Stratigraphic and Structural setting of Cenozoic deep-sea units from the Agri valley (southern Apennines, Italy), recording the tectonic evolution of the Southern Apennines.

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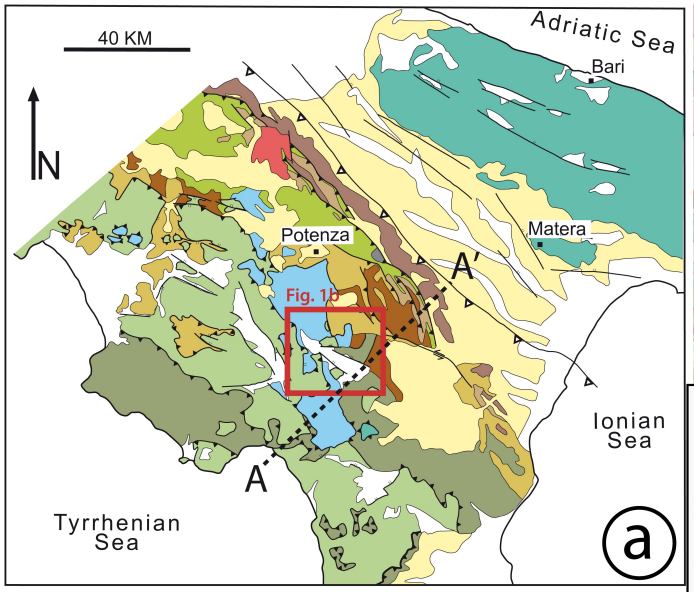
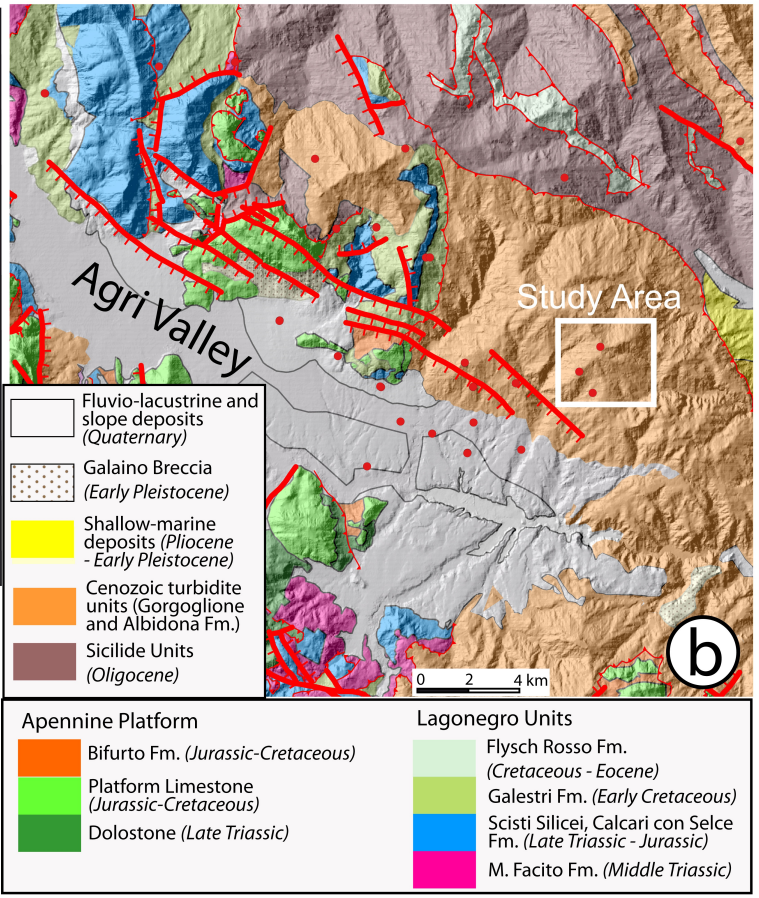
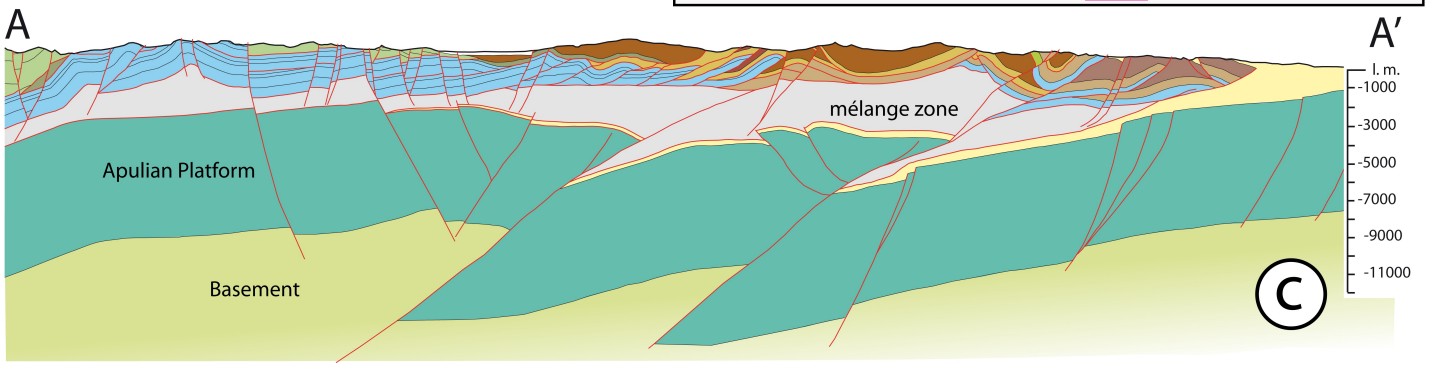
Regional geology of the Southern Apennines



