Geophysical Research Abstracts
Vol. 13, EGU2011-9487-1, 2011
EGU General Assembly 2011

A fabric study of the Jegłowa date-quartzite (quartz metaconglomerate)

Jacek Szczepanski (1), Marcin Dąbrowski (2), Olav Gundersen (2), and Robert Anczkiewicz (3)

(1) University of Wroclaw, Institute of Geological Sciences, Depertment of Physical Geology, Wroclaw, Poland (js@ing.uni.wroc.pl), (2) University of Oslo, Physics of Geological Processes, Norway, (3) Polish Academy of Science, Institute of Geological Sciences, Research Centre in Cracow

We investigate the crystallographic fabric of a deformed quartz-pebble metaconglomerate cropping out near Jegłowa (40 km south of Wrocław, Poland) in the Strzelin Crystalline Massif. The pebbles are of centimeter size (up to 4 cm) and exhibit a prolate shape resembling of dates that float in a fine-grained matrix. This peculiar appearance was already appreciated by Wolfgang Goethe during his visit in the area in 1790. The pebbles are composed of quartz grains reaching up to 1.5 mm in diameter, while quartz grains in the matrix rarely exceed 0.5 mm in diameter. The grains are rather uniform in size within domains and their boundaries are straight suggesting that the main recrystallization mechanism was subgrain rotation recrystallization (sensu Stipp et al., 2002).

The measurements of the quartz optical axes are performed using a newly developed technique that employs a photo slide scanner. The results are validated with a computer-aided microscopic technique described in Stoeckhert and Duyster (1999) using AVA Generator and StereoNett software (Duyster, 1996) and the manual U-Stage method.

The investigated metaconglomerate is characterized by a domainal fabric. Matrix grains exhibit a strong c-axis maximum centered near the Y axis of the finite strain ellipsoid indicating activity of the prism <a> slip system. A secondary maximum at an intermediate orientation between the Y and Z suggests additionally the operation of the rhomb <a> glide system.

The c-axes of quartz crystals in the pebbles are predominantly spread in the X-Z plane with a maximum close to Z axis implying the activity of the basal <a> glide system. Secondary maxima suggest the operation of the prism <c>, rhomb <a> and the prism <a> slip systems.

In our tentative view, the concurrent presence of the distinctly different CPO patterns in the studied sample can be explained twofold: (1) by the CPO pattern of the pebbles inherited from a previous higher temperature deformation episode or (2) different rheological behavior of matrix and pebbles during the same deformation episode. Matrix grains, which recorded c-axis maxima mainly near Y axis of the finite strain ellipsoid, behaved as a relatively weak rheological phase, whereas those grains forming pebbles, which recorded mainly maxima near the edge of the diagram, acted as a relatively strong rheological phase. In both scenarios the contribution of a grain-size sensitive deformation mechanism such as diffusional creep could lead to a higher effective viscosity of the pebbles with respect to the matrix grains providing the mechanism for the early fabric in the pebbles to escape from obliteration.

Duyster, J. 1996. StereoNett and AVA Generator. University of Bochum.

Heilbronner, R. and Tullis, J. 2006. Evolution of c axis pole figures and grain size during dynamic recrystallization : Results from experimentally sheared quartzite. Journal of Geophysical Research 111, B10202.

Stipp, M., Stuenitz, H., Heilbronner, R. and Schmid, S. M. 2002. The eastern Tonale fault zone; a "natural laboratory" for crystal plastic deformation of quartz over a temperature range from 250 to 700 degrees C. Journal of Structural Geology 24, 1861-1884.

Stoeckhert, B. and Duyster, J. 1999b. Discontinuous grain growth in recrystallised vein quartz; implications for grain boundary structure, grain boundary mobility, crystallographic preferred orientation, and stress history. Journal of Structural Geology 21, 1477-1490.