therefore, the geodesy monitors the gravity field and its temporal variability in order to transform the geodetic observations made on the physical surface of the Earth into the geometrical surface in which positions are mathematically defined. In this paper, the main components of the gravity field modeling, (Free-air and Bouguer) gravity anomalies are calculated via recent global models (EGM2008, EIGEN6C4, and GECO) over a selected study area. The model-based gravity anomalies are compared with the corresponding terrestrial gravity data in terms of standard deviation (SD) and root mean square error (RMSE) for determining the best fit global model in the study area at a regional scale in Turkey. The least SD (13.63 mGal) and RMSE (15.71 mGal) were obtained by EGM2008 for the Free-air gravity anomaly residuals. For the Bouguer gravity anomaly residuals, EIGEN6C4 provides the least SD (8.05 mGal) and RMSE (8.12 mGal). The results indicated that EIGEN6C4 can be a useful tool for modeling the gravity field of the Earth over the study area.

Keywords : free-air gravity anomaly, Bouguer gravity anomaly, global model, land gravity
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