

ASSESSMENT OF HIGH-RESOLUTION GLOBAL GEOPOTENTIAL MODELS TO FILL THE LEVELLING HEIGHT VOID FOR THE SRI LANKAN REGION

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Abstract

Due to the unavailability of a dense gravimetric network, Sri Lanka belongs to an area where gravity anomaly data are of poor nature. When developing the Global Geopotential Model (GGM) EGM2008, fill-in gravity anomalies using the Residual Terrain Model (RTM) gravity forward modeling technique has been used for the Sri Lankan context. Particularly, it is noted that fill-in values are the least quality gravity data used in constructing EGM2008. This EGM2008 data set has been used later to develop high-degree/order (2190) GGMs, as EIGEN-6C4, GECO, XGM2019e-2159, and SGG-UGM2. EIGEN-6C4 has been developed by combining EGM2008 data with more terrestrial data, which shows significant improvement over the Australian region up to 9.1cm considering Root Mean Square (RMS) about the mean of GNSS / leveling minus GGM-derived geoid heights. GECO was developed by combining GOCE satellite data with EGM2008. The proposed combination compared and showed which weights the different input contributions can outperform, locally, other more sophisticated combinations from global contributions. In XGM2019e, ground gravity observations regarding Sri Lanka are filled with a pre-compiled 15' global geographic grid. Even so, the resolution is not adequate enough to convert the ellipsoidal height to orthometric height in practical GNSS uses. SGG-UGM-2 does not notably represent ground gravity data, with respect to EGM2008. Hence, GNSS surveys using GGMs for levelling height determination in Sri Lanka cause accuracy anomalies. In order to fill the levelling height void for the Sri Lanka by using high resolution GGMs, assessment of the suitability of them for the region is important. The analysis shows that RMS Error for GGMs derived geoid heights have ranged from 0.094m to 0.074m over Sri Lanka.

Keywords: *Global Geopotential Models, Geoid Heights*