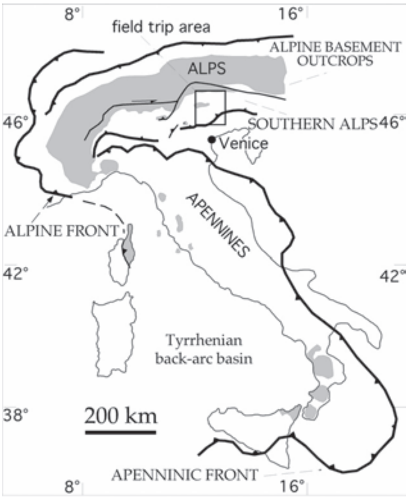
Dolomites field-trip

The field trip is organized into five days with different main topics, such as the structure of the Southern Alps fold and thrust belt, the Triassic tectonics, the geometry of carbonate platforms and their control in the thrust tectonics, the relationship between the Tethyan rift and the Alpine tectonics. The program has to be considered flexible since weather condition can determine variations on the stop progression.



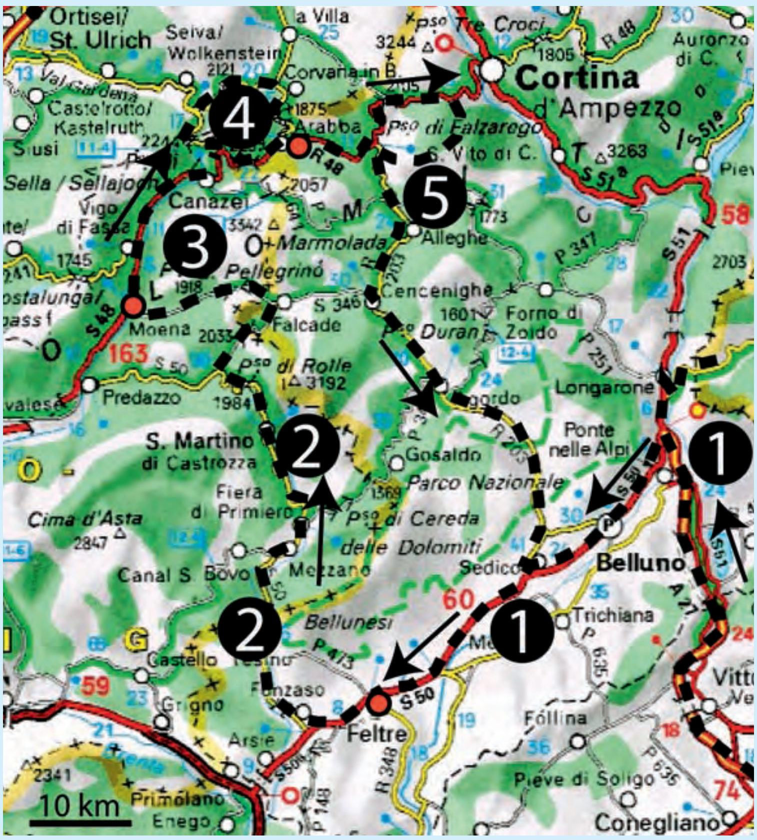


Fig. 269 - Location area of the field trip. Numbers indicate the days of the excursion.

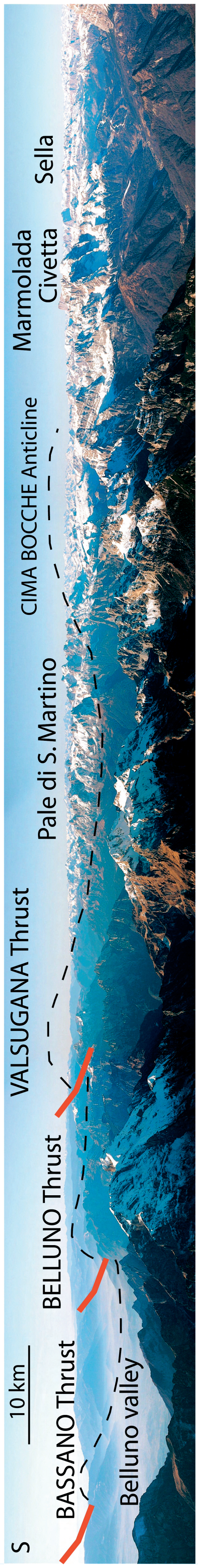


Fig. 270 - View of the Southern Alps thrust belt from the Venetian foothills (left) to the Dolomites (right). Note the gradual increase in structural elevation and topography from the Venetian foothills moving northward.

1st Day

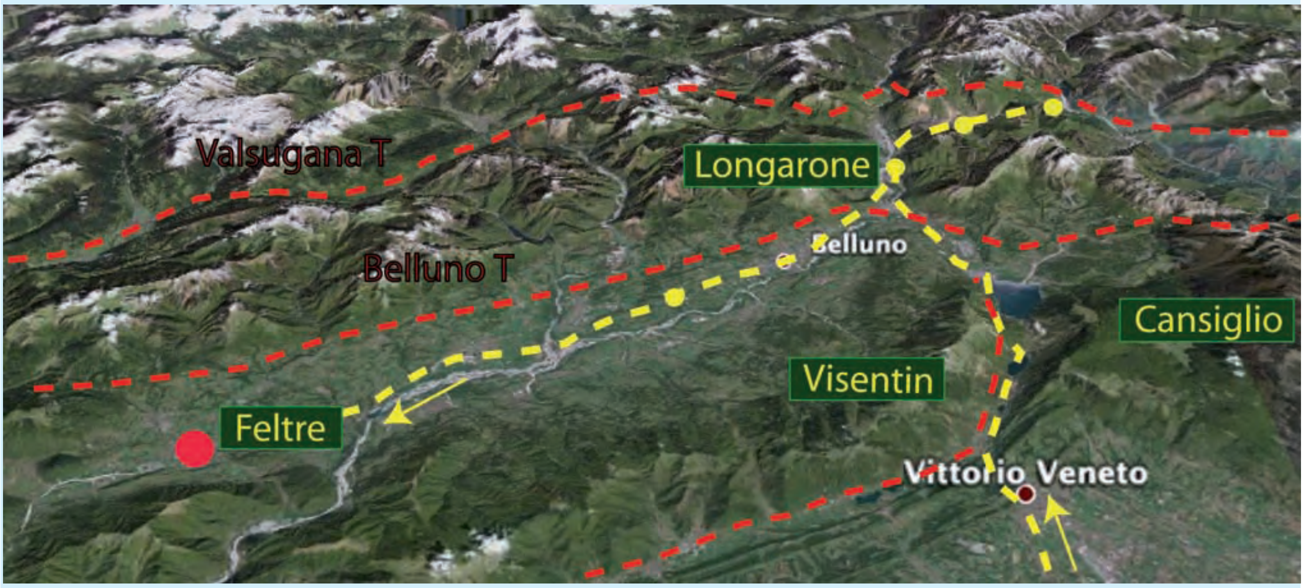
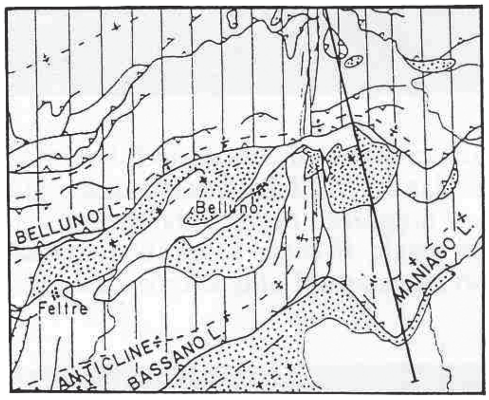


