Freie Universität Berlin

Geowissenschaftliches Kolloquium

Interplay between fracture and flow during shear localisation in the middle and lower crust

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Sheared, crosscutting pseudotachylyte developed under lower crustal, sub-eclogitic conditions from the Musgrave Ranges, Central Australia. Scan by Giorgio Pennacchioni.

It is commonly assumed that there is a distinct "brittle-ductile" or "frictional-viscous" transition in the continental crust due to the increase in temperature and pressure with depth. It is also generally assumed that elongate, approximately planar localized shear zones can develop spontaneously by a feedback mechanism involving weakening due to (e.g.) grain size reduction, fabric development, or thermal runaway. This talk challenges both these assumptions. Largely based on field observations from the Neves area (Tauern Window, Eastern Alps) and the Musgrave Ranges (Central Australia), it is shown that there is an intimate interplay between fracture and flow during deformation of the "ductile" middle to lower crust. These fractures, typically associated with pseudotachylyte in the "dry" lower crust or fluid-rock alteration in the "wet" middle crust, are crucial precursors for many if not most localized ductile shear zones.

Prof. Neil Mancktelow has a B. Sc. (Hons) from James Cook University and a Ph.D. from Adelaide University, Australia. He is Titular Prof. in the Structural Geology and Tectonics Group of the Dept. of Earth Sciences, ETH Zurich. His interests cover a broad spectrum from the regional geology of the Alps to the geometry, kinematics and mechanics of rock deformation structures, using field observation as a basis for analogue and, more recently, numerical modelling.

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