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Title : GRAVIMETRIC GEOID MODEL DETERMINATION FOR PENINSULAR MALAYSIA USING LEAST SQUARES MODIFICATION OF STOKES

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Geoid is vital information in the determination of orthometric height via GNSS levelling. Based on the ellipsoidal height observed by GNSS, the accurate orthometric height can be easily computed by adding precise and accurate geoid model information. This will particularly enable the users to replace the traditional orthometric height determination techniques to become faster and more cost effective. The Peninsular Malaysia Seamless Geoid Model 2014 (PMSGM2014) is the first geoid model computed based on the Least Square Modification of Stokes' (LSMS) approach. In spite of the available land observation gravity data is sparse and not well distributed, however the PMSGM2014 is successfully constructed as accurately as possible. Based on the literature review, the LSMS is the most appropriate approach in determination of geoid model. However, even with a good approach, the accuracy of the geoid model is totally depends on the quality of the data. In this study, development of gravimetric database is the priority because of an accurate data is required in determination of geoid model using LSMS. The procedure for evaluating, selecting, removing blunders, combining and re-gridding the surface gravity anomalies from land observed gravity, marine ship track and Global Geopotential Model (GGM) and Satellite Altimetry model data has been developed. The cleaning and quality control for the gravimetric database was based on the cross validation approach combined with Kriging spatial interpolation method. The limits of Peninsular Malaysia Gravimetric database are Latitudes S 3^0 00' - N 10^0 00' and Longitudes E96^0 00' - E108^0 00'.The gravimetric geoid model for the Peninsular Malaysia was computed based on LSMS with Additive Correction (AC). The geoid model estimation was firstly computed based on the optimal condition modification parameters (M=L=180 degree/order, Ψ_0=3^0, and $\sigma_{\Delta g}$ =10mGal). Thereafter, the Additive Corrections (Combined Topographic, Downward Continuation, Total Atmospheric and Ellipsoidal Correction) were added to the estimation geoid height to produce accurate gravimetric geoid height called Peninsular Malaysia Seamless Gravimetric Geoid Model 2014 (PMSGM2014$_{GRAV}$). The PMSGM2014$_{GRAV}$ cover the whole of Peninsular Malaysia at 1 x 1 arc minute grid interval with limited to Latitudes N0^0 00' - N7^0 00' and Longitudes E99^0 00' - E105^0 00'. A total number of 70 GNSS levelling points were qualified to assess the accuracy of PMSGM2014GRAV. The accuracy of PMSGM2014$_{GRAV}$ is ±0.142m and after removing the systematic effect and fitting the PMSGM2014$_{GRAV}$using means parametric model, the accuracy was increased to ±0.017mand called as PMSGM2014$_{fitted}$. The applications PMSGM2014$_{GRAV}$ and PMSGM2014$_{fitted}$ as vertical datum for deriving GNSS orthometric height were also performed in absolute and relative sense.