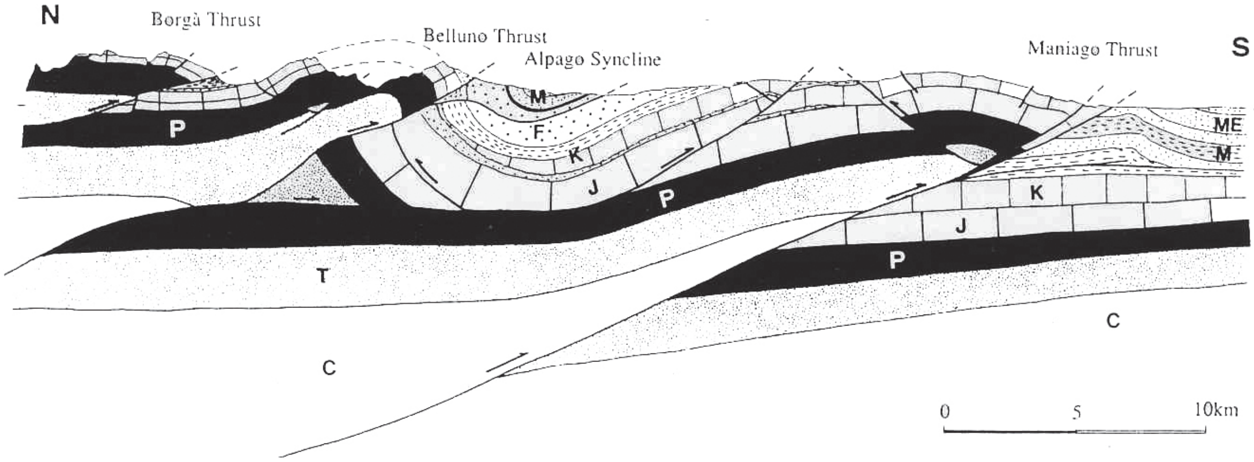
Fig. 1.0 - Itinerary: Longarone, Prealpi Bellunesi, Feltre. Google Earth view. Dashed red lines are the main thrusts of the area.

Subject: Mesozoic extensional structures and their alpine inversion

Mesozoic extensional structures have been often interpreted and described in literature on the basis of sudden variations of thickness and, eventually, of facies of the sedimentary cover. Seismic reflection studies confirmed such geometries and allowed the observation of typical morphologies of extensional structures. In the zone of Longarone, some tensional Mesozoic structures can be studied in outcrops that, quite peculiarly, allow a 3D view of such structures. They are west-dipping faults that developed at the western margin of the Friuli Platform. Being located in the Southern Alps fold-and-thrust belt, often such structures were re-sheared, particularly those oriented N-S and dipping to the west.
This attitude made them particularly suitable to alpine inversion as sinistral transpressional faults (the regional sense of transport of thrust bodies is towards SSE), much more than east dipping faults.

Fig. 1.1 - Cross-section through the eastern Venetian Alps. The Belluno Thrust emplaced at the margin between the Belluno Basin sequence (in the hangingwall) and the Friuli Platform sequence (in the footwall). Legend: C, undifferentiated crystalline basement; T, Late Permian and Early-Middle Triassic formations; P, Late Triassic Dolomia Principale; J, undifferentiated Jurassic: platform facies (Calcari Grigi) in the southern part of the section, gradually passing northward to basinal facies (Soverzene Formation, Igne Formation, Vajont Limestone, Fonzaso Formation, Ammonitico Rosso); K, Cretaceous, platform facies (Calcare del Monte Cavallo, brick pattern) gradually passing northward to slope deposits and basinal facies (Calcare di Soccher, Biancone); S, Scaglia Rossa, Late Cretaceous - Paleocene; F, Eocene Flysch; M, Late Oligocene - Early-Middle Miocene Molasse; ME, Messinian conglomerates.





