A ductile shear zone terminating a brittle strike-slip fault: The gypsum-dominated Paluzza-Comeglians shear zone as western extension of the Fella-Save fault, Southern Alps

Bartel, E.M. & Neubauer, F.

Dept. Geography and Geology, University of Salzburg, Hellbrunnerstr. 34, A-5020 Salzburg, Austria (Esther.Bartel@sbg.ac.at; Franz.Neubauer@sbg.ac.at)

Compressive and extensive horsetails are common structures on the lateral termination of brittle strike-slip faults, which forms within the shallow continental crust. Here we report another possibility, the lateral termination of a brittle strike-slip fault in a formation-parallel low-temperature ductile shear zone within sulphatic, gypsum-dominated evaporites. In the Southern Alps, over a distance of ca. 35 km, a steeply to gently S-dipping foliation, a subhorizontal stretching lineation and pure shear-dominated porphyroclast systems developed within the S-dipping Lower Bellerophon Formation of uppermost Permian age. Subordinate σ-clasts indicate dextral shear. The main-stage foliation is often overprinted by shear band structures, which also consistently indicate dextral shear along the shear zone. Open to tight faults form at several stages during shear zone development, and mainly refold the mylonitic foliation. Open folds are sometimes associated with reverse faults indicating final N-S shortening. Together, the structures within the Paluzza-Comeglians shear zone indicate transpression, which accommodated dextral displacement of the Fella-Save fault in the east.

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Analyzing hydrogeological properties of fault rocks and fracture networks in fault zones in carbonate rocks

Bauer, H., Schroeckenfuchs, T. & Decker, K.

Department for Geodynamics and Sedimentology, University of Vienna, A-1090 Vienna, Austria (helene.bauer@univie.ac.at; theresa-christina.schroeckenfuchs@univie.ac.at; kurt.decker@univie.ac.at)

Around 60 % of the drinking water for Austria's capital Vienna comes from springs at the N and NE of the Hochschwab Massif. Hydrogeological flow properties in the Hochschwab Massif are essentially governed by karstified fault zones. We investigated sinistral strike-slip fault zones exposed in the Upper Triassic Wetterstein Fm., which formed at shallow crustal depth during the process of eastward lateral extrusion of the Eastern Alps in the Oligocene and Lower Miocene.

In detailed structural field-work we analyzed fault zone anatomy and distinguished zones of certain hydrogeological properties within the fault core and the damage zone. Fault rock classification, fracture network analysis and estimates over their spatial distribution in outcrop studies were supplemented by porosity and permeability measurements from representative samples. Additionally, thin-sections have been investigated with optical microscopy, cathodoluminescence and electron microscopy using backscattered electron imaging and focused ion-beam techniques.

The results show that by trend fault zones in dolomite lack a distinct, single fault core and masterfault but show multiple branching, minor fault cores that interlock in the 3D geometry of the outcrop. Fault zone formation in dolomite is accompanied and influenced largely by fluid interaction producing large volumes of cemented fault rock. In contrast fault zones in limestone have a definite fault core characterized by a distinct masterfault and delimited cataclastic fault rock associated. There is no evidence for spacious cementation processes.