The analysis of vertical gravity gradient measurements in Slovakia

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A b s t r a c t : Several campaigns of vertical gravity gradient measurements using relative gravity meters CG-5 (or CG-3M) were carried out during the recent years in Slovakia. They were performed mainly on the absolute gravity points, but some of the gradients were measured in the field. The range of measured values of the vertical gradient is quite large, from –0.180 mGal/m to –0.410 mGal/m (normal value is –0.3086 mGal/m). The value of vertical gravity gradient is actually determined by several factors as are the height of measurement, topography, geology, near building structures, hydrology etc. In this contribution we are concerned with some of mentioned effects, which strongly influence the measured values.

First we analyzed the measurement error and its impact on the accuracy of measured vertical gradients. We found out that this accuracy depends on the standard deviation of the infividual gravity measurement as well as on the methodology of the measurements. Next we studied the effects of topography and building structures by means of 3D modelling, as well as the effect of hydrology models. The topography effect we present also on a synthetic model. We can state that the surrounding topography has the major impact on the „anomalous“ values of vertical gravity gradients (that is the case of deep valleys

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and mountain peaks for example, or, if the absolute gravity point is situated in the basement floor of the building under surrounding topography). We calculate the topography effect to „standard“ distance of 166,7 km around the calculation point. The effect of distant topography (and bathymetry) beyond 166,7 km on the vertical gradient can be neglected in our territory (Mikuška et al, 2008).

We studied also the effects of buildings and hydrology respectively. These are smaller, but not negligible within precise studies.

Key words: vertical gravity gradient, topography effect, gravity modelling

References

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