Geophysical Research Abstracts, Vol. 9, 03313, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03313

Paleostress analysis applied to fault-slip data from the southern margin of the Central European Basin System (CEBS)

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We investigate the paleostress fields which controlled the post-Variscan evolution of the Central European Basin System (CEBS). Therefore, field studies are carried out in the marginal areas of the CEBS where Late Palaeozoic and Mesozoic rocks of the basin fill are present in outcrops bearing the imprints of several deformation phases that affected the basin system since the latest Carboniferous.

Field studies including structural analysis, measurement of fault-slip data and careful collection of kinematic indicators provide the data base for this study. In the case of polyphase tectonics, the chronology of successive events is deduced and the total fault population from each site is qualitatively divided into different subsets, each being consistent with one specific stress regime. Since the stratigraphy and evolution of the CEBS are well known, temporal and spatial correlations of paleostress orientations are possible.

Beside cross-cutting relationships derived from outcrops, we apply different graphical and mathematical methods to separate the faults into homogeneous subsets. Depending on (1) the nature of faults (i.e. neoformed or reactivated), (2) the distribution of fault-slip data and (3) the deformation style, the deviatoric stress tensor is calculated for each subset using either the Numeric Dynamic Analysis (Spang, 1972; Sperner et al., 1993) or the Multiple Inverse Method (Yamaji, 2000). The results are obtained in terms of a reduced stress tensor, consisting of (1) the orientations of the three principal stress axes σ_1, σ_2 and σ_3 with $\sigma_1 \geq \sigma_2 \geq \sigma_3$ and (2) the ratio of principal stress differences, R=$(\sigma_2 - \sigma_3)/(\sigma_1 - \sigma_3)$ with $1 \geq R \geq 0$.

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