

TERRESTRIAL GRAVIMETRIC GEOID MODEL DEVELOPMENT IN LATVIA

Vents Zusevics¹

¹*Latvian Geospatial information agency, O.Vaciesa 43, Riga, Latvia
e-mail: vents.zusevics@lgia.gov.lv*

Global positioning methods are the basis of modern infrastructure. For practical application of global positioning, it is crucial to precisely transform the observed ellipsoidal heights to national height reference frame. The modelling of such transformation surfaces, also called gravimetric quasigeoids, is done, fitting gravimetric geoids to the chosen height reference frame. The most important input of said gravimetric geoids can be assumed to be pointwise gravity data.

Historically, gravity data coverage in Latvia has developed sporadically, within campaign efforts spanning multiple years. Between such campaigns there can be seen significant differences in instruments, field and post-processing workflows used, and final value accuracy estimations. Gravity surveys in Latvia pre-2022 have been done with final data density ranging from 1,5 km in central areas up to 15 km in eastern parts of the country. Geoid models traditionally are calculated, using interpolation methods powered by input data set statistics. Variations in data precision and density negatively influence accuracy, robustness and error evaluation of resulting models. When performing unification of data sets of varying origins and accuracy, intercomparison and harmonization is a must; for this, statistically significant overlaps in information must be provided.

Over a new gravity survey, between 2022 and 2025, 2658 new pointwise gravity values have been obtained. Data provides 4 km data step over the eastern part of Latvia. New data is validated by independent repeat measurements. Precision evaluation is presented, based on validation and post processing results. Validation of pre-2022 data has been used for older data error evaluation. Both new and old data have been harmonized and included in the new gravity reference frame LAG-2019.

Free air anomaly grids were calculated and used in old and new data comparison. Comparison results reflect the positive influence new data will have on a new gravimetric geoid development in Latvia.