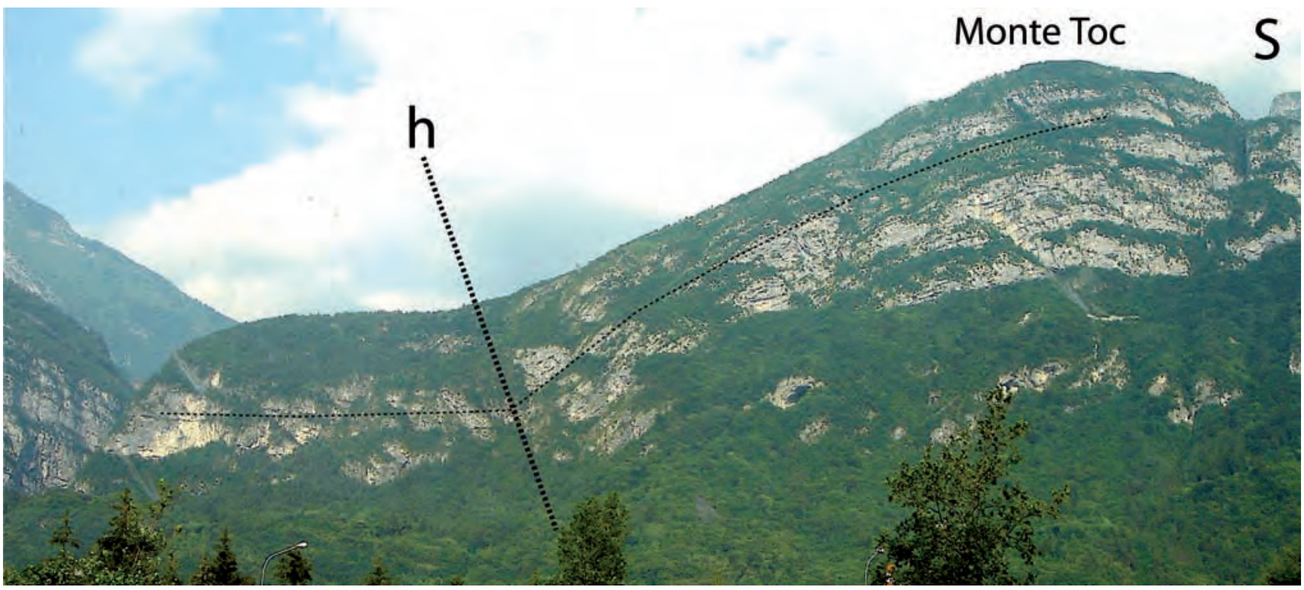


Fig. 1.2 - Eastern flank of the Piave Valley, near Longarone. The fold hinge (h) observable in the Calcare del Vajont (Dogger) belongs to the northern flank of the anticline developed in the hangingwall of the Belluno Thrust. It should correspond at depth to a transition from horizontal detachment to ramp of the thrust fault. The flank dipping to the north was the movement plane of the Vajont landslide, detached along the underlying Fonzaso Fm.

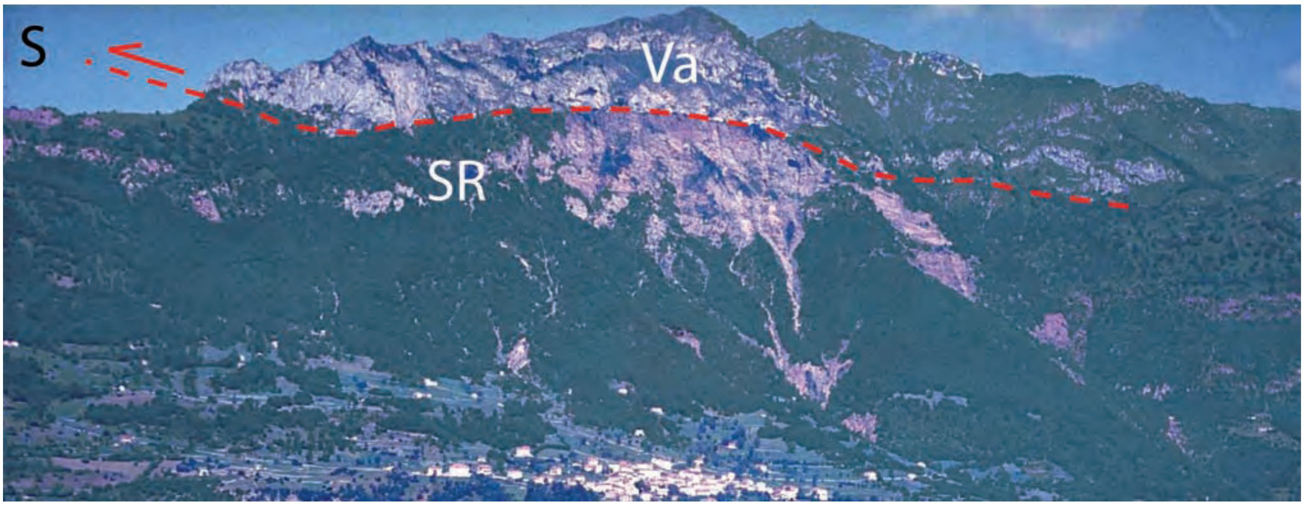


Fig. 1.3 - Western flank of the Piave Valley, above Longarone. Whitish Jurassic limestones (mostly Calcare del Vajont, Va) were thrust over the Scaglia Rossa (SR) along a sharp decollement plane. The thrust is a splay of the Valsugana Line. To the left, the thrust fault cuts downsection the Scaglia Rossa sediments, or it is folded by the deeper thrusts.

