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Development of Deformation Bands in Lower Cretaceous Sandstones in Namibia

E. Salomon (1), D. Koehn (2), and C.W. Passchier (1)

(1) Institute of Geosciences, University of Mainz, 55128 Mainz, Germany (salomon@uni-mainz.de), (2) School of Geographical and Earth Sciences, University of Glasgow, G12 8QQ, United Kingdom

Deformation bands were analyzed in a major sandstone basin in Namibia in order to try and distinguish the separate effects of reservoir compaction and external extensional tectonics. If this can be done successfully, deformation bands are a potential source of information on large scale tectonics. The Lower Cretaceous Etjo Formation in the Huab basin, NW Namibia comprises sandstone interlaced and subsequently covered by the Paraná-Etendeka flood basalts. The Etjo Formation sandstone matures from fluvial deposits at their base to large-scale alluvial cross-bedding with a thickness of up to 150 m (Mountney et al., 1999).
First results of an ongoing study about deformation bands in these sandstones are as follows. The bands vary in thickness between 1 to 30 mm, and many of the deformation bands exhibit normal offsets up to 40 cm. The majority of bands strike NNW-SSE and parallel to the continental passive margin. This direction is not expected from reservoir compaction alone, and probably indicates the onset of faulting related to the South Atlantic rifting.
A study of the internal structures of the deformation bands with a detailed thin-section and SEM analysis illustrate how the bands form. Thickness of the bands scales with the grain-size, and an analysis of this scaling behavior and present structures that develop during grain crushing in the bands is presented. First numerical models of deformation band development have been set up with a hybrid distinct particle code that allows for the crushing of grains with variable grain sizes including complex internal grain fracturing.

References

Mountney, N., Howell, J., Flint, S., and D. Jerram (1999): Climate, sediment supply and tectonics as controls on the deposition and preservation of the Aeolian-fluvial Etjo Sandstone Formation, Namibia: Journal of the Geological Society, London, 156, 771-777.