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KGEOID10: A New Hybrid Geoid Model in Korea

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This study describes in brief the construction of a new hybrid geoid model, KGEOID10, which can be used as an accurate vertical datum in Korea. The hybrid geoid model should be determined by fitting the gravimetric geoid to the geometric geoid undulations from GPS/Levelling data which were presented the local vertical level.

For developing the gravimetric geoid model, we determined all frequency parts (long, middle and short-frequency) of gravimetric geoid using all available data with optimal remove-restore technique based on EGM2008 reference surface. In remove-restore technique, the EGM2008 model to degree 2,160, 4-band spherical FFT with modified stokes kernel and RTM reduction method were used for calculating the long, middle and short-frequency part of gravimetric geoid, respectively. A number of gravity data compiled for modelling the middle-frequency part, residual geoid, containing 8,296 points gravity data on land and ocean areas. And, the DEM data gridded by 100m$\times$100m were used for short-frequency part, is the topographic effect on the geoid generated by RTM method. The accuracy of gravimetric geoid model were evaluated by comparison with GPS/Levelling data was about -1.63m $\pm$ 0.123m.

Finally, we developed the hybrid geoid model in Korea, KGEOID10, corrected to gravimetric geoid with the correction term by fitting the 1,185 GPS/leveling data. The correction term is modelled using the difference between GPS/Levelling derived geoidal heights and gravimetric geoidal heights. The stochastic model used in the calculation of correction term is the LSC technique based on second-order Markov covariance function. The post-fit error (mean and std. dev.) of the KGEOID10 model was evaluated as 0.001m $\pm$ 0.054m.

Concerning the result of this study, the accurate orthometric height at any points in Korea will be easily and precisely calculated using the KGEOID10 and GPS technique. Therefore, the KGEOID10 could be used as a vertical datum for determining the vertical positions precisely in the various fields of geosciences; surveying, geophysical research and engineering work etc.