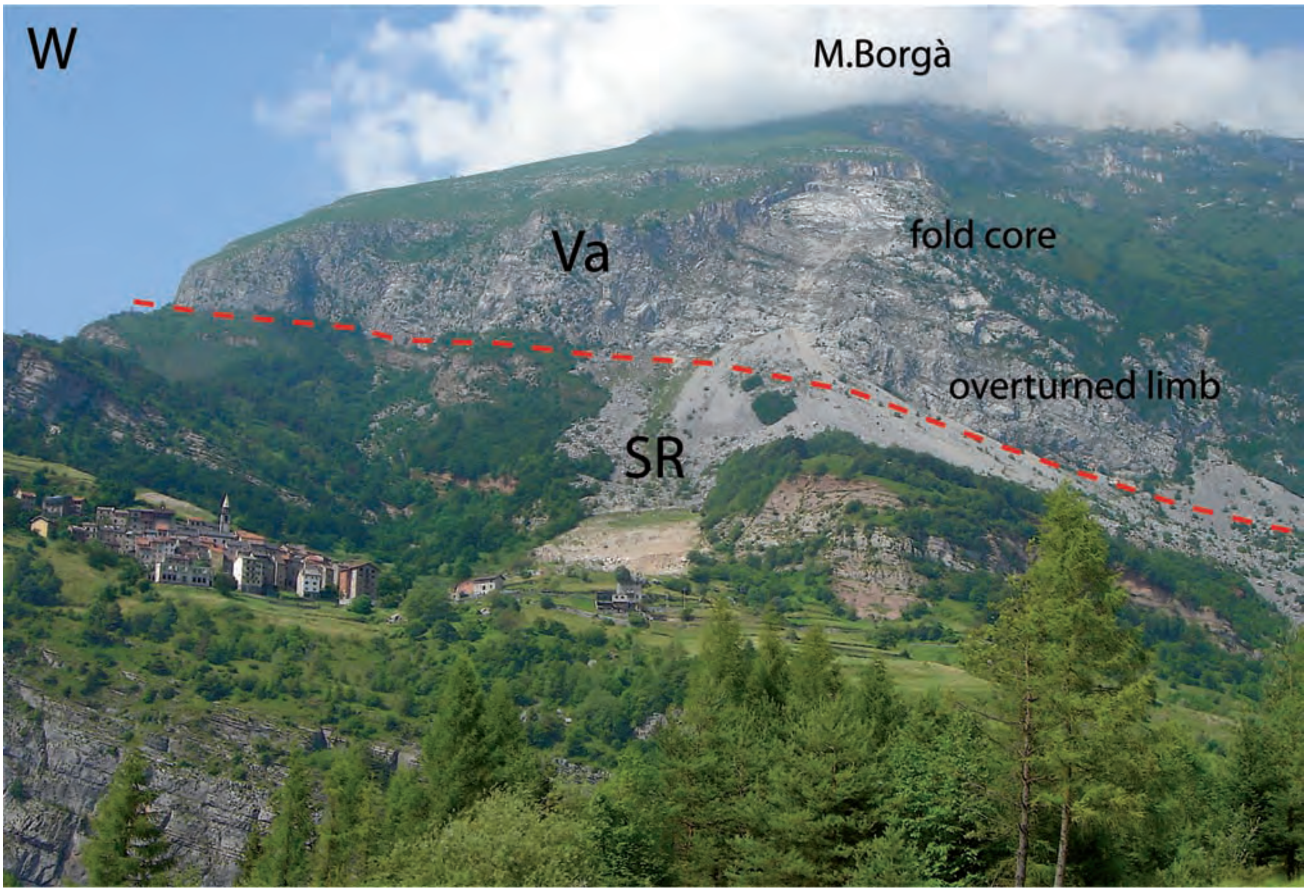


Fig. 1.4 - The eastward prolongation of a Valsugana Thrust splay outcropping in the southern cliff of the Mt. Borgà. The thrust is verging toward the observer and shows a lateral ramp geometry dipping to the east. In the hangingwall the overturned forelimb indicates fault-propagation fold kinematics. Va, Dogger Vajont Limestone; SR, Upper Cretaceous-Lower Tertiary Scaglia Rossa.

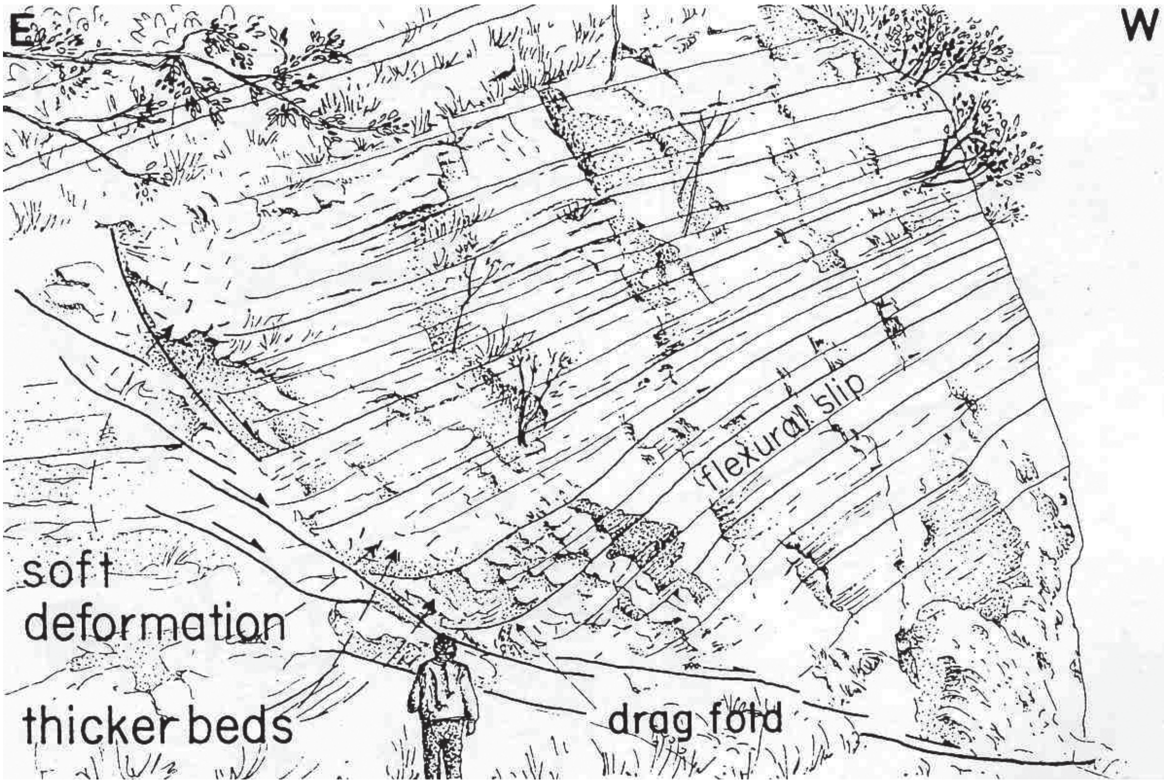


Fig. 1.5 - Natural cross-section of a small but significative synsedimentary Liassic fault in the Igne Fm, observable in the Vajont canjon, along the old ENEL road. In this outcrop it is possible to observe a rare example of listric fault in three dimensions. Notice the en-echelon distribution of synthetic faults along the main shear zone, the deformation of unconsolidated sediments and the thickening of strata in the vicinity of the fault. At the top, the structure is sutured by undeformed strata.

