Timing, fabrics and thermal evolution of an exhumed strike-slip fault zone

SHUYUN CAO[1], FRANZ NEUBAUER[2], JUNLAI LIU[3], MANFRED BERNROIDER[2], JOHANN GENSER[2]

[1]State Key Laboratory of Geological Processes and Mineral Resources, Center for Global Tectonics and School of Earth Sciences, China University of Geosciences, Wuhan 430074, China,shuyun.cao@cug.edu.cn

[2]Dept. Geography and Geology, University of Salzburg, Hellbrunnerstr. 34, A-5020 Salzburg, Austria,Franz.Neubauer@sbg.ac.at

[3] State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Beijing 100081, China,jliu@cug.edu.cn

Formation of major strike-slip faults represents one of the

most important dynamic processes significantly affecting the lithosphere system. Orogen-scale exhumed strike-slip faults are often subparallel to mountain ranges. The major strike-slip fault represents the presence of crustal rocks exhumed from great depth. The dominant but contrasting mineralogy results in shear concentration in the rheological weakest layer, which exhibits contrasting patterns of fabrics and thermal conditions during their formation. We tested a combination of methodologies including microstructural and textural investigations, geochronology and geothermometry on deformed rocks from an exhumed strike-slip fault, the Ailao Shan-Red River fault, SE Asia. The initiation of strike-slip faults occurs by rheological weakening along hot-to-cold contacts deep within the crust and mantle lithosphere. Results indicate that the exhumed deep-crustal rocks exhumed since late Oligocene (ca. 28 Ma) to Pliocene (ca. 4 Ma) typically involve dynamic microstructural, textural and thermal evolution processes, which typically record a progressive deformation and syn-kinematic reactions from ductile to semi-ductile and brittle behavior during exhumation. This transformation also resulted in a dramatic strength reduction that promoted strain localization along the strike-slip and transtensional faults. Detailed analysis has revealed the co-existence of microfabrics ranging from high-temperatures (granulite facies conditions) superimposed by low-temperature fabrics (lower greenschist facies conditions). As a result, grain-size reduction associated with alteration by fluids circulating within the strike-slip fault zone at brittle–ductile transition is common.