

## Vertical gravity gradient measurements along a medium-range GNSS-leveling traverse in the Taurus Mountains, Türkiye

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Vertical Gravity Gradient (VGG) observations are highly sensitive to topographic irregularities and subsurface mass distributions. The differences between actual and normal gravity gradients must be taken into account to achieve a sub-centimeter geoid model. They serve as a significant source of information and a valuable tool in gravity reductions and geoid determination. To interpret the topographic effects on the gravimetric geoid model over an irregular topography where elevations range from 500 to 3,500 m, a high-accuracy GNSS-leveling traverse was established along a profile of approximately 100 km between Ulukışla and Tarsus, on the Taurus Mountains, Türkiye. The VGG data were mostly collected within a valley at intervals of 1-1.5 km. This study investigates how theoretical values differ from practical measurements and how they can be modeled in mountainous terrain. In the field survey, measurements were conducted using a Scintrex CG-5 gravimeter calibrated on an absolute gravity baseline and a vertical gradient measurement stand. After applying correction terms related to instrument height, temperature, pressure, etc. all observations were adjusted by considering a linear drift model. Based on linear approximation, a total of 79 VGG values and their associated errors were estimated from observations recorded as six groups across three different floors spaced in vertical with 50 cm. The average actual vertical gravity gradient of the study area, derived from station values, is approximately 200 Eötvös lower than the theoretical value. This result is assessed to the distribution of observation points within the valley along the survey route. The dispersion of actual vertical gradient values strongly indicates a high correlation between the topographic feature and the actual vertical gravity gradient values.

**Keywords:** Vertical gravity gradient, theoretical gravity, geoid determination, gravity reduction, topographic effect, GNSS-leveling

