

Stampfli, G.M., von Raumer, J.F., Borel, G., 2003: From peri-Gondwana to Variscan collision: The Palaeozoic evolution of pre-Variscan relicts in the Variscan domain of Europe – a discussion. GSA Special Paper 264 in press;

Von Raumer, J.F., Stampfli, G.M., Borel, G.D. & Bussy, F., 2002: The organization of pre-Variscan basement areas at the Gondwana margin. Int. J. Earth Sci. 91,35-52

Fault Backstripping: A method to quantify synsedimentary dip slip

M. Wagreich¹, H.P. Schmid², R. Faber¹

¹ *Institut für Geologie, Universität Wien, Geozentrum, 1090 Wien;* ² *OMV AG, 1211 Wien, Austria*

Analysis of deformational histories along faults is commonly based on the dating of cross-cutting relationships using relative ages of offset strata or geochronological ages of syntectonically grown minerals within fault planes. TEN VEEN & KLEINSPEHN (2000) introduced a new approach to reconstruct the vertical component of synsedimentary fault movements by geohistory analysis of sedimentary sections from both the hanging-wall and the footwall blocks adjacent to major normal faults to evaluate timing and sense of dip-slip along these faults.

The backstripping process includes corrections for paleobathymetry and stepwise decompaction of stratigraphic units. Paleobathymetry estimates are based mainly on known depth ranges of sedimentary structures and paleoecological proxies, e.g., benthic foraminiferal assemblages or plankton/benthos ratios. Decompacted thicknesses and paleo-water depths for each stratigraphic unit result in a basement (sediment-loaded) subsidence curve.

The fault backstripping method compares basement subsidence curves from sedimentary successions on two fault blocks adjacent to major synsedimentary normal faults. Segments of convergence or divergence record times of dip-slip activity. Parallel curved segments record either times of inactivity or pure strike-slip motion. Intervals of faulting can be dated according to the established chronostratigraphic resolution. The relative sense of fault movement can be directly determined, with converging or crossing basement subsidence curves

indicating reversals in the sense of faulting. Based on this method apparent dip-slip rates, i.e. the vertical component of displacement, can be calculated for individual faults. Assuming similar stratigraphic timing within both sections and the absence of significant erosion, the difference of the basement subsidence values on either side of the fault are calculated stepwise for each stratigraphic unit. These dip-slip values are divided by the time duration to give apparent dip-slip rates for each fault. Results of this fault backstripping method are presented in step plots of the slip rate versus time. Positive or negative values indicate the sense of dip-slip, i.e. which block moved faster; fault inactivity or pure strike slip motion result in zero values.

A case study in the central Vienna Basin demonstrates the applicability of this method to transtensional basins. Major dip slip with rates as high as 3 mm/a is recorded in the central part of the Vienna Basin during the Karpatian. Reversal in the sense of normal faulting during the Karpatian and lowermost Badenian indicates a complex tectonic evolution.

Ten Veen, J.H. & Kleinspehn, K.L., 2000: Quantifying the timing and sense of fault dip slip: New application of biostratigraphy and geohistory analysis. *Geology* 28, 471-474.

Wagreich, M. & Schmid, H.P., (in press): Backstripping dip-slip fault histories: Apparent slip rates for the Miocene of the Vienna Basin. *Terra Nova*.