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# 3d density modelling in the southern North Sea Basin

**F. Hese** (1), S. Arndt (1), T. Bode (2), A. B. Cremers (2), H.-J. Götze (1), W. Rabbel (1), M. Schaefers (2), A. Schlesinger (1), F. Theilen (1)

(1) University of Kiel, Germany, (2) University of Bonn, Germany
(fabian@geophysik.uni-kiel.de / Phone: +49-0431-8801518)

The CORTEC Project is part of the SPP 1135 "Dynamics of sedimentary systems under varying stress conditions: The example of the Central European Basin", which is funded by the German Research Foundation (DFG). The investigation area is the southern Permian basin of the German North Sea sector. The main goal of the project is the investigation of geological processes, structures and the deeper basement of the basin as well as the reconstruction of the basin evolution. Furthermore, we are focussed on the influence of deep seated faults on basin tectonics through the combined use of reflection seismics, potential field analysis and 3D Modelling. Using gravimetric studies, we are working on following key questions. How is the basement structure of the basin characterized ? The gravity effects of basin sediments have been eliminated by downward continuation of the field to the Base of Zechstein. The resulting residual field gives us information on mass distributions of the Pre-Zechstein formations. What is the isostatic state of the crust ? The isostatic anomaly indicates the isostatic equilibrium of the crust, taking different lithospheric rigidities into account. In addition to 3D density modelling we develop a 3D geoinformation system to ease interdisciplinary interpretation of all available geoscientific data. Modelling density, susceptibility and geological structures foster a better understanding of the relation between basin development processes and structures of the deeper basement.

For Gravity Modelling, we use gravity data from GETECH (Leeds UK, Bouguer-, Free Air - and Isostatic Anomaly, 8 km point spacing), the Danish land registry office (Kort Matrykelstyrelsen Copenhagen, KMS Free Air Anomaly, 2 minutes point spacing) as well as 15,000 gravity and magnetic stations from the Federal Bureau of Seashipping and Hydrography Germany (1 km point spacing along shiptracks). High resolution reflection seismic sections (about 3500 km) from TGS-Nopec (Oslo, Nor-

way) provides geometric constraints for 3D Modelling and will be analyzed according to geological processes and structures of the southern Permian basin. Additional information have been taken from the Geotectonic Atlas (Baldschuhn et al. 2001). For the prepreparation of the 3D density model, numerical data processing was applied to the gravity anomalies of the southern North Sea. Curvature of the vertical gradient of the gravity field gave hints to near surface mass distributions. In order to get information about the depth of sources causing the positive and negative anomalies, we used the Euler deconvolution and the spectral analysis of selected anomalies. The results show that the long wavelength components of the anomalies are attributed to sources in the middle to lower crust (7-12 and 20 km).

We used the modelling software GOCAD to build a 3D geological Model of the investigation area by fitting interpolated surfaces to depth points of seven depth migrated geological horizons (Base Zechstein - Base Neogene). Afterwards, an initial density model was set up by transferring the model geometry from GOCAD to the geophysical 3D modelling software IGMAS. In addition, we develop a modelling system, consisting of two interacting applications (GOCAD and IGMAS), which expands the possibilities of building models and visualization techniques. Both applications will be connected with a database system, developed by the computer science group at Bonn University (A.B. Cremers, T. Bode, M. Schaefers).

References: Baldschuhn, R., Kockel, F. (2001): Geotektonischer Atlas von Nordwest-Deutschland und dem deutschen Nordsee-Sektor, Geologisches Jahrbuch, Reihe A, Heft 153