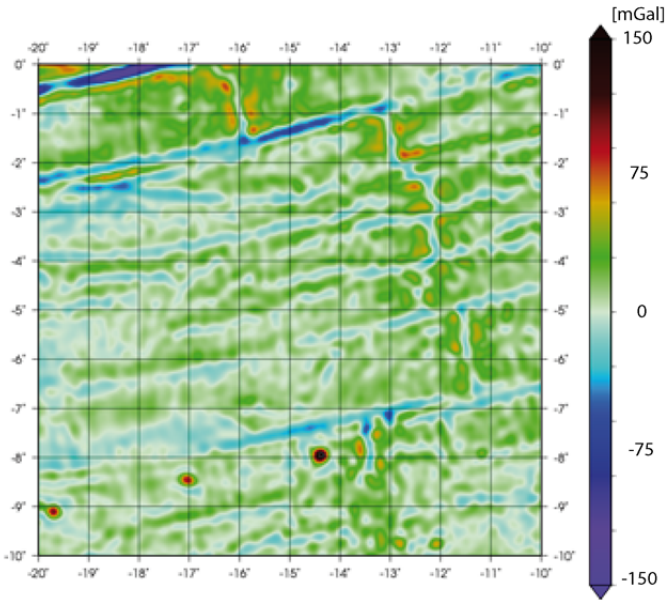
Current topic for a Master's Thesis

Introducing topography models as prior information for regional gravity modelling via RegGRAV

The Earth's gravity field and the topography are related quantities. While global topography models, such as GTOPO30, SRTM30 or ETOPO2, are mainly derived from satellite remote sensing data and available in high-resolution 1x1km grid files, the low-resolution information (up to 100km) in global gravity models stems from satellite gravity missions, such as GRACE and GOCE. For high-resolution gravity modelling, we aim to combine GRACE and GOCE data sets with high-resolution terrestrial, air- and shipborne observations. As the latter are only available in specific regions, DGFI-TUM developed a regional gravity field modelling software (RegGRAV) to obtain high-resolution regional gravity models from the optimal combination of all data sets using a Multi-Resolution Representation (MRR).



High-resolution regional gravity field model in the South Atlantic showing topography structures of the Mid Atlantic Ridge.

However, the combination of observations with different resolutions, distributions and the handling of data gaps is very challenging. We thus have to introduce prior information for the stabilization of the algorithm. The idea is, to derive this prior information from high-resolution topographic models. The relative weighting of all data sets is regulated by variance component estimation (VCE). Depending on the quality of the prior information and the resolution of the observation data, the relative weight of the prior information has to be adapted, e.g. in case of data gaps. The derived output gravity field models for specific regions finally can be validated against existing global gravity field models, such as EGM2008. From such a comparison the aim is to show the additional value of optimized regional models.

Main tasks:

- Study the availability and resolution of current topography models.
- Derive gravity quantities, such as gravity anomalies or deflections of the vertical, from appropriate topography models.
- Implement the use of topography data in the RegGRAV software.
- Study the introduction of appropriate stochastic information and the need of low-resolution global gravity information.
- Compute high-resolution regional gravity field models for specific test areas.
- Validate the results against existing global gravity field models.

Institute	Deutsches Geodätisches Forschungsinstitut der TUM (DGFI-TUM)
Supervisors	Prof. Dr. Michael Schmidt / M. Sc. Qing Liu
Phone	089/23031-1123
Email:	mg.schmidt@tum.de