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Validation of high resolution GGMs over Sri Lanka using ground gravity & GPS-levelling data

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With the advent of new gravity dedicated satellite missions (CHAMP, GRACE and GOCE), the long wavelength gravity field modeling of the Earth is possible with remarkable accuracy. Numerous global geopotential models (GGMs) have been developed to date with the improved satellite gravity information, enhanced land gravity and satellite altimeter data. Since recent past, high resolution GGMs (HR-GGM) have been developed with significant accuracy. They can be useful for local and regional geodetic and geophysical applications; especially, in areas with lack of ground gravity data coverage. An accuracy analysis of GGMs is vital before using them in geodetic or geophysical applications. In this study, five HR-GGMs are evaluated against the absolute gravity, Bouguer anomaly and GPS-levelling data. Two regions with flat and rugged terrain; Jaffna and Bandarawela, were utilized to investigate their variations appropriately. Analysis of gravity and Bouguer anomaly revealed that the even high resolution global models are not capable of representing features in rugged mountainous areas because of the omission errors resulted due to the truncation of the model's gravity field at its maximum degree and order, but fitted quite well with flat terrain. A clear bias around 1.6 m of Sri Lankan GPS-levelling datum can be seen through the results of geoid height analysis of high mean values and comparatively low standard deviations. Overall, recently released SGGUGM-2 model shows a better agreement with ground gravity and GPS-levelling data in Sri Lanka.

Keywords: Global geopotential models, gravity data, GPS-levelling data

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