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Paleostress field analysis of the southeastern part of the Aller Lineament

Christian Brandes (1) and Carolin Schmidt (2)

(1) Leibniz Universität Hannover, Institut für Geologie, Hannover, Germany (brandes@geowi.uni-hannover.de), (2) Landesamt für Bergbau, Energie und Geologie (LBEG), Hannover, Germany

The Aller Lineament is more than 200 km long and one of the most important fault zones in the Central European Basin System. It was active during the Mesozoic and there is evidence for Late Quaternary tectonic movements (Veldkamp et al., 2002). The evolution of the central and southeastern part of this fault zone was analysed in detail with seismic surveys (Best, 1996; Lohr et al., 2007), but a comprehensive outcrop based paleostress field analysis stills lacks. We analysed faults and conjugate shear fractures in the upper Aller Valley to derive the deformation history and the paleostress field evolution at the southeastern end of the fault zone. Especially conjugate shear fractures serve as important fabric for the paleostress analysis. Hancock & Kadhi (1978) showed that in such a system $\sigma 1$ bisects the smallest dihedral angle and $\sigma 2$ is parallel to the intersection of the conjugate fractures. The great advantage of conjugate shear fractures is that the orientation of the three major stress directions can be accurately constrained.

Different paleostress directions were identified in the data from the upper Aller Valley. Sets of NW-SE trending normal faults are developed in Upper Triassic sandstones, which indicate an NE-SW directed extensional phase. This was most likely the initial phase of faulting along the Aller Lineament. It took place in the Late Triassic and matches the results derived from seismic sections presented by Best (1996). Sets of NNE-SSW trending, conjugate fractures with a vertical acute angle in the fracture sets are developed. They indicate a vertical maximum principle normal paleostress, which could have resulted from the formation of relay zones between individual NW-SE trending fault planes. From a second set of conjugate shear fractures, a maximum horizontal compressive paleostress vector was reconstructed that is NNE-SSW to N-S oriented. This fits with the previous results from the Central European Basin System and reflects the NNE-SSW directed Late Cretaceous inversion phase.

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