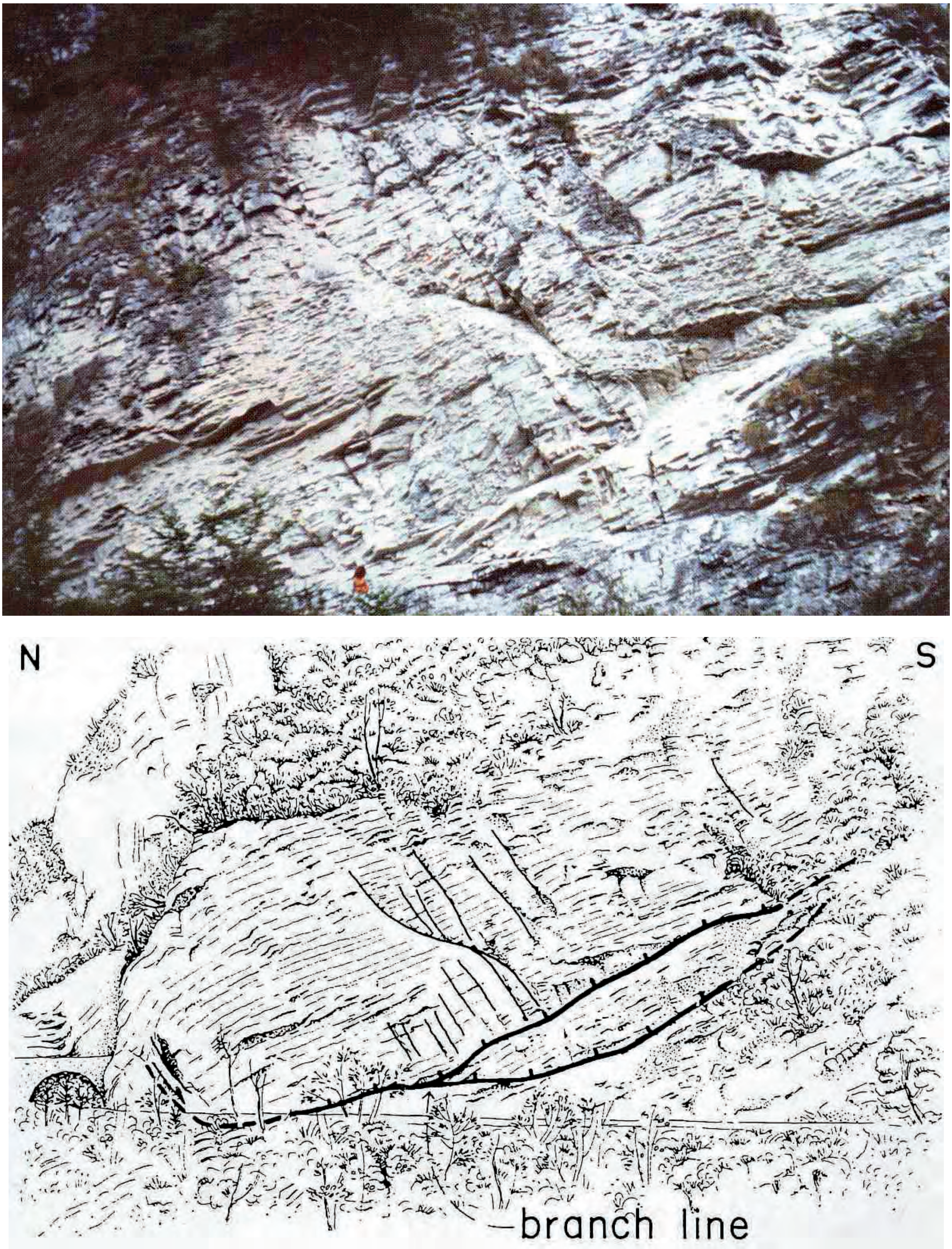


Fig. 1.6 - Frontal view of the Liassic growth fault in the basinal deposits of the Igne formation, in the Vajont canjon. Notice the ramification of the fault plane and the lateral and oblique ramp geometry of the fault. Extensional slickenfibers confirm that the hangingwall moved downward with respect to the footwall. Small conjugate fractures are confined to the hangingwall of the fault plane.

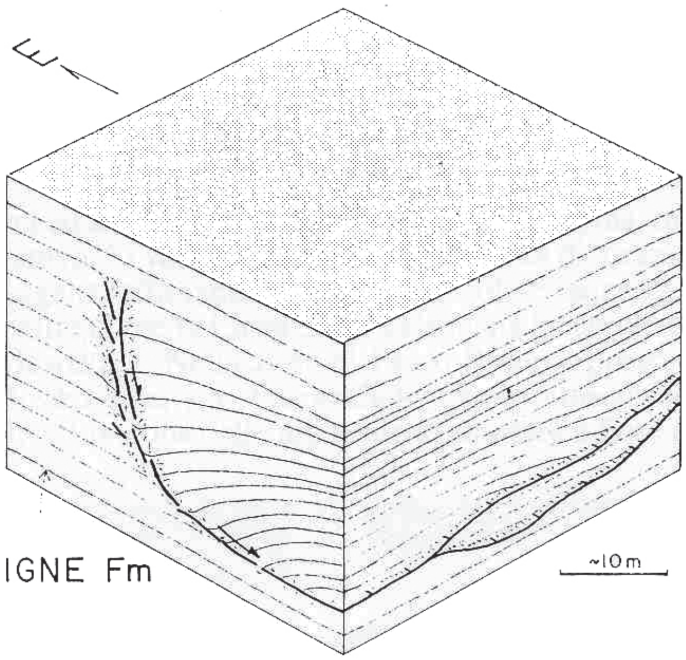


Fig. 1.7 - Schematic three-dimensional view of the extensional fault of the previous figures. A major regional extensional structure can be envisaged in the Col delle Tosatte Line, probably an extensional Mesozoic fault dipping to the west, reactivated as a sinistral transpressive fault during the Neogene Southalpine compressional deformation.

