ELSEVIER

Journal of Structural Geology 30 (2008) 1201

JOURNAL OF STRUCTURAL GEOLOGY

www.elsevier.com/locate/jsg

Photograph of the Month

Blocky boudins between a set of small normal faults in a pegmatite enclosed in marble, Naxos, Greece. Width of image is about 1.5 m. Photograph Janos L. Urai, Aachen, Germany ©Janos L. Urai.

During ductile deformation of marbles under high grade metamorphic conditions on Naxos, Greece, pegmatites enclosed in the marbles were deformed in a brittle fashion forming blocky boudins with quartz veins in the inter-boudin zones. In spectacular marble quarries near Kinidaros the three dimensional geometry of the boudins is exposed. In profile, the boudins can be classified as symmetric torn type boudins, evolving towards asymmetric boudins with a later domino boudin component. In three dimensions, however, the morphology of the boudinaged pegmatite is a simple set of normal faults with mode-I fractures in the fault tips and rotation of the fault blocks to accommodate the extension in the marble. Deformation history is constrained by petrology and microstructures in combination with simple order of magnitude calculations of both the cooling and pore fluid pressure evolution. After the pegmatite intruded the marble and solidified, it was deformed at peak M2b metamorphism ($\sim$670 °C and $\sim$0.6 GPa). Such pegmatitic melts contain $\sim$10% H_2O which is released during crystallization and creates lithostatic pore fluid pressure in the pegmatite due to the very low permeability of the surrounding marble. Initially the pegmatite was deformed at very low effective stress which led to brittle deformation of feldspar and mode-I fracturing of the pegmatite, forming torn type boudins. With time the pore fluid pressure slowly decreased, increasing the effective stress. Ongoing N–S extension thus resulted in slip along the quartz-filled interboudin zones and in block rotation, producing domino boudins.

Janos L. Urai*
Oliver Schenk[1]
Wouter van der Zee[2]
Manuel Blumenthal
Structural Geology, Tectonics and Geomechanics, Geological Institute, RWTH Aachen University, Germany
*Corresponding author.
E-mail address: j.urai@ged.rwth-aachen.de (J.L. Urai)
[1]Present address: IES, Integrated Exploration Systems, Aachen, Germany.
[2]Present address: GeoMechanics International, Houston, USA.

Available online 26 July 2007

0191-8141/$ - see front matter
doi:10.1016/j.jsg.2007.07.010