MESO-CENOZOIC EVOLUTION AND STRUCTURE OF THE GLUECKSTADT GRABEN BY WELL DATA, SEISMIC LINES AND 3D-STRUCTURAL MODEL, NW GERMANY

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The Glueckstadt Graben is one of the deepest post Permian structures within the Central European Basin System and is located right at its heart, at the transition from the North Sea to the Baltic Sea and from the Lower Saxony Basin to the Rynkoebing Fyn High. The area of the Glueckstadt Graben is also a large natural laboratory concerning the effects of salt tectonics in space and time.

The Mesozoic to recent evolution is investigated by use of selected seismic lines, seismic flattening and a 3D-structural model.

A major extensional event in the Middle-Late Triassic was accompanied by strong salt tectonics within the Glueckstadt Graben. At that time a rapid subsidence took place within a narrow band which provides the core of the Glueckstadt Graben. The post-Triassic tectonic evolution of the area does not follow the typical scheme of thermal subsidence. In contrast it seems that there is a slow progressive activation of salt movements, triggered by the initial Triassic event. Starting with the Jurassic, the subsidence centre partitioned into two parts located adjacent to the Triassic core. During the Late Jurassic to Early Cretaceous the area around the Glueckstadt Graben was affected by relative uplift with regional erosion of the elevated relief. Subsequently, the two centres of sedimentation moved gradually towards the flanks during Paleogene and Quaternary-Neogene. The data indeed point toward a control of post-Permian evolution by gradual withdrawal of salt, triggered by the initial exhaustion along the Triassic subsidence centre. In this sense, the Glueckstadt Graben was formed at least partially as basin-scale rim syncline during post-Permian times. The present day Hamburger
Loch, East- and Westholstein Troughs are the actual final state of this long term process which still may continue and may play a role in terms of young processes and e.g. for costal protection.
The results of our investigation pose the question whether the Glueckstadt Graben really is a Graben involving deeper levels of the crust or whether it is just an upper crustal structure which developed above the Permian salt, decoupled from stresses in the deeper crustal levels.