

The Insubric fault zone in the Canavese and Val d'Ossola areas

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The Palaeogene to Miocene Insubric fault zone (IFZ) is divided along its southwesternmost part into two individual faults (external and internal Canavese fault, ECF and ICF) framing the Canavese zone. The ICF is brittle or at the brittle-ductile transition, and the observed structures in the rocks deformed at the brittle-ductile transition indicate mostly dextral shearing (in map view) with a NW-side-down component. Along the ECF between Cuorgnè and Ivrea, only rock types that can be deformed ductilely under relatively low temperatures (e.g. serpentinite, calcschist and quartz- and/or mica-rich metasediments) are mylonitised. These mylonites generally show a W-side-up displacement sense with only a small horizontal component whereas in the cataclasites the horizontal displacement (with partly dextral and partly sinistral sense) usually exceeds the vertical component. Toward the north, the IFZ cuts through progressively deeper levels of the crust. Mylonites with small plunging angles of the stretching lineation cropping out along the ECF north of Ivrea are probably the lateral equivalents of the cataclasites found further south.

North of the Serra d'Ivrea, the ECF and ICF merge into a single fault zone as the Canavese zone wedges out. The boundary of the Sesia zone toward the Southern Alps is in most places overlain by andesitic volcanic rocks. The Miagliano and Biella plutons in the Ivrea and Sesia zones, respectively, are commonly regarded as the plutonic equivalents of the andesites. While the uplift of the Biella pluton with respect to the andesites was accommodated mostly by clockwise rotation (looking north) of the Sesia zone around an axis (sub)parallel to the IFZ (e.g. Lanza 1977), the lowering of the andesites with respect to the Miagliano pluton was achieved by NW-side-down faulting along the IFZ. These displacements must have taken place after the Early Oligocene magmatism.

N-side-down faulting can also be observed in mylonites from the most internal part of the IFZ in Val d'Ossola and Val Strona. Mylonites with N-side-up shear sense are overprinted by mylonites with dextral shear sense in Val d'Ossola and further east (see also Schmid et al. 1987). These observations, when integrated with those from Valle Sessera to the south, have led to the following preliminary hypothesis:

The formation of N-side-down mylonites in Val d'Ossola and further west was kinematically linked with the NW-side-down faulting between the Sesia zone (andesites) and Ivrea zone (Miagliano pluton) mentioned above. Further south, the same NW-side-down displacements were accommodated by the ICF. Likewise, the formation of N-side-up mylonites occurring in Val d'Ossola and further east and the formation of dextral mylonites in the same segment of the IFZ is kinematically equivalent to the W-side-up mylonites overprinted by cataclasites with subhorizontal displacement direction along the ECF. The fact that both sinistral and dextral shear senses are observed in the cataclasites of the ECF while the mylonites in Val d'Ossola and further east are always dextral may be explained by the accumulation of horizontal displacement from southwest (where it is probably very small) to the northeast.

References:

- Lanza, R. 1977. Palaeomagnetic data from the andesitic and lamprophyric dikes of the Sesia-Lanzo Zone (Western Alps). *Schweiz. Mineral. Petrogr. Mitt.* 57, 281-290.
- Schmid S. M., Zingg, A. & Handy, M. 1987. The kinematics of movements along the Insubric Line and the emplacement of the Ivrea Zone. *Tectonophysics*, 135, 47-66.