



Long-term Crustal Deformations Based on Gravity and GPS Measurements (2006 - 2010) in Marmara Region, Turkey

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Abstract

The Marmara region is one of the most tectonically active regions along the branches of North Anatolian Fault Zone and is an ideal natural laboratory for geodynamic studying. The main goal of this study is to determine long-term vertical and horizontal crustal deformations using repeated gravity and Global Positioning System (GPS) observations. While the repeated gravity measurements provide informations about vertical surface motions and subsurface mass changes in time, GPS time series constrain the horizontal and vertical recent crustal deformations. Hence, the 4D deformation anomalies in the Marmara Region can be interpreted with the joint analysis of GPS and gravity. The results help to understand better both the horizontal and the vertical components of the postseismic deformations of the 1999 earthquakes. We carried out the first time absolute gravity measurements with A10 absolute gravimeter along the western North Anatolian Fault after 17 August 1999 Izmit earthquake and along a gravity calibration baseline stations which was established in the region for the purposes of the calibration of the relative gravimeters. In addition, a precise determination of vertical gravity gradients with two Scintrex CG-5 relative gravimeters were carried out at the all absolute gravity stations. All gravity sites measured with GPS to correlate the different time series, simultaneously, from years 2006 - 2010 in the Marmara Region.

We introduce here gravity and GPS networks, discuss gravity and GPS data processing strategy and present the results of the time series analysis. We also identify what appear to be different crustal properties in the western and eastern parts of the region and obtained results will be used in connection with the earthquake hazards in this region.

Keywords: Absolute and relative gravity, Crustal deformation, Marmara Region, GPS