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Regional basin modelling in the Polish part of the Central European Basin System – general overview on the project and first results

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The project deals with 2D temperature modelling along a 200 km long transect which extends from the central part of the Polish Baltic coastal area towards SW to the Polish-German border. The profile crosses several major tectonic units of the Central European Basin System. A fundamental part of the project includes building a structural and maturity model of a large basin – the Mid Polish Trough - inverted during Late Cretaceous-Early Paleogene and now forming the Mid Polish Swell. The swell is located in the northeastern part of the study area and overlies the border zone between the East European Craton and the Paleozoic fold belts of Central Europe called the Teisseyre-Tornquist Zone. The southwestern termination of the profile reaches the frontal zone of the Variscan mobile belt.

The formation of the Polish Basin started with extensive terrestrial sedimentation of the Upper Rotliegend. Structurally weakened crust in the Teisseyre-Tornquist Zone resulted in the depocentre development and the initiation of the Mid Polish Trough which stayed a dominant basin element through the Late Permian and Mesozoic and was filled with deposits up to 10 km (about 7 km in the study area) thick. The emergence of the Mid Polish Swell in the Late Cretaceous-Early Paleogene was followed by its erosion down to the Lower Jurassic (or locally Upper Triassic). The exact timing of inversion, which still remains problematic, must have had an essential influence on the thickness of now eroded Upper Cretaceous sediments and the total amount of subsidence in the Mid Polish Trough.

First 1D modelling results (which precede 2D modelling) are presented for several

wells including one situated in the central part of the Mid Polish Swell. A very rapid burial from Rotliegend to Early Triassic (Buntsandstein) followed by undisturbed sedimentation to the Late (but not the latest) Cretaceous (only interrupted by a minor erosional episode in Keuper times) characterizes this well. Due to the Late Cretaceous-Early Paleogene uplift approximately 2450 m of Cretaceous and Jurassic sediments were removed. The total thickness of eroded strata has been estimated on the basis of maps published by Dadlez (2003). However, the estimation of the Upper Cretaceous sediment thickness remains a problem due to unknown timing of inversion. Our first modelling results calibrated with vitrinite reflectance values have revealed that the deposits of this age might have reached only about 250 m in thickness suggesting long lasting inversion. During time of the deepest burial, i.e. in the Late Cretaceous, heat flows of about 50 mW/m^2 have been modelled to act in the area. These values are close to the present day ones.

The Permo-Mesozoic sequence in the vicinity of the Mid Polish Trough/Swell is characterized by lower sedimentation rates and reaches only 2-5 km in thickness. Deposition was interrupted several times by erosional events of minor importance: in the Late Triassic (Keuper), Early/Middle Jurassic, Late Jurassic/Early Cretaceous and finally Late Cretaceous/Early Paleogene. In general the total thickness of eroded sediments is up to 200-300 m.

A comparison of sedimentation and erosion rates calculated for several wells located on the Mid-Polish Swell and in its vicinity leads to the conclusion that the phases of basin evolution in the Late Permian-Early Triassic were almost synchronous. The first major phase of erosion in the Late Triassic (Keuper) is also synchronous as is the phase during the Late Cretaceous-Early Paleogene. However, the latter is far more intense in the area of Mid-Polish Swell.

References

Dadlez, R. (2003): Mesozoic thickness pattern in the Mid-Polish Trough. - Geol. Quart., **47**: 223-240.