

## **Heterogeneous gravity data combination for geophysical exploration research and the applications of the GOCE satellite data for regional basin and petroleum system analysis (Example from the Arabian Peninsula)**

R. Abdul Fattah<sup>1</sup>, S. Meekes<sup>1</sup>, E. Guasti<sup>1</sup>, J. Bouman<sup>2</sup>, M. Schmidt<sup>2</sup>, J. Ebbing<sup>3</sup>

1: TNO, Utrecht, The Netherlands

2: Deutsches Geodätisches Forschungsinstitut (DGFI), Munich, Germany

3: NGU, Trondheim, Norway

TNO Geological Survey, P.O.Box 80015, 3508TA Utrecht, The Netherlands

Email: rader.abdulfattah@tno.nl

The GOCE satellite gravity mission was launched in 2009 to measure the gravity gradient with high accuracy and spatial resolution. It may improve the understanding and modeling of the Earth's interior and its dynamic processes. Here we show how GOCE gravity data can be used for basin maturity evaluation on regional scales with the Arabian Peninsula presented as a case study. GOCE gravity gradients are used in forward and inverse modeling in the Arabian Peninsula. The data is combined with other gravity data such as GRACE or terrestrial gravimetry. Gravity gradient is generally sensitive to the density structure of the upper crust. It provides a better resolution of the edges of geological features (such as faults, lineaments and large intrusions). Gradient data from GOCE have the potential to identify the extent of different structures with varying densities in the lower crust in the Arabian Plate. Using GOCE-based gravity anomaly maps, in combination with land-measured gravity data, gravimetric backstripping of the basin will be performed in order to identify basement inhomogeneity and Moho topography. The outcome of this phase is a model of the crust and the lithosphere in the study area. The gravity-based structural model is then used for modeling the basal heat flow within the basin using the grid-based stochastic tool (PetroProb) developed by TNO. The model is based on the inversion of basin subsidence data to calculate the tectonic subsidence and tectonic heat flow. It includes the radiogenic heat due to the effect of radiogenic elements in the crystalline basement. Different zonation in the basement can have varying radiogenic element concentrations and thus varying heat flow contributions. The maturity of the source rocks in the basin is calculated based on the modeled heat flow. Regional maturity maps are produced of the Paleozoic and Mesozoic plays in the Arabian Peninsula.