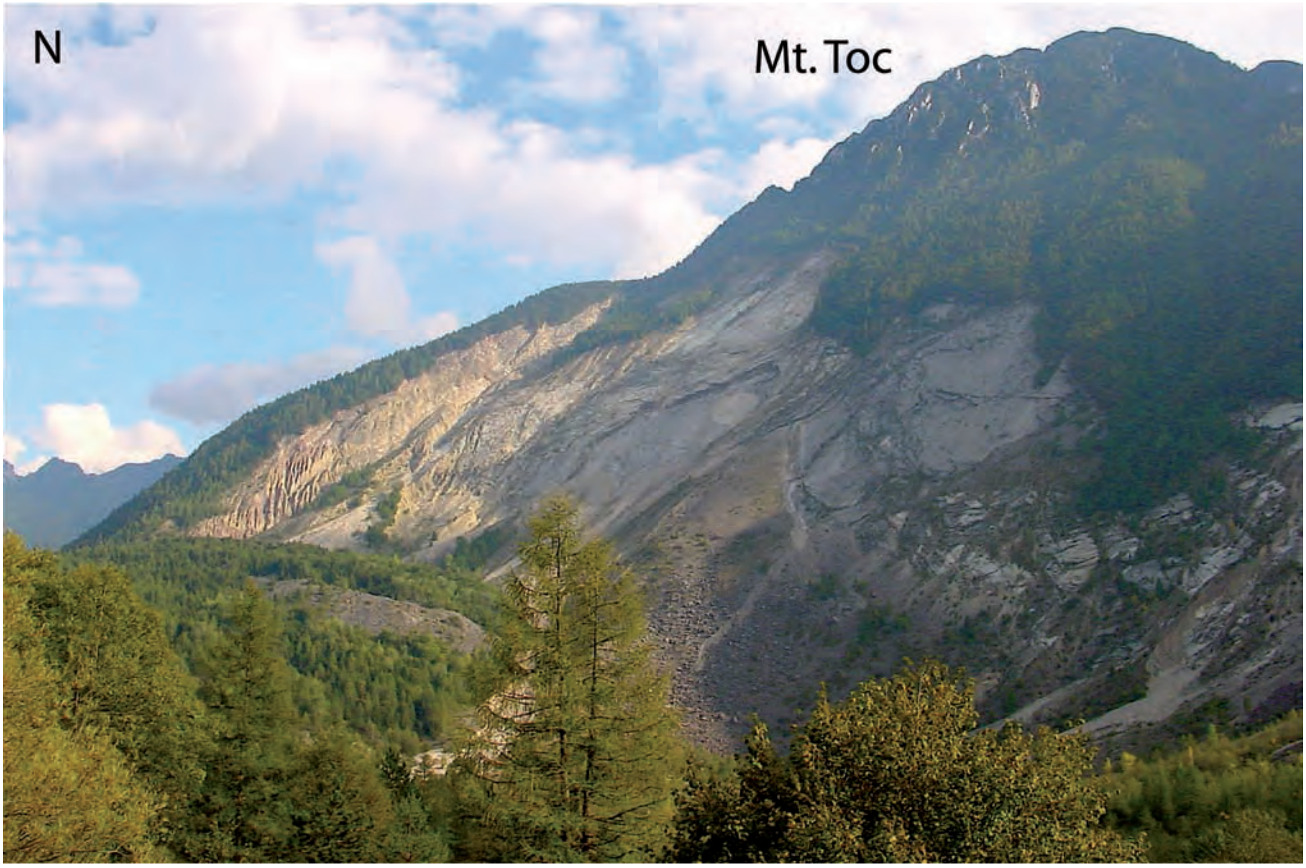


Fig. 1.8 - The landslide from Mt. Toc that generated the Vajont tragedy of the 9th October 1963, in which the water of the underlying artificial lake was squeezed out and devastated the city of Longarone with 1910 casualties. The decoupling surface is the basinal Middle Jurassic Fonzaso Fm, and the dip of the beds is due to the deeper S-verging ramp of the Belluno Thrust.

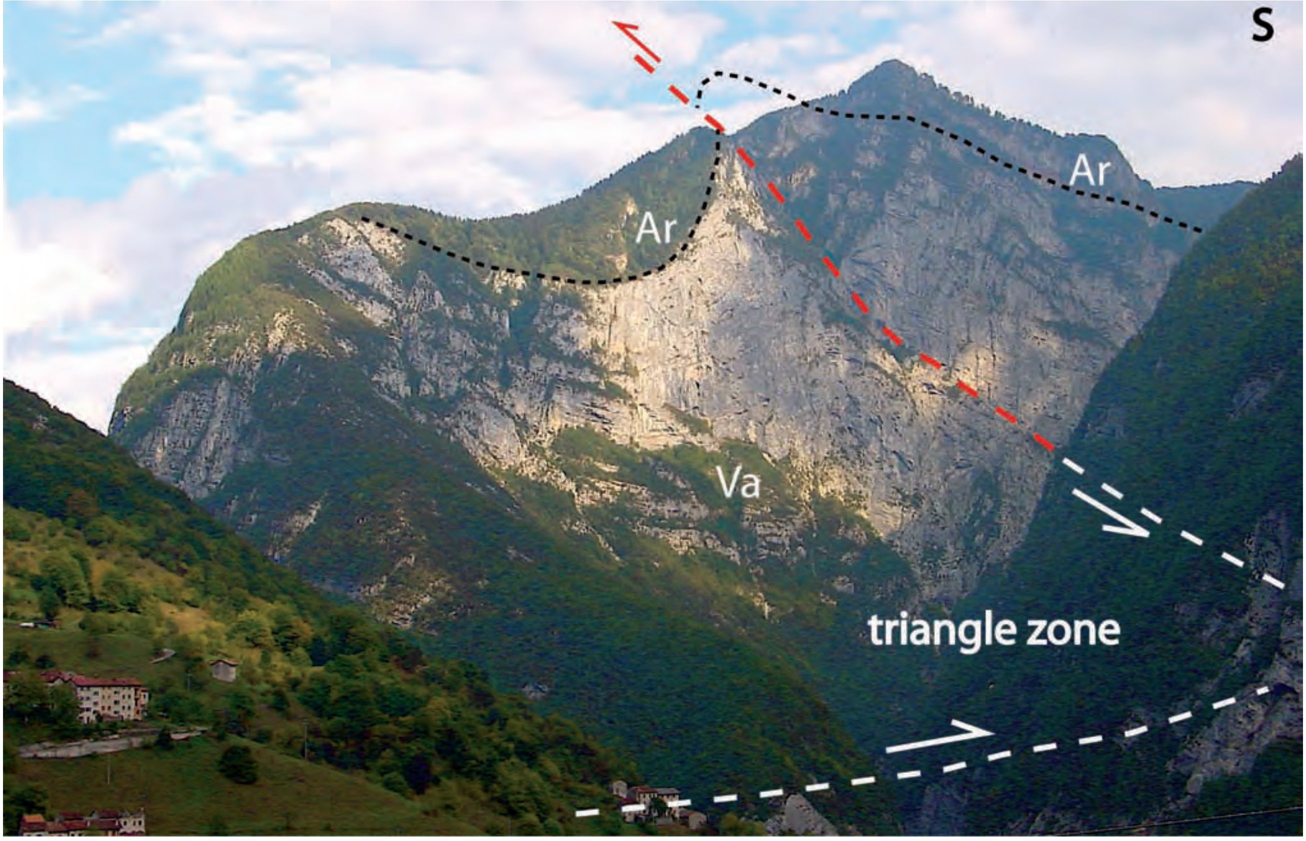


Fig. 1.9 - The thrust outcropping at the top of Mt. Borgà, has a lateral ramp cutting downsection eastward where it continues, east of the Vajont area, near Erto. Here it outcrops at lower elevation and generates a triangle zone as in this photo. The white part of the thrust is behind or below the ridge in the foreground. Ar, Ammonitico Rosso; Va, Vajont Lm.

