



Porosity reduction within shear deformation bands in unconsolidated Pleistocene sediments

Christian Brandes (1) and David Tanner (2)

(1) Leibniz Universität Hannover, Institut für Geologie, Hannover, Germany (brandes@geowi.uni-hannover.de), (2) Leibniz Institute for Applied Geophysics (LIAG), Stilleweg 2, D-30655 Hannover, Germany

Deformation bands are important structural elements that occur in the upper crust and develop in porous sandstones and even in unconsolidated sands. In contrast to discrete surfaces such as faults, deformation bands represent tabular zones of continuous displacement over several centimeters (Fossen et al., 2007). We present an outcrop-based study on the internal fabric of shear deformation bands that developed in Pleistocene unconsolidated sands in northern Germany. The deformation bands formed in an extensional stress regime, have a normal sense of displacement in a range of centimeters to decimeters, and form conjugate sets that intersect at angles between 70° and 90° (Brandes & Tanner, 2012). Due to their near-surface position, they are a perfect target for the study of deformation band formation prior to burial and diagenesis.

Thin section analysis show a significant pore space reduction from the host sediment to the shear deformation band. The boundary between the host sediment and the shear deformation bands can be very sharp. The grains within the deformation band are of the same grain size as the host sediment. Grain shape varies from angular to well-rounded. Many elliptic grains have a long-axis orientation parallel to the trend of the deformation band. The grains in the analysed thin sections are all intact, i.e. there is no evidence for cataclasis.

We believe the shear deformation bands are created by a grain-sliding process that decreases the porosity and leads to a denser packing of the sand. This is a porosity reduction mechanism in sandstone that occurs prior to burial without cataclasis. This can have an impact on fluid-flow in unconsolidated sediments in the near-surface.

References:

- Brandes, C. & Tanner, D.C. (2012) Three-dimensional geometry and fabric of shear deformation bands in unconsolidated Pleistocene sediments. *Tectonophysics*, 518-521, 84-92.
- Fossen, H., Schultz, R.A., Shipton, Z.K., & Mair, K. (2007) Deformation bands in sandstone: a review: *Journal of the Geological Society*, 164, 755-769.