Geophysical Research Abstracts,
Vol. 11, EGU2009-8176, 2009
EGU General Assembly 2009

Timing and Kinematics of Cretaceous to Paleogene inversion at the SE margin of the Central European Basin System: Part 1, Kinematics

F. Jähne (1), J. Kley (1), V. E. Hoffmann (2), H. v. Eynatten (2), and I. Dunkl (2)

(1) Institute of geosciences, Structural geology, Jena university, Germany (fabian.jaehne@googlemail.com), (2) Geowissenschaftliches Zentrum, Dept. Sedimentology/ Environmental geology, Göttingen university, Germany (hilmar.von.eynatten@geo.uni-goettingen.de)

Late Cretaceous to Early Tertiary inversion of the Central European Basin system (CEBS) is remarkably heterogeneous in the mode and timing of structural inversion (i.e., including reactivation of normal faults). Paleogene inversion present in rifts from the British Isles to the Netherlands decreases eastward into the Lower Saxony basin. Further east, in the North East German basin (NEGB), the influence of Paleocene to Eocene events is difficult to prove. There, much or all of the inversion occurred in Late Cretaceous time. E.g., the Dekorp Basin 9601 regional seismic section shows flat lying Paleocene on top of steeply dipping, folded and thrust-faulted Triassic to Upper Cretaceous strata. Thickness variations of Lower Tertiary strata in the southern NEGB mostly result from differential subsidence by salt withdrawal: salt-cored anticlines subsided after Late Cretaceous inversion and formed up to 1400 m deep basins predominantly filled with Eocene to Oligocene sediments. Fission track dating on bedrock from the basement highs in central Germany supports the hypothesis of a short but intense phase of inversion in Late Cretaceous time, although some Early Tertiary exhumation is documented as well. Apart from the timing of inversion, the different parts of the CEBS differ in the magnitudes of uplift and horizontal shortening and in structural style. In the western and central parts of the basin system, Late Cretaceous shortening is focussed on the NW-SE trending Jurassic to Lower Cretaceous extensional basins. In contrast, little shortening is accommodated within the NEGB. Rather, it is concentrated in the Thüringer Wald, Harz and Flechtingen basement uplifts and associated footwall structures on the southern basin margin. There is no clear evidence for increased original thicknesses of the sedimentary cover overlying the basement uplifts. On the contrary, part of the area affected by basement thrusting was underlain by the Eichsfeld-Altmark swell, a long-lived paleogeographic and structural high of Permian-Jurassic age. There is also no evidence for the regional reverse faults being reactivated normal faults, so the basement thrusting does not represent inversion in a strict sense. Still further east in Poland, the magnitude of "true" basin inversion increases again in the Polish basin. Nevertheless, first results of structural balancing across the CEBS suggest that shortening and uplift attained a maximum on a transect crossing the East German basement uplifts. Bulk horizontal NE-SW shortening from Scandinavia to southern Germany is about 15-20 km there. The total shortening decreases westward to a few km on a southern North Sea transect and probably also toward the east, although regional uplift of the Bohemian Massif inducing widespread non-deposition or erosion of Mesozoic strata make this difficult to prove. The irregular arrangement of extensional basins and intervening highs or swells apparently had a stronger effect on shortening styles than magnitudes. A counterintuitive conclusion from the symmetric regional shortening pattern is that the basins were not mechanically weaker than some specific regions of unextended crust. Rather than particularly strong basins this probably indicates weak basin margins, potentially resulting from a thermal anomaly or a previously thickened felsic crust.