



## **Brittle fault analysis from the immediate southern side of the Insubric fault**

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The Insubric segment of the Periadriatic fault is characterised in its central part between Lago Maggiore and Valle d'Ossola by two greenschist-facies mylonitic belts which together are about 1 km thick. The northern, external belt has a north-side-up kinematics generally with a minor dextral component and the southern internal belt is dextral, locally with a considerable south-side-up component. Overprinting relations locally show that the internal belt is younger than the external one (e.g. Schmid et al., 1987). The absolute age of dextral shearing is probably given by K-Ar white mica ages ranging mostly between from c. 27 to 23 Ma (Zingg and Hunziker, 1990).

We analysed fault-slip data from various locations in the Southern Alps immediately south of the Insubric Fault. From the results, two different patterns of orientations of contraction (P-axes) and extension (T-axes) axes can be distinguished. One group (group 1) of analyses is compatible with dextral transpression (i.e. both P- and T-axes are subhorizontal) and the other (group 2) with roughly orogen-perpendicular extension (i.e. subvertical P-axes and subhorizontal T-axes).

The orientations of subhorizontal axes (P- and T-axes in group 1, T-axes in group 2) show a tendency to follow the curved shape of the Insubric fault, i.e. P-axes of group 1 and T-axes of group 2 change from NNW-SSE in the east where the Insubric fault trends east-west to WNW-ESE in the west where the Insubric fault trends northeast-southwest. We speculate that group 1 formed at the same time as dextral shearing on in the internal mylonite belt while none of our fault analyses reflects the north-side-up reverse faulting that is observed in the external mylonite belt. The northwest-southeast extension documented in the analyses of group 2 is not associated with a continuous mylonitic belt or brittle fault plane along the Insubric fault. Instead, an uplift of the Southern Alps with respect to the northern block was accommodated by numerous small-scale brittle faults. This uplift probably began at c. 23 Ma, which is the K-Ar age obtained from a fault gouge (Zwingmann and Mancktelow, 2004) from a south-side-up fault in Valle Morobbia included in our fault-slip analysis from this area. It may have lasted until c. 17 Ma (40Ar/39Ar dating of a pseudotachylyte from a south-side-up fault by Müller et al., 2001) and our analyses suggest that it occurred along the entire Insubric fault. The absence of fault-slip analysis results documenting orogen-parallel stretch south of the Insubric fault is in line with interpretations that the Insubric fault is a stretching fault, because orogen-parallel stretching did occur in the northern block (e.g. Ciancaleoni and Marquer, 2006).

### References:

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