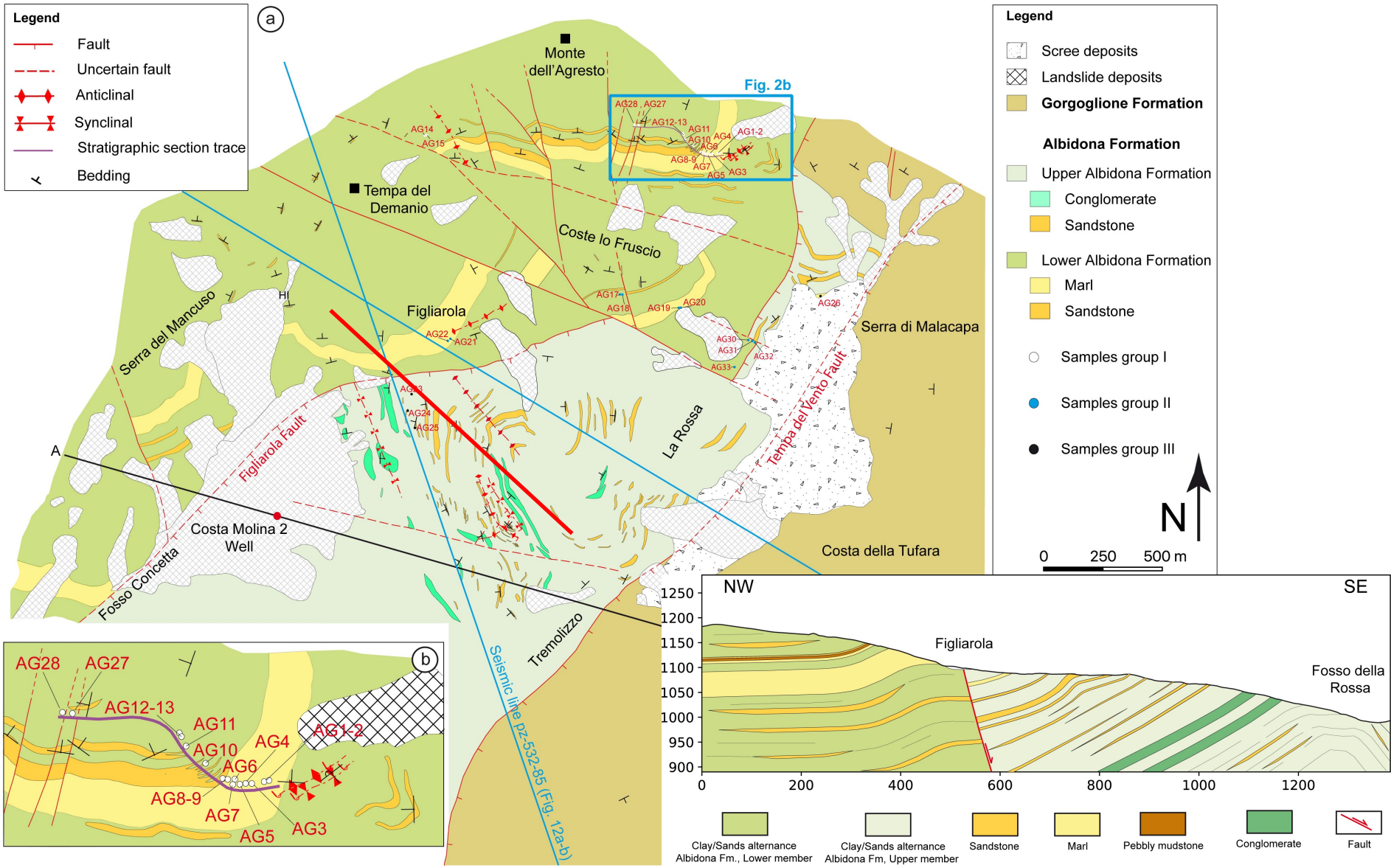


Liguride Complex
Gorgoglione Formation
Pliocene - Pleistocene
Apennine Platform
Sicilide Units
Serra Palazzo Formation
Lagonegro Basin
Numidian Formation
Apulian Platform



