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Dextral displacement along the Canavese Fault (western segment of the Insubric Fault, Swiss-Italian Alps)

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The Insubric Fault is the most important fault of the Alps with a dextral displacement usually assumed to exceed 100 km. Even 240 km of dextral displacement have recently been postulated by Handy et al. (2010). The displacement is commonly attributed to combined westward motion and counterclockwise rotation of the Adriatic microcontinent with respect to Europe after ca. 35 Ma.
The western segment of the Insubric Fault, the Canavese Fault, comprises several mostly greenschist-facies mylonitic belts which display structural evidence for different episodes of normal, reverse, and dextral faulting between the Southern and the Penninic Alps. Three dextral mylonitic belts can be distinguished. (1) An amphibolite-facies belt of dextral mylonites affects parts of the Alpine Southern Steep Belt and parallels the Canavese Fault to the north. There, dextral shearing probably took place between ca. 29 and 26 Ma and is therefore also usually referred to as Insubric deformation. The structural record within this shear zone indicates that it initiated as a normal fault. (2) The well-described dextral mylonite belt between Lago Maggiore and Valle d'Ossola (Schmid et al. 1987, 1989) can be traced to the west only until Valle Strona, i.e. ca. 10 km southwest of Valle d'Ossola where it looses thickness and finally ends in a brittle structure with an offset of only few tens of metres. This belt probably developed between ca. 26 and 19 Ma. (3) A probably older (pre-Oligocene) dextral mylonite belt extends from Valle Mastallone to Valle Sessera.
Since none of these three dextral belts extends along the entire Canavese Fault, it is impossible that the observed structures account for the above-mentioned dextral displacement of 100 km or more. Such a large displacement amount is only possible if part of the displacement was transferred into the Penninic nappe stack along splays branching off from the Canavese Fault. Several such splays were proposed by Handy et al. (2005), connecting the Canavese Fault e.g. with the Simplon Fault and a top-to-the-southwest shear zone at the boundary between the Monte Rosa and Zermatt-Saas Nappes. Preliminary structural observations from the possible locations of such splays indicate that their effect was probably moderate. Therefore, we conclude that the total dextral displacement accommodated by Insubric deformation was probably only a few tens of kilometres.

References

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