



Pre-Permian structures in the german North Sea area

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The CORTEC research 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). Our project aims to investigate the relation between basement structures and sedimentary basin tectonics in the German North Sea area. The study presented here is focused on geological processes and structures of the Pre-Permian lower crust, which was mainly affected by the convergence and collision between the Gondwana derived microcontinent Avalonia and Baltica. After the accretion of Avalonia, various processes like magmatic activity, lithospheric cooling, extension and regional subsidence influenced the composition of the crustal structure. These processes lead to differences in rock properties and caused anomalies of potential fields.

We aspire an integrative analysis of datasets from various geoscientific fields. The data was provided by national and international project partners. The data base consists of a net of high resolution reflection seismic profiles (3500 km length, TGS-Nopec, Oslo), potential field data (gravity grids from KMS - Copenhagen and GETECH - University of Leeds, as well as gravity point data from BSH Hamburg and the NOAA ship track database, a total magnetic anomaly grid was obtained from GGA Hannover), borehole data (DGMK Hamburg) and the geological data sets of the Geotectonic Atlas of NW-Germany (BGR Hannover).

Using the geological 3D modelling system GOCAD and the geophysical 3D modelling system IGMAS, a 3D density model down to the upper mantle was built for the German North Sea area. The model is constrained by depth migrated seismic horizons within the basin and density values from borehole data, literature and seismic velocities. The basin model was used to derive a residual gravity field, showing the gravity effect of Pre-Permian rocks. The gravity field was calculated using the 3D gravity

stripping method to separate the gravity field of the sedimentary basin and the underlying Pre-Permian basement. The obtained residual gravity field, downward continued to the Base of the Zechstein A2 horizon, reveals information about the structure of the Palaeozoic basement and the lower crust. We identified a gravity lineament striking parallel between the Caledonian Deformation Front and the Elbe Lineament, which is most probably caused by density contrasts in the suture zone between Avalonia and Baltica. Different geometries of this suture zone have been modelled and compared to interpret the gravity lineament and to obtain the best fit between modelled and measured gravity field.