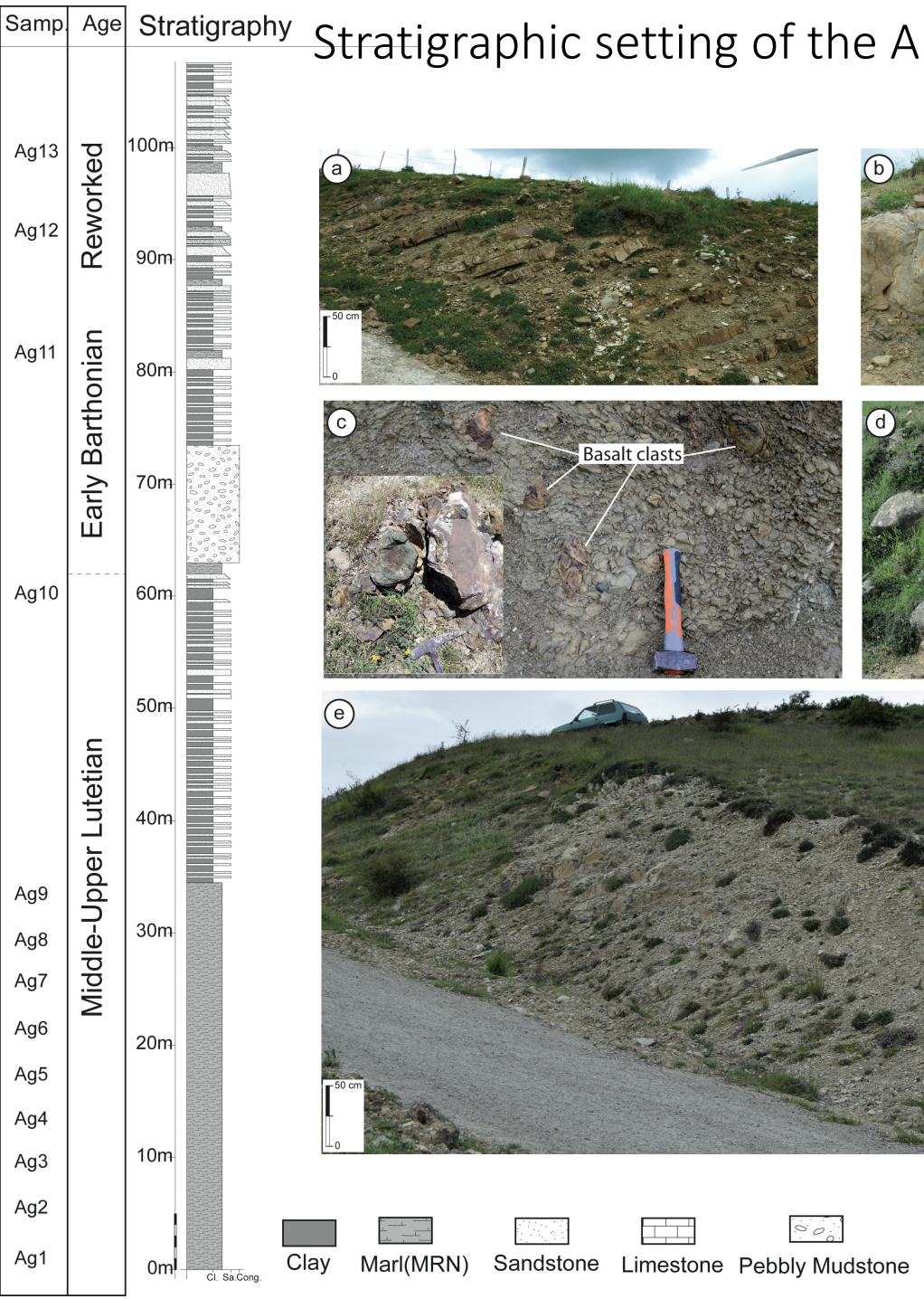
(a) Regional geological map of the Southern Apennines;
(b) Sketch map of the Val d'Agri tectonic graben showing the location of the study area. The study area is located in a major outcrop of Miocene turbiditic units.
(c) Schematic geological cross-section outlines the structural highs of the Internal Apulian Platform and the geometry of the overlying allochtonous units.

