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High-resolution combined global gravity field modelling – Towards a combined d/o 10800 model

Philipp Zingerle, Roland Pail, and Thomas Gruber
Technische Universität München, Institute of Astronomical and Physical Geodesy, München, Germany (zingerle@tum.de)

Compared to XGM2016, with the latest experimental gravity model version XGM2018 open problems concerning the optimal combination of terrestrial and satellite gravity field information have been resolved by introducing spheroidal harmonics and by using a more realistic stochastic model for the terrestrial observations.
So far, the limited resolution of d/o 719 ($\sim$30 [km] spatial resolution) has been one of the remaining drawbacks of XGM2018. This limitation arises from two facts: firstly, the terrestrial dataset provided by courtesy of the NGA is limited to this resolution, and secondly, solving dense normal equation systems above d/o 719 becomes computationally very demanding. This contribution addresses the question of how to further refine the resolution of combined gravity field models.
To remedy the limitations stated above, it is proposed to extend the terrestrial dataset in a first step by including additional data sources such as higher-resolution gravity field models, gravity anomalies derived from satellite altimetry and topographic models. The combination of these datasets is performed spectrally applying block-diagonal techniques and spatially applying tapered transitions, ultimately resulting in one consistent high-resolution terrestrial dataset.
Having this dataset at hand it is further proposed to use a so-called kite-system instead of a dense normal equation system for the final combination with the satellite model to keep the computational effort within a reasonable limit. The final result of this work shall then be a gravity field model up to d/o 10800 ($\sim$2 [km] spatial resolution), densely modeled up to d/o 719.