Geophysical Research Abstracts, Vol. 7, 02348, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02348

Anatomy of a fault zone: the Periadriatic fault

Franz Neubauer, Franz Nemes

Dept. of Geography, Geology and Mineralogy, University of Salzburg, Hellbrunnerstrasse 34, A-5020 Salzburg, Austria (franz.neubauer@sbg.ac.at; ++43-662-8044-621)

Detailed studies of entirely exposed, major fault zones seem to rare. Therefore, the distribution of fault rocks and damage zones according to existing fault zone models (e. g., Caine et al., 1996) are rare. The ca. E/ESE-trending Periadriatic fault is a crustal-scale strike-slip fault in Eastern Alps separating Austroalpine and Southalpine tectonic units. Based on marker offsets, a dextral strike-slip displacement of ca. 350–400 km and a variable top south reverse offset have been inferred.

The entirely exposed Archerlabach brook and adjacent section across the Periadriatic fault (Austria), the eastern segment of the Periadriatic Fault, reveals a wide range of fault rocks that have been formed within different crustal levels. Ductile rocks including mylonites and cataclasites, that are mostly derived from Oligocene tonalites, and deformed Gröden sandstone dominate northern sectors of the fault zone. These rocks occur within shear lenses that are surrounded by fault gouge of variable origin. A subvertical to steeply N-dipping foliation within mylonites, subhorizontal, respectively gently east-dipping stretching lineation, and some questionable shear sense indicators suggest formation of mylonites within a predominant pure shear regime in deeper crustal levels. The coaxial component of ductile deformation argues for accommodation of crustal shortening within a stretching fault.

Ductile fabrics were overprinted by brittle structures including major proportions of fault gouges by mineral reactions that produced clay minerals. Strain concentration within fault gouges produced an anastomosing pattern of the fault zone, which includes previously formed mylonites/cataclasites within shear lenses. Although low cohesion, the fault gouges include many structures that are similar to ductile fabrics within mylonites. These structures include: S-C fabrics, shear bands, rigid clasts with strain shadows. Fibre-bearing striae dominate within shear lenses. The brittle fabrics indicate, beside a subordinate strike-slip component, mainly a top to the S reverse faulting. This stage is interpreted to contribute to exhumation of previously formed mylonites/cataclasites.

The following units from (1) to (6) are separated by variably thick fault gouge layers, too. These units represent therefore boudins within fault gouge/cacirite. From N to the S the Archerlabach section includes the following major units: (1) *Gailtal Metamorphic Complex*: Garnet bearing, more or less undeformed micaschists and gneisses of the Gailtal Metamorphic Complex mark the northern edge of the Gailtal - (Periadriatic) Fault zone. The micaschists are well recrystallised under peak metamorphic conditions and include only a few features of retrogression, like chloritisation along scarce fault planes. The subvertical foliation trends E. This mylonite is characterised by plastic deformation of minerals showing evidence of internal grain rotation and secondary grain size reduction. The contact to the adjacent Gröden Fm. is marked by ultramylonitic micaschists and partially developed fault gouges. (2) *Fault gouge*: A 40 m thick package of fault gouge indicating plastic deformation under semi-ductile and brittle conditions is one of the main features in the cross-section. The fault gouges show no matrix components and are massively sheared. Such fault gouges can be traced over a length of more than 250 m through the cross-section as interbedded components in chlorite schists. The range of cataclastically deformed rocks varies from fault gouges to cacirites. (3) *Gröden Formation*: Sandstones of the Gröden Fm. and chlorite schists are folded in large isoclinal folds with fold axes oriented parallel to the strike of the Periadriatic Lineament. Sandstones display an internal foliation subparallel to bedding that is later folded. (4) *Chlorite schists*: Chlorite schists and black phyllites are interbedded between cataclastic tonalites and ductilely deformed fault gouges. These chlorite schists mainly consist of chlorite and quartz and most likely of some talc, and include sometimes boudins of less foliated rocks, mainly cataclasites. The foliation is mm-spaced. (5) *Tonalite*: The Tonalite suite dips to the S, and is partly overthrusted by black slates (Palaeozoic units of Carnic Alps). The tonalites have an preferred orientation and planar subvertical anisotropies. (6) *Black slate*: The black slates from the Paleozoic units of the Carnic Alps show steep foliation and large isoclinal folds with axes parallel to the strike of the fault zone arguing for overall pure shear N-S shortening.

The cataclastic deformation of a wide variety of fault rocks caused by hydrolytic weakening is the most remarkable feature of the Archerla brook cross section. These structures mainly indicate transpressive N-S directed shortening along the Gailtal Fault with high strain. Ductilely deformed rocks including mylonites and cataclasites, that are derived from Oligocene tonalites, and deformed Gröden sandstone dominate northern sectors of the fault zone. These rocks occur within shear lenses that are surrounded by fault gouge of variable origin. A subvertical foliation within mylonites, subhorizontal, respectively gently east-dipping stretching lineation, and some questionable shear sense indicators suggest formation of mylonites within a strike-slip shear zone regime in deeper crustal levels. Furthermore, a major coaxial component of ductile deformation argues for accommodation of crustal shortening within a stretching fault as proposed by experiments of Means (1990).

References

Caine, J. S., Evans, J. P., Forster, C.B., 1996. Fault zone architecture and permeability structure. Geology, 24, 1025–1028.

Means, W. D. (1990): One-dimensional kinematics of stretching faults. J.Struct.Geol., 12, 267–272.