Geological map and stratigraphic setting of the Albidona Formation



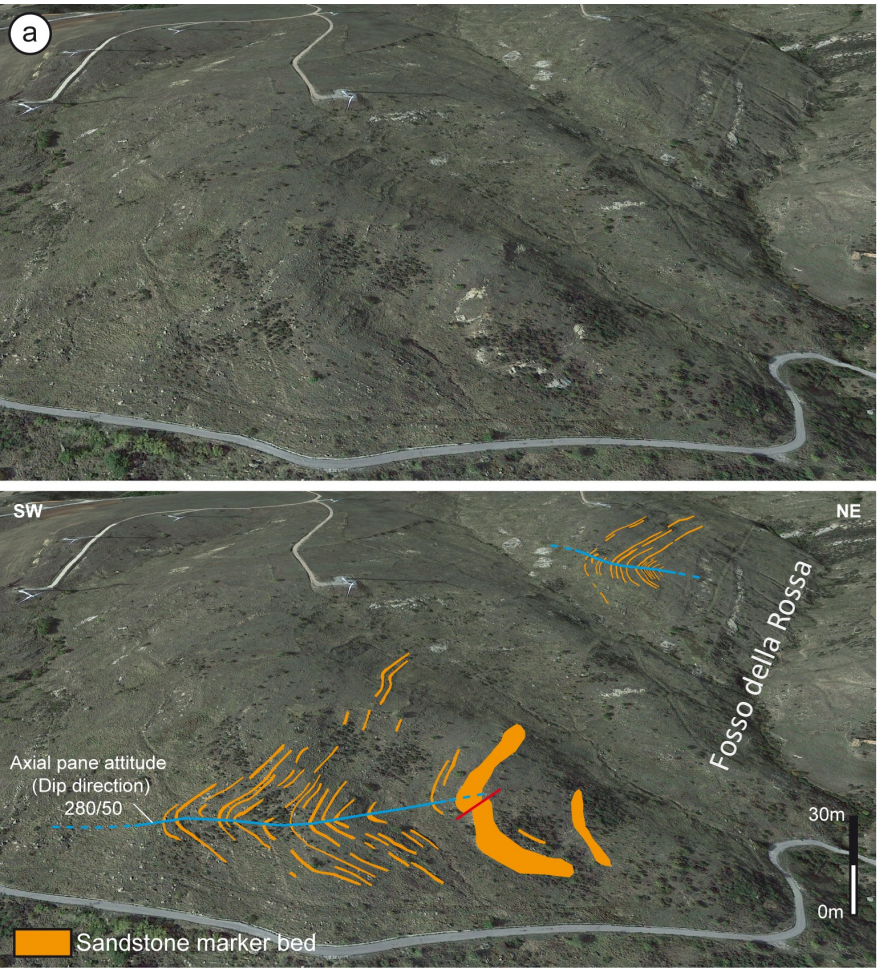
Geological map of the Costa Molina - Monte dell'Agresto-Tempa del Vento area, showing the location of the studied stratigraphic section (b), collected samples and seismic lines. Cross section (c: red line in the geological map) illustrates the relationships between the two members of the Albidona Formation.

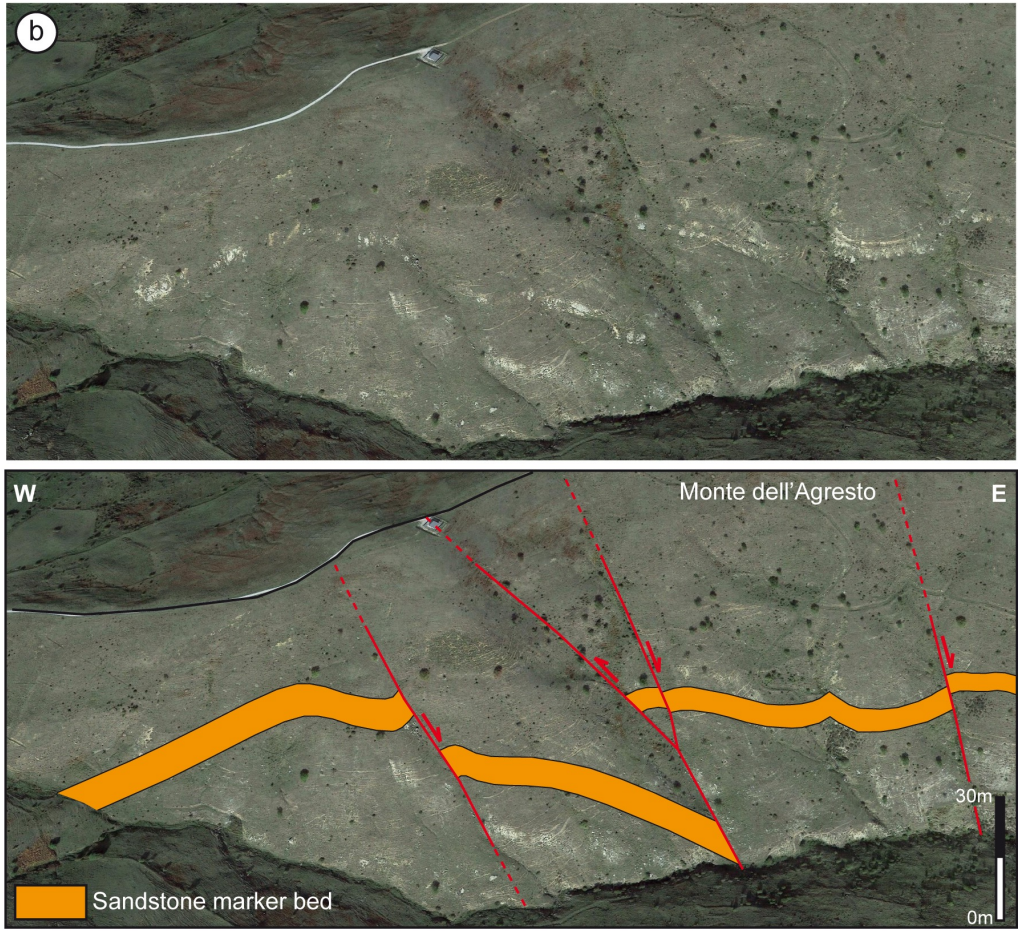
Stratigraphic setting of the Albidona Formation: Lower member



