

The Frontal Pennine Fault on the northern side of the Aosta Valley

Paolo Piazza, Marco G. Malusà & Giovanni Vezzoli

University of Milano-Bicocca, P.za della Scienza 4, Milan (Italy) (marco.malusà@unimib.it)

A field geology study on 1:10,000 scale was carried out across the Frontal Pennine Fault on the northern side of the Aosta Valley (Ferret and Sapin valleys), in order to characterize the surface expression of this orogen-scale structure and unravel its kinematic evolution in the study area. Preliminary fission-track data integrate the structural data set collected in the field, and constrain the exhumation path of major fault blocks at shallow crustal levels.

Along the Aosta Valley transect, the Frontal Pennine Fault separates rocks classically ascribed to the Ultrahelvetic and Penninic paleogeographic domains. Within the Ultrahelvetic domain, an anchimetamorphic Mesozoic cover sequence, cut by near-vertical NE-SW faults, is juxtaposed against the low-grade Mont de la Saxe continental margin unit, which consists of metagranitoids, metarhyolites and foliated metacarbonate cover rocks. This latter unit is overthrust onto Ultrahelvetic mylonitic carbonate rocks along a SE-dipping low-angle fault.

Within the Penninic domain, the continental margin Sion-Courmayeur unit consists of low-grade marbles and foliated metacarbonate rocks with minor carbonate breccias, schists and quartzites. These rocks are piled up along SE-dipping low-angle shear planes marked by evaporitic rocks and carbonate tectonic breccias.

Two major deformation events were recognized in the study area. NW-SE shortening (D1), consistent with the observed stacking of the Sion-Courmayeur unit onto the Mont de la Saxe unit, preceded the NE-SW dextral transcurrence (D2) which led to the development of near-vertical faults cutting across the Ultrahelvetic and Sion-Courmayeur units. Such right-lateral transcurrence is best expressed by the near-vertical faults that separate the Mont Blanc massif from the Ultrahelvetic units exposed on the SE side of the Ferret and Veny valleys.

Apatite fission-track data point to negligible differential exhumation at shallow crustal level between fault-blocks consisting of Ultrahelvetic and Penninic rocks of the Sion-Courmayeur unit. Major throws were probably accommodated during deformation phase D1, when rocks now exposed at surface resided at depth greater than the partial annealing zone of apatite (3-4 km).

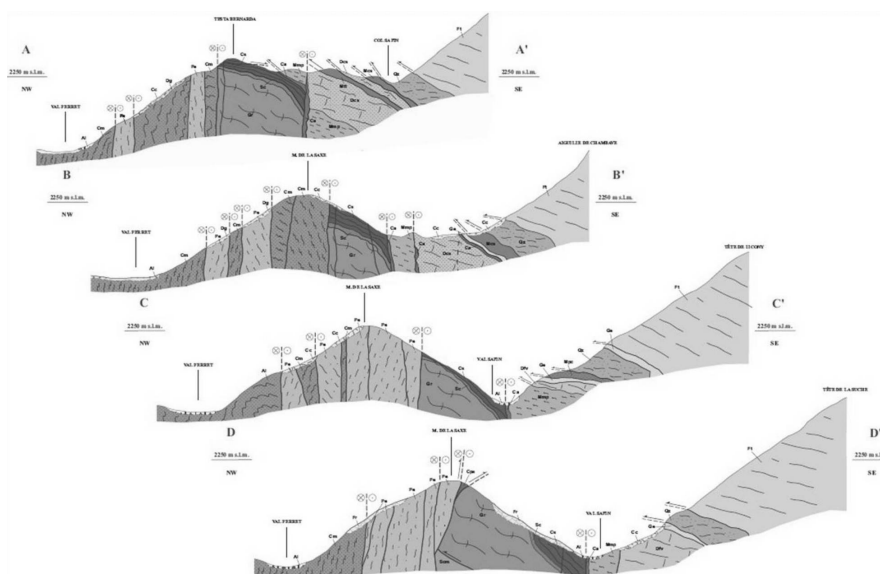


Figure 1: NW-SE transects across the Frontal Pennine Fault north of Courmayeur