



The geoelectrical survey: a powerful tool for the identification of fault zones

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A geoelectrical survey recently carried out in the western Trento province (Eastern Alps, NE Italy), near the Tonale fault (i.e. a segment of the Periadriatic tectonic lineament) allowed to identify some linear hydrologic bodies.

The tectonic setting of the survey area (upper Val di Sole valley) is strongly influenced by faults. The main faults are: i) the ENE-trending Tonale fault which separates the Tonale gneiss from the Southalpine schists and the Presanella Tertiary pluton along the southern Val di Sole, ii) the NNE-trending Giudicarie fault system located a few km to the East, and the NE-trending Peio fault located a few km to the North, both characterized by mineral springs, iv) NW-SE trending brittle faults.

The geoelectrical survey was done: (1) across the bottom of the upper Val di Sole valley here namely the Vermigiana valley in NW-SE direction; (2) across the Val di Sole southern slope, where retrogressed gneiss (Tonale gneiss), thermally metamorphosed schists (Southalpine schists) and quartz-diorite (Presanella pluton) crop out from N to S, in NW-SE direction; (3) across the Val di Sole northern slope formed of retrogressed gneiss (Tonale gneiss), and particularly across a 20 m thick, NW-SE trending well exposed cohesive cataclasite belt associated to mylonites and pseudotachylites.

The geoelectrical array was a dipole-dipole with electrodes at 2m of distance. The maximum investigated depth was 30 m over a length of 142 m.

As the results, the geophysical section (1) enhanced the presence of a hydrologic body oriented NE-SW, characterized by a resistivity range between 300 and 500 Ω m. The geophysical section (2) across the southern slope carried out along two measurements sections (N: Lat N 461725,56 Long E 104104,51; S: Lat N 462714,23 Lon E 104105,46 WGS84), has shown presence of two hydrologic bodies oriented NE-SW, characterized respectively by resistivity ranges between 200 and 400 Ω m the first body, and between 1000 and 1300 Ω m the second one.

The geophysical profile (3) across the cataclasite belt has shown an hydrologic body oriented NW-SE, characterized by resistivity range between 0 and 200 Ω m. These results are in agreement with the composition of the cataclasite belt which is characterized by decimeter-centimeter karst cavities and with the presence of gypsum in crystals and in the matrix.

The differently oriented hydraulic bodies in the upper Val di Sole valley have been interpreted as related to the main faults of the Periadriatic tectonic lineament. In particular, the bodies identified along the southern side with NE-trending are related to the Tonale fault, while the body identified along the northern side with NW-trend, which is the only one cropping out along the slope, is related to the cohesive cataclasite associated to pseudotachylites and mylonites.