Stratigraphy and peculiar stratigraphic intervals within the iower Member (Member B-C) of the Albidona Formation.
(a) Thin-bedded turbidites and clays representing the background sedimentation of Member B-C of the Albidona Formation.
(b) Structureless sandstone intervals.
c) Pebbly mudstone exposed at Monte dell'Agresto.
Note the occurrence of ophiolite debris consisting of scattered basalt clasts within the clayey matrix. In the box, a close-up view of a clasts consisting in a pillow lava fragment.
(d) Pebbly sandstone. Scattered clasts mainly occur in
the laminated lower portion.
(e) Marls affected by cleavage and calcite veins.

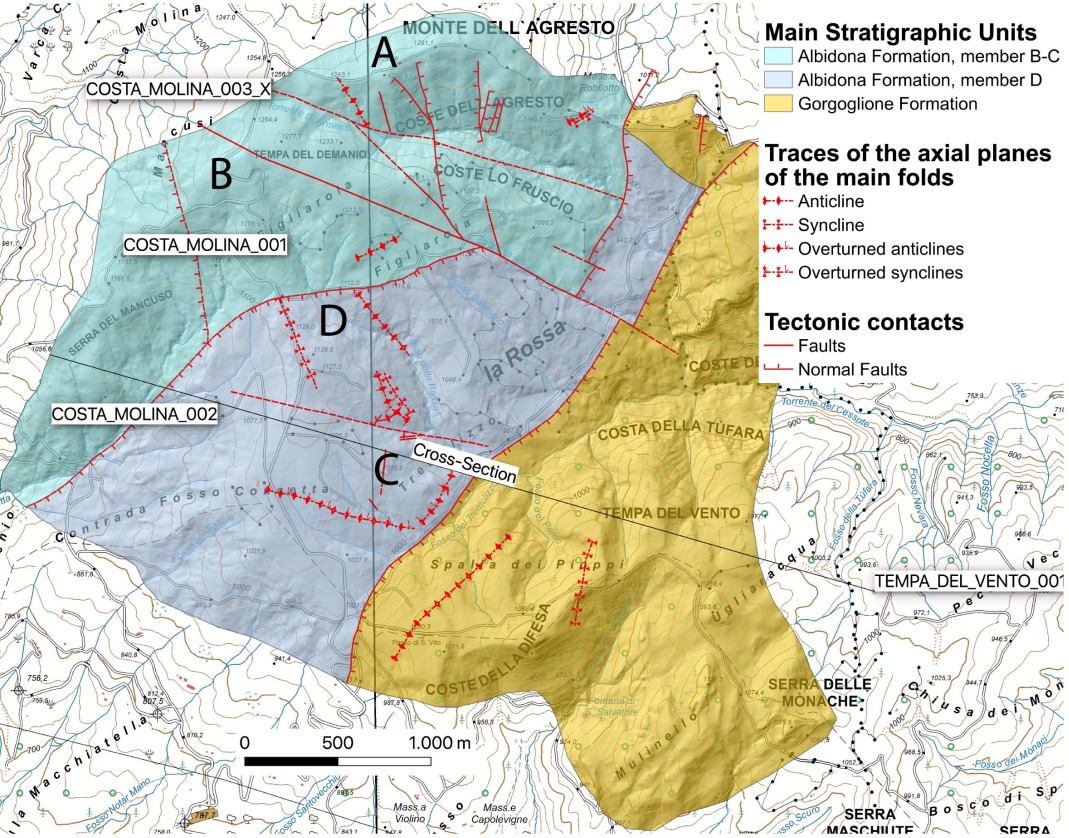
Folding of the Albidona Formation

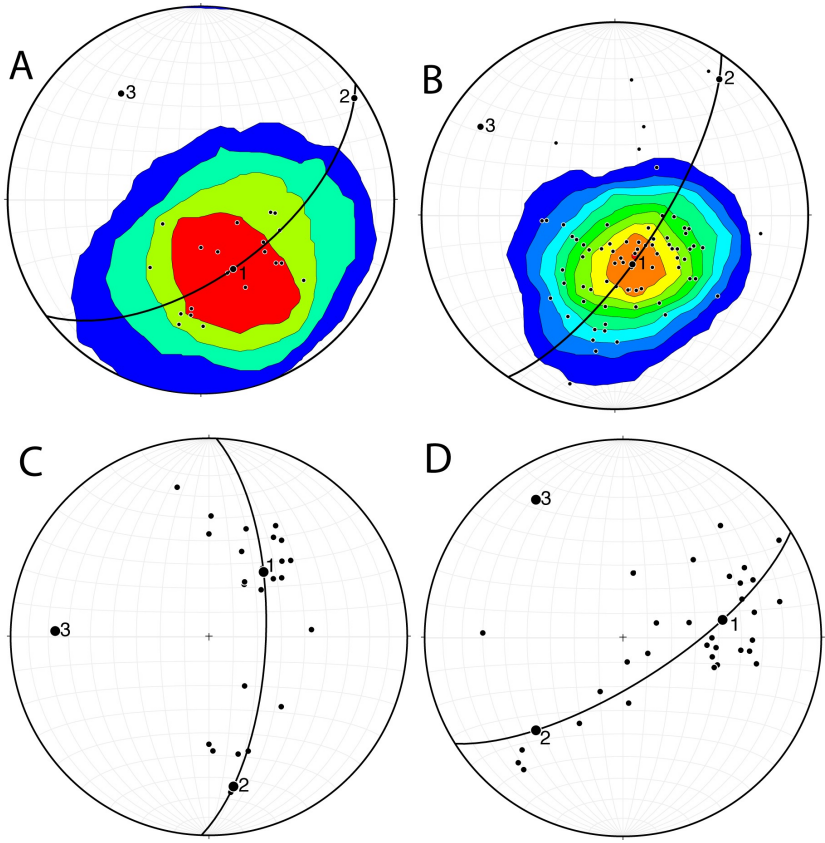




Sandstone marker beds in the M. dell'Agresto – C.da La Rossa area allow the reconstruction of km scale folds:
(a) Geometry of the D1 E-trending Tremolizzo overturned anticline; a minor E-trending anticline in the limb of a major NW-trending D2 fold is visible in the minor valley of Fosso della Rossa.
(B) D2 NW-trending anticline outlined by a thick sandstone bed offset by minor normal faults at M. dell'Agresto.