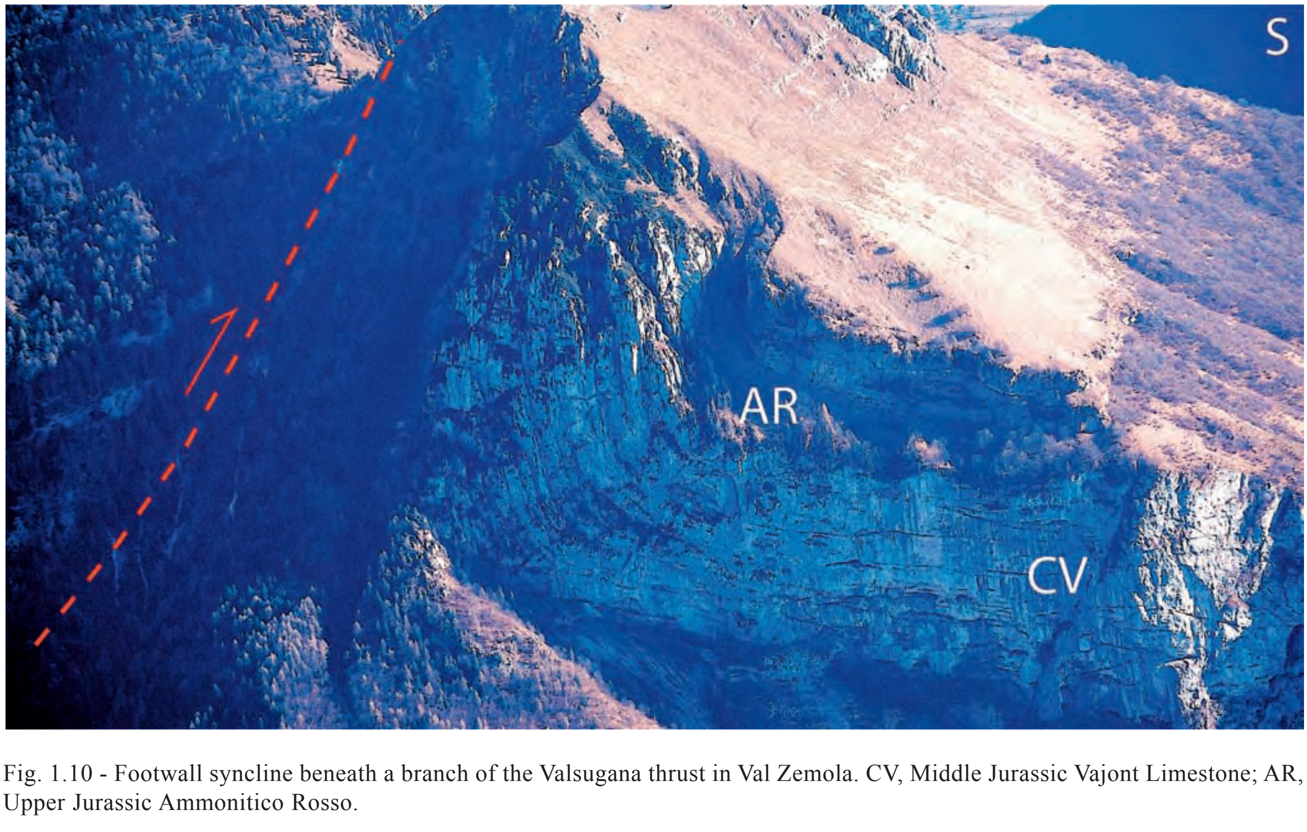


Fig. 1.10 - Footwall syncline beneath a branch of the Valsugana thrust in Val Zemola. CV, Middle Jurassic Vajont Limestone; AR, Upper Jurassic Ammonitico Rosso.

Fig. 1.11 - A branch of the Valsugana thrust system affects the Norian Dolomia Principale (DP) at the toe of the Duranno Mt., at the top of the Val Zemola. Note the different cutoff angles of the hangingwall and the footrwall.

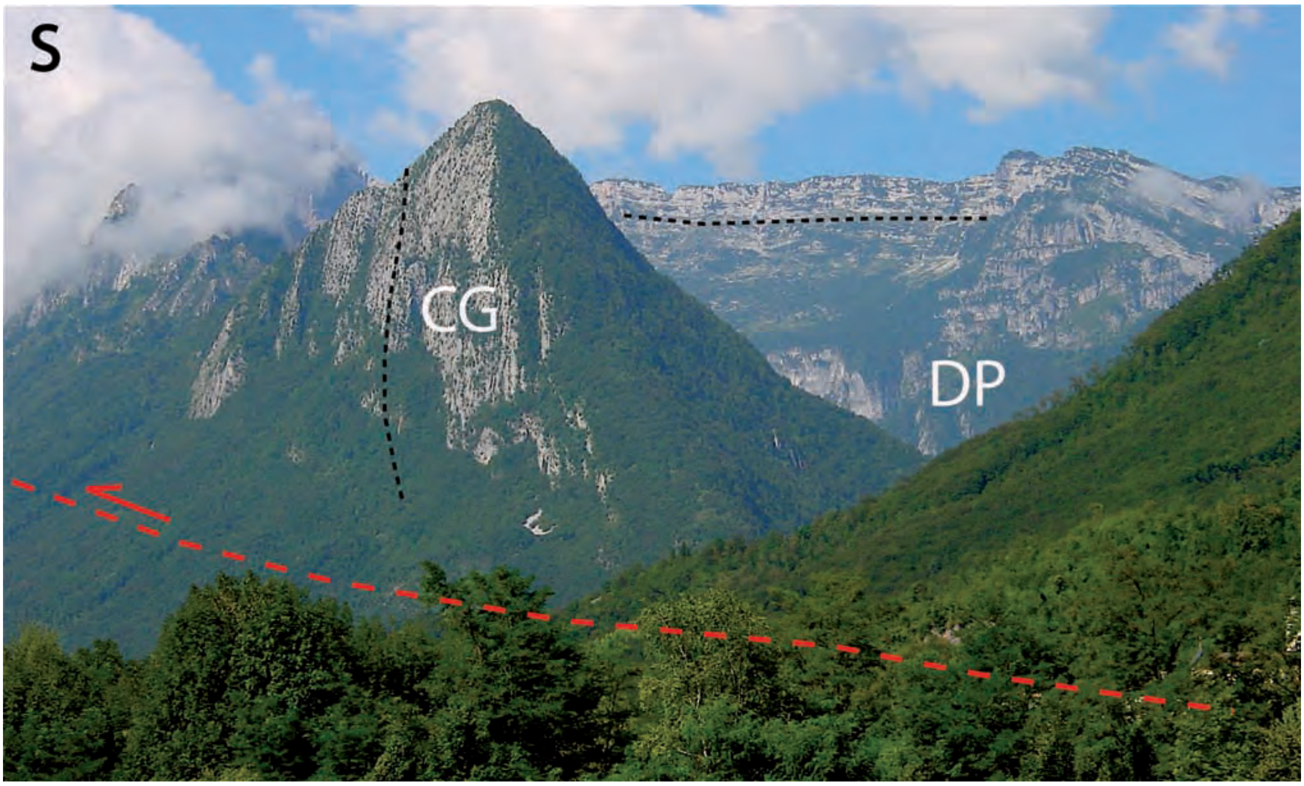


Fig. 1.12 - Fault-propagation fold in the hanginwall of the Belluno Thrust, west of Mas. CG, Liassic Calcari Grigi; DP, Norian Dolomia Principale. Not visible in the footwall the Tertiary Molasse and Flysch.

