Geophysical Research Abstracts, Vol. 8, 06213, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06213

Fault systems of the southern North Sea acting as pathways for fluid and gas migration (CORTEC)

S.Arndt,H.-J.Götze,F.Hese,W.Rabbel,**A.Schlesinger**,Fr.Theilen

Kiel University, Institute of Geoscience, Department of Geophysics
(angela@geophysik.uni-kiel.de)

The CORTEC project "Towards a correlation of basement structures and sedimentary basin tectonics" is focussed on the geological development of the German sector of the southern North Sea and the influence of the deep basin structures on the Earth's surface morphology. CORTEC is part of the SPP 1135 "Dynamics of sedimentary systems under varying stress regimes: The example of the Central European Basin System" supported by the DFG. The southern North Sea consists of two main depression areas, the northern and the southern Permian basin, which are separated by the Ringkobing - Fyn - High. Thick evaporitic series were deposited in the late Permian and mobilised during the middle Mesozoic. Large salt uplift induced salt diapirism and the formation of tectonic fault systems, which play an important role for the structure of the basin.

These fault systems differ in their geological depth range and their types. We have identified a group reaching from the Mid Miocene Unconformity nearly to the surface. These faults typically form vertical channel like features or only disturbances in the sequences. Most of all faults rise up from the top Zechstein to younger layers. Some of them can be observed up to the seafloor. Most of them appear as dislocations often connected with large vertical offsets of the geological unconformities or as an accumulation of little faults. Their geological development is often associated with salt tectonics. Some of these faults appear as pathways for fluids and gas migration, causing bright spots in our reflection seismic sections. For instance, we discovered bright spots above two large salt domes in a time window from 0.5 - 1.0 s two way travel time (TWT). These bright spots are arranged in echelon with increasing TWT values from the centre to the edges of the diapirs. Other bright spots located in the upper Neogene are not related to salt tectonics. They are of biogeneous origin and are caused by layers consisting of carbon dioxide or methane gas (Brekke et al, 1997).

Observed bright spot related amplitudes are increased by factor of about 2.5 or higher compared to the surrounding reflectors. Similar values were observed in the southern canary basin, where bright spots extend over 50 km^2 (Müller et al, 2001).

Our studies are based on 3500 km of reflection seismic data provided by the Norwegian company TGS NOPEC. A record length of 5 sec TWT allows to define many sedimentary sequences down to the Pre- Zechstein. The interpretation of the seismic data set together with several other geophysical methods will result in a structural 3-D model of the southern North Sea, to explain the subsidence and sedimentary history of the basin.

Literature:

Brekke,T., Lonne,O., Ohm,S.E.: Light hydrocarbon gases in shallow sediments in the northern North Sea. Marine Geology, 1997, pp 81 -108.

Müller,C., Theilen,Fr., Milkereit,B.: Large gas- prospective areas indicated by bright spots. World Oil, January 2001, pp 60 - 67.