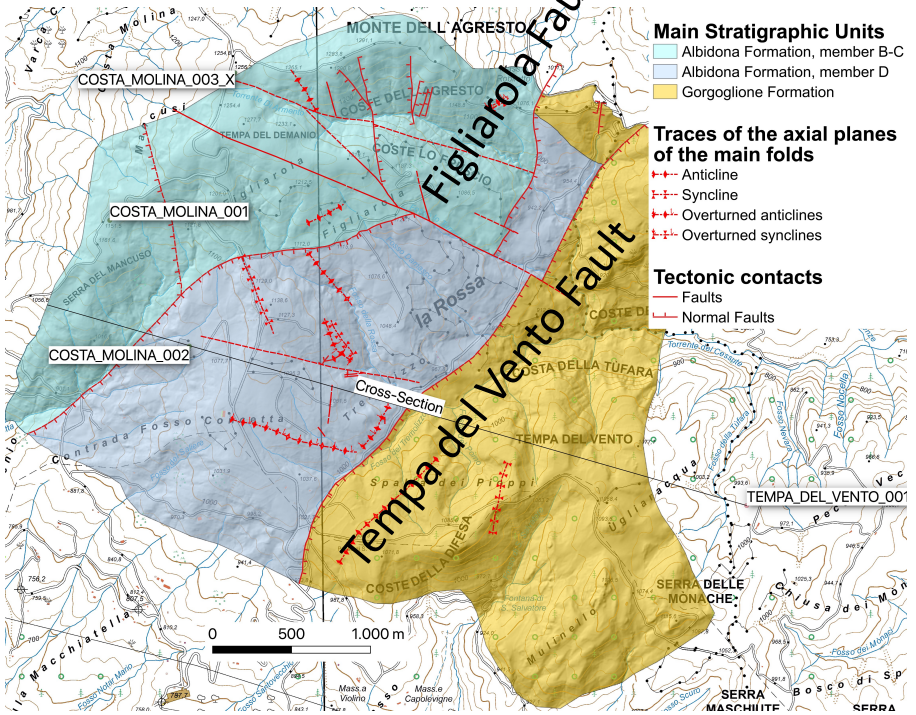
Folding of the Albidona Formation

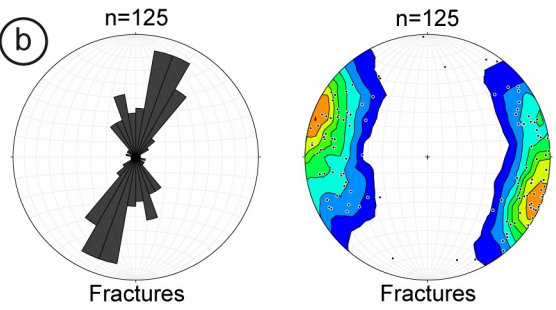


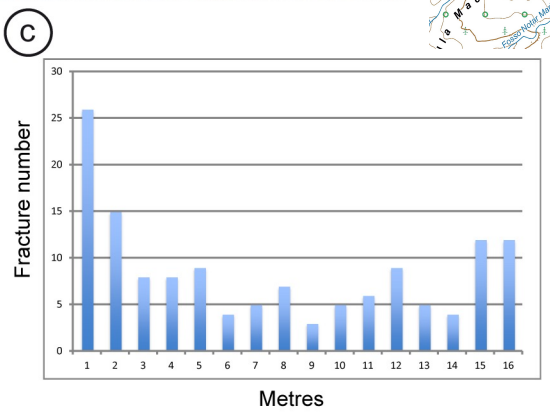


Tectonic sketch map of the study area. Stereoplots (Stereonet, RWA Allmendinger) show the distribution of the bedding poles in the four sub-areas A-D. Point 3 corresponds to the best-fit axis of folds.
Subarea C corresponds to the E-trending overturned Tremolizzo anticline (D1). This km-scale shows a S-directed vergence and an axial surface refolded by NW-trending folds (D2), which are widespread in the whole study area (subareas A, B and D).

Major normal faults







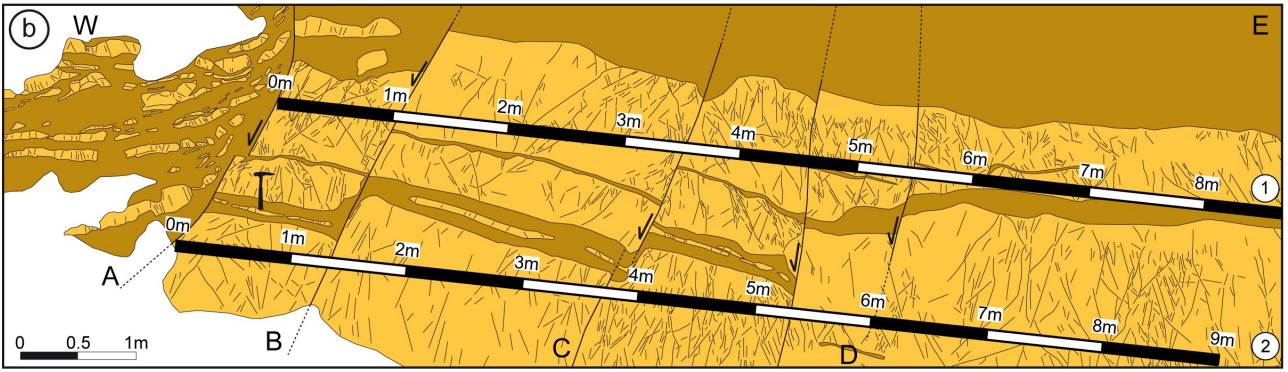
The area is dominated by two major NE-trending, SE dipping normal fault identified as the **Tempa del Vento** and **Figliarola faults**. Structural data have been collected from the damage zone of the Figliarola Fault, which is exposed in the northern sector of the study area.

a) photograph of the outcrop, which outlines the brittle deformation of a 10 m thick sandstone/microconglomerate interval of the Miocene Gorgoglione Formation at the hangingwall of the Figliarola Fault.

