



Steps towards improvement of Latvian geoid model

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The high precision geoid model is essential for the normal height determination when the GNSS positioning methods are used. In Latvia for more than 10 years gravimetric geoid model LV'98 is broadly used by surveyors and scientists. The computation of this model was performed using GRAVSOF software using gravimetric measurements, digitised gravimetric data and satellite altimetry data over Baltic sea, the estimated accuracy of LV'98 geoid model is 6-8cm. (J. Kaminskis, 2010)

However, the accuracy of Latvian geoid model should be improved. In order to accomplish this task, the evaluation of several methods and test computations have been made.

KTH method was developed at the Royal Institute of Technology (KTH) in Stockholm. This method utilizes the least-squares modification of the Stokes integral for the biased, unbiased, and optimum stochastic solutions. The modified Bruns-Stokes integral combines the regional terrestrial gravity data with a global geopotential model (GGM) (R. Kiamehr, 2006).

DFHRS (Digital Finite-Element Height Reference Surface) method has been developed at the Karlsruhe University of Applied Sciences, Faculty of Geomatics (R. Jäger, 1999). In the DFHRS concept the area is divided into smaller finite elements – meshes. The height reference surface N in each mesh is calculated by a polynomial in term of (x,y) coordinates. Each group of meshes form a patch, which are related to a set of individual parameters, which are introduced by the datum parametrizations. As an input data the European Gravimetric Geoid Model 1997 (EGG97) and 102 GNSS/levelling points were used.

In order to improve the Latvian geoid model quality and accuracy the development of mobile digital zenith telescope for determination of vertical deflections with 0.1" expected accuracy is commenced at University of Latvia, Institute of Geodesy and Geoinformation. The project was started in 2010, the goal of it is to design a portable, cheap and robust instrument, using industrially produced components as much, as possible. Currently the prototype of instrument is complete and first test observations have been made.