Geophysical Research Abstracts
Vol. 18, EGU2016-6903-4, 2016
EGU General Assembly 2016

Microstructures and elastic properties of sheared calcite flowstone

Ivanka Mitrovic (1,2), Bernhard Grasemann (1), Lukas Plan (2), Telemaco Tesei (3), and Ivo Baron (2)

(1) Department of Geodynamics and Sedimentology, University of Vienna, Vienna, Austria (ivanka.mitrovic@univie.ac.at), (2) Cave and Karst Group, Museum of Natural History, Vienna, Austria, (3) Structural Geology & Rock Mechanics, National Institute of Geophysics and Volcanology, Rome, Italy

Flowstone is a monomineralic rock precipitated along cave walls and floors, composed of columnar centimeter-scale calcite crystals with strong growth orientation perpendicular to the growth surface. Broken and scratched flowstone can serve as evidence for active faulting and has been found in several alpine caves in Austria. In order to understand the fault mechanics, and associated potential earthquake hazard, experimentally deformed flowstone is studied using microstructural analysis and EBSD-measured physical properties of calcite crystals.
For that purpose, we have performed sliding experiments using a rock deformation biaxial apparatus on rectangular blocks of flowstone that were sheared perpendicular to the calcite growth direction. The experiments were performed under room conditions, with sub-seismic sliding velocity (0.001-0.01 mm/s) and constant effective normal stress (3-10 MPa).
The deformed samples show diverse brittle features, including high fracture density, the development of calcite-rich fault gouge with Riedel shears within a foliated cataclasite, and drastic grain size reduction down to nm-scale grains. The dominant plastic microstructure is mechanical twinning. Due to the strong growth orientation of calcite in flowstone, crystals can be bent due to shearing. We examine the bending by applying orientation distribution, Schmid factor and elasticity tensor calculations using MTEX Toolbox from EBSD data. In this unique case the flowstone deformation experiments bridge the gap between single crystal and rock powder experiments. This study is supported by the Austrian Science Foundation: SPELEOTECT project (P25884-N29).