Geophysical Research Abstracts,
Vol. 11, EGU2009-8493, 2009
EGU General Assembly 2009

Fault zone architecture of a major oblique-slip fault in the Rawil depression, Western Helvetic nappes, Switzerland

D. Gasser (1) and N.S. Mancktelow (2)

(1) Department of Earth Science, University of Graz, Universitätsplatz 2, A-8010 Graz, Austria (deta.gasser@uni-graz.at), (2) Geological Institute, ETH Zürich, CH-8092 Zürich, Switzerland (neil.mancktelow@erdw.ethz.ch)

The Helvetic nappes in the Swiss Alps form a classic fold-and-thrust belt related to overall NNW-directed transport. In western Switzerland, the plunge of nappe fold axes and the regional distribution of units define a broad depression, the Rawil depression, between the culminations of Aiguilles Rouge massif to the SW and Aar massif to the NE. A compilation of data from the literature establishes that, in addition to thrusts related to nappe stacking, the Rawil depression is cross-cut by four sets of brittle faults: (1) SW-NE striking normal faults that strike parallel to the regional fold axis trend, (2) NW-SE striking normal faults and joints that strike perpendicular to the regional fold axis trend, and (3) WNW-ESE striking normal plus dextral oblique-slip faults as well as (4) WSW-ENE striking normal plus dextral oblique-slip faults that both strike oblique to the regional fold axis trend. We studied in detail a beautifully exposed fault from set 3, the Rezli fault zone (RFZ) in the central Wildhorn nappe.

The RFZ is a shallow to moderately-dipping (ca. 30-60˚) fault zone with an oblique-slip displacement vector, combining both dextral and normal components. It must have formed in approximately this orientation, because the local orientation of fold axes corresponds to the regional one, as does the generally vertical orientation of extensional joints and veins associated with the regional fault set 2. The fault zone crosscuts four different lithologies: limestone, intercalated marl and limestone, marl and sandstone, and it has a maximum horizontal dextral offset component of $\tilde{3}00$ m and a maximum vertical normal offset component of $\tilde{2}00$ m. Its internal architecture strongly depends on the lithology in which it developed. In the limestone, it consists of veins, stylolites, cataclasites and cemented gouge, in the intercalated marls and limestones of anastomosing shear zones, brittle fractures, veins and folds, in the marls of anastomosing shear zones, pressure solution seams and veins and in the sandstones of coarse breccia and veins. Later, straight, sharp fault planes cross-cut all these features. In all lithologies, common veins and calcite-cemented fault rocks indicate the strong involvement of fluids during faulting.

Today, the southern Rawil depression and the Rhone Valley belong to one of the seismically most active regions in Switzerland. Seismogenic faults interpreted from earthquake focal mechanisms strike ENE-WSW to WNW-ESE, with dominant dextral strike-slip and minor normal components and epicentres at depths of < 15 km. All three Neogene fault sets (2-4) could have been active under the current stress field inferred from the current seismicity. This implies that the same mechanisms that formed these fault zones in the past may still persist at depth. The Rezli fault zone allows the detailed study of a fossil fault zone that can act as a model for processes still occurring at deeper levels in this seismically active region.