ABSTRACT

Localization of deformation occurs in Earth's crust as a consequence of applied stress and is widespread phenomenon that can be found in crustal rocks. Such localization of deformation can be mostly seen in a form of shear zones. Small shear zones referred as shear bands or S-C structures are often used as kinematic indicators. However, the evolution and kinematic continuity of such structures is not well identified, which makes it problematic when interpreting regional geodynamic evolution. Two possible cases were distinguished and described in this thesis: a) kinematically discontinuous S-C structures formed during two deformation events and b) kinematically continuous S-C structures formed during single deformation event. Kinematically unrelated S-C structures were studied in westernmost part of Tauern Window in Eastern Alps and in Gemer-Vepor Contact Zone in Central West Carpathians where previous geodynamic interpretations might have misinterpreted localization structures. Kinematically continuous shear bands were studied in South Armorican Shear Zone where the S-C fabrics were originally defined and described (Berthé et al., 1979).

Two fabrics that crosscut each other at small angles forming S-C geometries were documented during field work and studied from macroscale down to microscale or nanoscale. Main part of the work focused on microstructural analyses of the respective fabrics and its deformation microstructures, mineral assemblages and mineral chemistry changes, pressure-temperature conditions, age estimates etc.

Kinematically continuous S-C structures formed by several deformation mechanisms, which are connected both to chemical changes in the rock as well as mechanical changes and presence of fluids. The observed relationships show dramatic weakening at brittle-plastic transition in non-steady-state regime. On the other hand presence of kinematically discontinuous S-C structures reveal polyphase evolution documenting burial and extensional exhumation of basement rocks, where the S and C fabrics form subparallel and crosscut each other at different conditions during different deformation events.

This thesis shows that proper distinguishing of kinematically continuous and discontinuous S-C structures/shear bands is fundamental while interpreting consequences for geodynamic evolution and detailed studies give important observations of interplay of deformation mechanisms and rock rheology.