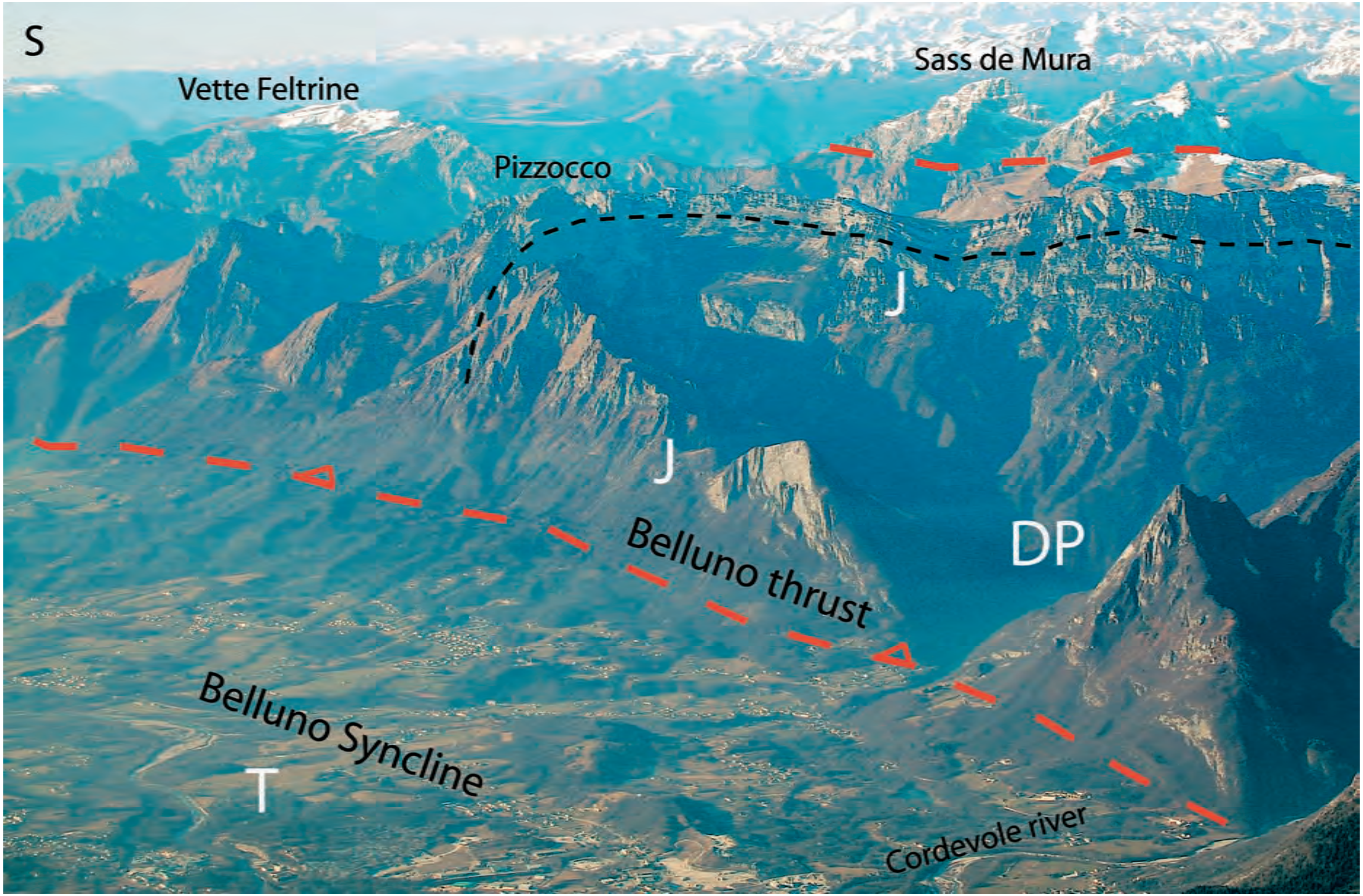


Fig. 1.13 - The anticline in the hangingwall of the Belluno thrust carries the Mesozoic sequence over the Tertiary Paleocene-Eocene flysch and the Oligo-Miocene molasses in the footwall. J, Jurassic; DP, Dolomia Principale; T, Tertiary.

Fig. 1.14 - The Eocene Flysch (F) covered unconformably by the Upper Oligocene Molasse (M) in the Belluno Syncline, in the footwall of the Belluno Thrust.

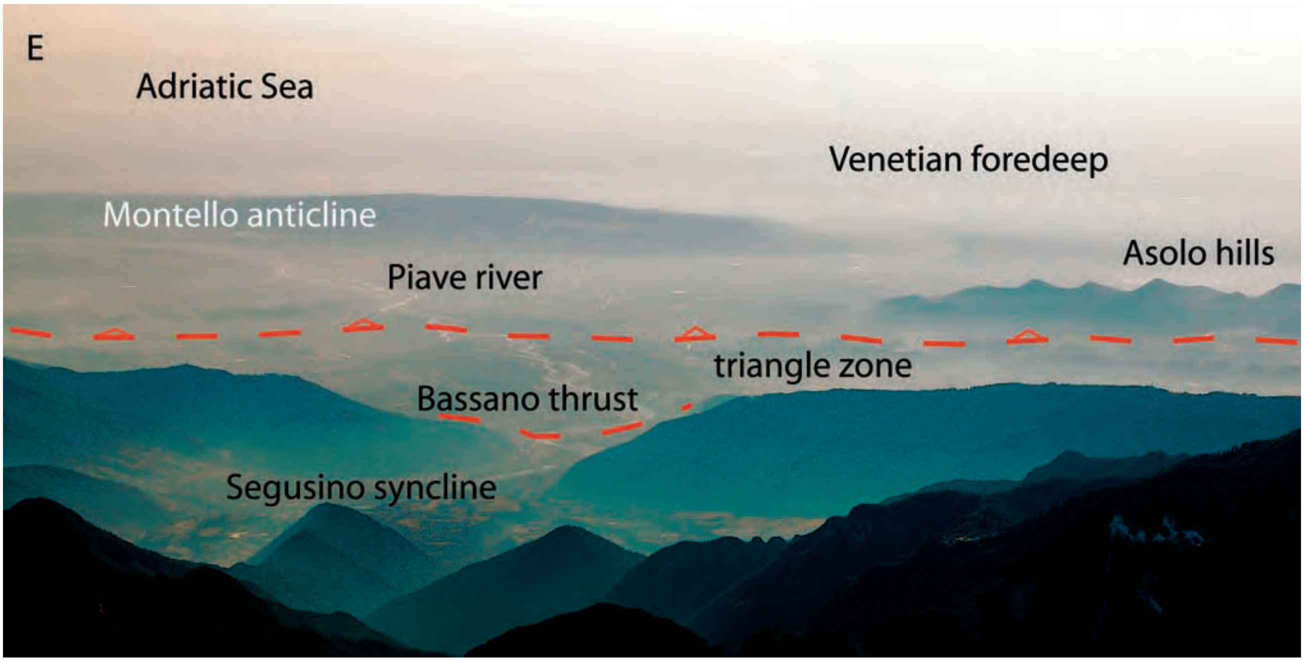


Fig. 1.15 - Southern view of the Southern Alps front with the active Montello anticline affecting Upper Miocene conglomerates and Pliocene shales.