

Establishment of GSIGEO2011 (Japanese geoid model)

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Geospatial Information Authority of Japan (GSI) established Japanese geoid model "GSIGEO2000". The model has enabled a translation from ellipsoidal heights to orthometric heights in GNSS survey for triangulation points, which are positional reference for surveys in Japan. As a result, the model greatly has contributed to realize efficient control point survey. In order to expand utilization field of geoid model to height determination of third-order benchmarks by GNSS satellite positioning, GSI has established new Japanese geoid model "GSIGEO2011" and reported here.

GSIGEO2011 has established as a hybrid geoid model of a gravity geoid model and observed geoid height data. New Japanese gravity geoid model, JGEOID2008 (Kuroishi, 2009), is adopted as the base model, and least square collocation method is adopted to fit the model to observed geoid height data obtained at over 750 GNSS-based control stations all over Japan. In order to utilize for height determination of third-order benchmarks, residuals between the model and input observed geoid heights are set to 2cm in standard deviation. JGEOID2008 is greatly improved at reduction of local systematic errors which are contained in older gravity geoid models. Therefore, short wavelength components in geoid are well described and fit to observed data, and as a result, the accuracy of the hybrid model is improved.

The 2011 off the Pacific coast of Tohoku Earthquake caused huge crustal deformation in an wide area around eastern Japan. GSI urgently conducted control point surveys for restoration and opened the result for eastern Japan. GSI also conducted geoid surveys for GNSS-based control points which is located in an area experienced huge crustal deformation, and the results have been utilized for the input geoid heights data of GSIGEO2011. Therefore, GSIGEO2011 is consistent with the revised survey results in eastern Japan.

GSI has published newly established GSIGEO2011 and tired to realize height determination of third-order benchmarks by GNSS survey referring GNSS-based control points which have orthometric heights. This challenge is expected to drive further improvement in efficiency of survey procedure in Japan.

Keywords: GSIGEO2011, Geoid model, survey results