



Lateral seismic velocity variations in lithological units in the German North Sea sector

S. Arndt, W. Rabbel, H.-J. Götze, F. Hese

Institute for Geosciences, Department of Geophysics, Christian-Albrechts-Universität zu Kiel, Germany,

The CORTEC project “Towards a correlation of basement structures and sedimentary basin tectonics” is focused on the geological evolution of the German North Sea sector. CORTEC is part of the priority program SPP 1135 (Dynamics of sedimentary systems under varying stress regimes: The example of the Central European Basin System), which is funded by the DFG - Deutsche Forschungsgemeinschaft.

In this study, we interpreted marine seismic reflection data, acquired by TGS NOPEC, Norway, supplemented by borehole information provided by DGMK - Deutsche Wissenschaftliche Gesellschaft für Erdöl, Erdgas und Kohle. The seismic network comprises about 3500 km of seismic profiles. The seismic data was provided by TGS NOPEC in time-migrated format together with a migration velocity model based on an interactive 2-step DMO velocity analysis at an average grid point spacing of 0.2 km.

We present a 2D post stack migration tool, which we developed and used to depth-migrate the velocity model and the seismic profiles. Using the velocity model in the time domain, the algorithm first iteratively generates a spatiotemporal velocity model, which is then used for the migration of the seismic amplitude information. Our time-to-depth migration is based on the Eikonal equation and a Runge-Kutta-Fehlberg ordinary differential equations solver. We implemented the algorithm in C++.

In the depth-migrated seismic database we identified horizons that correspond to the base Middle Miocene, base Oligocene, base Eocene, base Tertiary, base Upper Cretaceous, Top Zechstein, and base Zechstein. For these units, we show lateral seismic velocity variations with consideration of depth-level. In addition, we used velocity density conversion to build up a 3D density model for the identified layers.