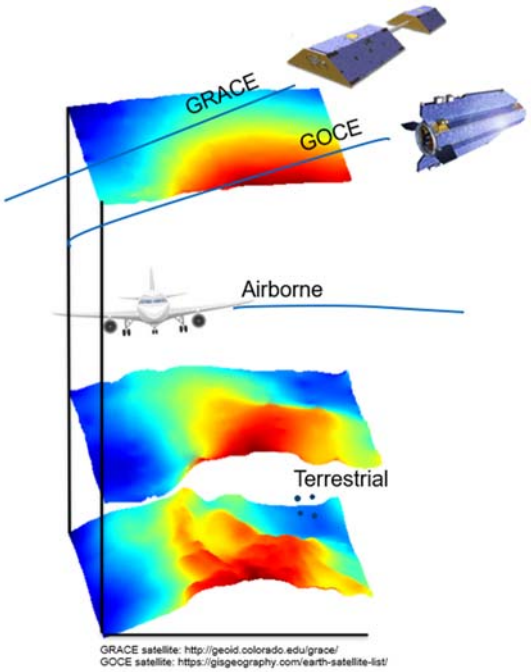
Current topic for a Master's Thesis

Regional gravity field modeling from the combination of heterogeneous observations using the multi-resolution representation (MRR)

Satellite gravity observation missions such as GRACE and GOCE provide gravity data globally, and they are the main data sources for the global gravity models. However, their disadvantage is the limited spatial resolution, which is only 70 km to 80 km at the Earth's surface. In contrast, other types of regional measurements such as airborne, shipborne or terrestrial gravity observations can provide a much higher spatial resolution of a few kilometers. Thus, they can be used in addition to the global models for a regional gravity field refinement to improve the resolution and accuracy.

Due to the different spectral and spatial sensitivities as well as the heterogenous distributions of different observation techniques, approaches need to be set up in order to combine various types of observations optimally. The method of spherical radial basis functions (SRBF) has been developed at DGFI-TUM in the last two decades. Currently, the gravity data are combined in one single resolution level, and high-resolution regional gravity models have been obtained.



High-resolution regional gravity data (airborne, terrestrial measurements) in combination with global satellite data

The aim of this thesis is to set up a multi-resolution representation (MRR) for regional gravity refinement by combining a low-pass filtered global gravity model with band-pass filtered satellite gradiometer and regional high-pass filtered gravity data. With this approach, different observations can contribute information exactly in the spectral domain of their highest sensitivity and the detail signals of each resolution level can also be obtained.

Main tasks:

- Study the SRBF method for regional gravity field modeling.
- Realization of the MRR approach (in Matlab) to combine different types of gravity observations optimally.
- Compute high-resolution regional gravity field models using the SRBF/MRR approach for specific test areas.
- Compare the regional gravity field models using the MRR approach to the ones obtained from the single-level approach.

References:

Liu Q., Schmidt M., Pail R., Willberg M.: Determination of the Regularization Parameter to Combine Heterogeneous Observations in Regional Gravity Field Modeling. Remote Sensing, 12(10), 1617, 10.3390/rs12101617, 2020

Lieb V., Schmidt M., Dettmering D., Börger K.: Combination of various observation techniques for regional modeling of the gravity field. Journal of Geophysical Research, 121(5), 3825-3845, 10.1002/2015JB012586, 2016

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