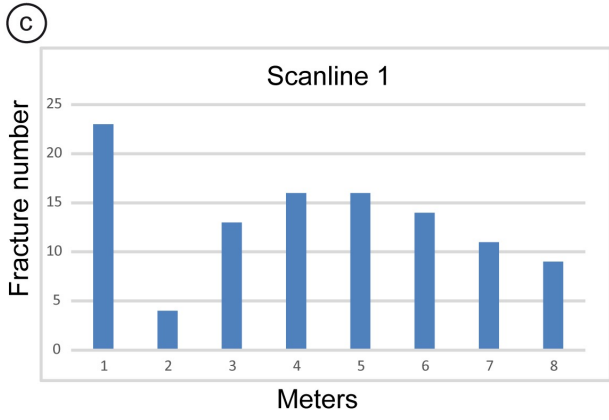
b) rose and contour plot diagrams of fracture data measured along the scanline shown in a);

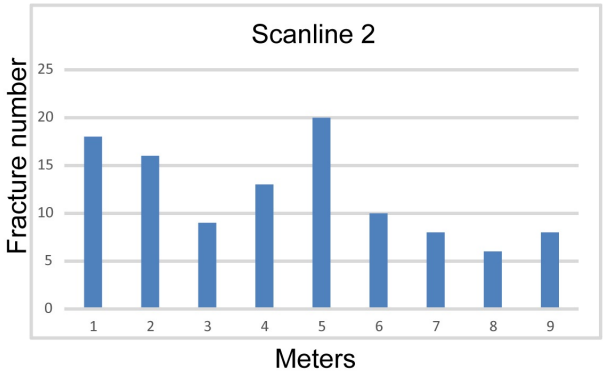
c) distribution of the fracture intensity (the number of fractures per unit length (m–1)) along the scanline shown in a).

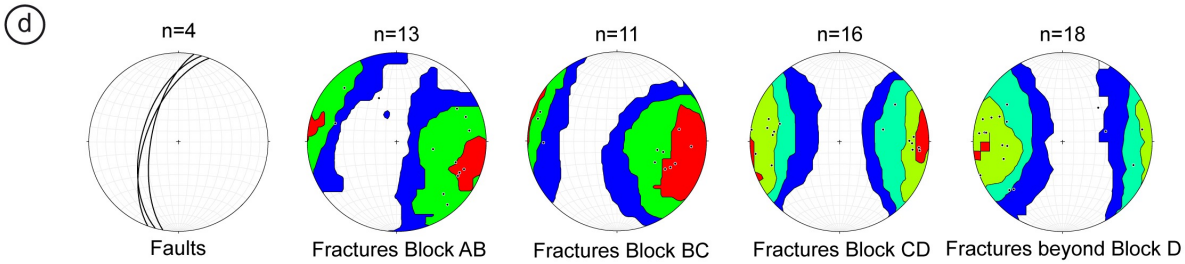
Minor normal faults at the hangingwall of the Figliarola Fault



Sandstone Clay Cover

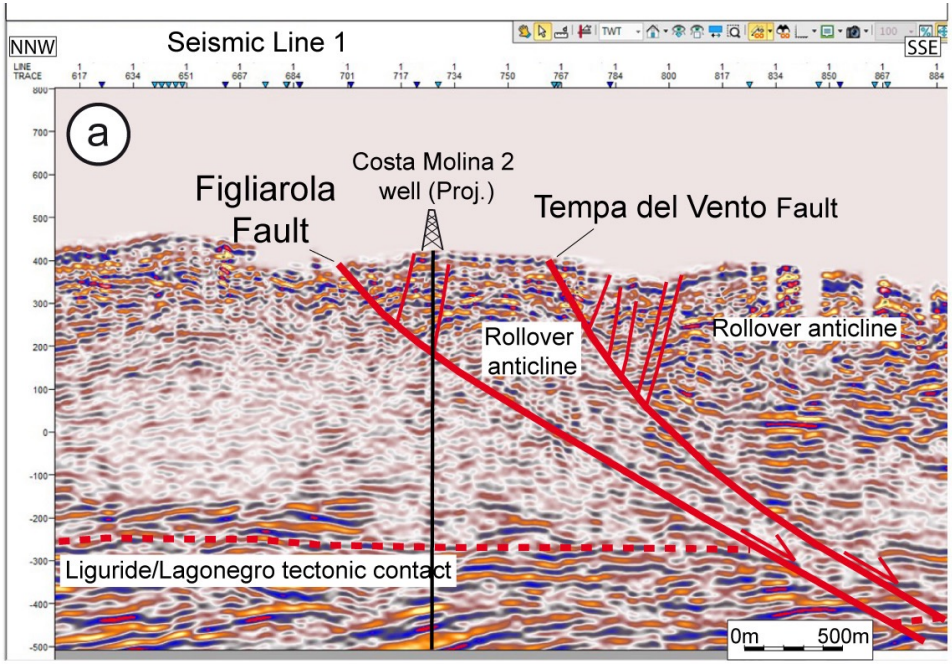


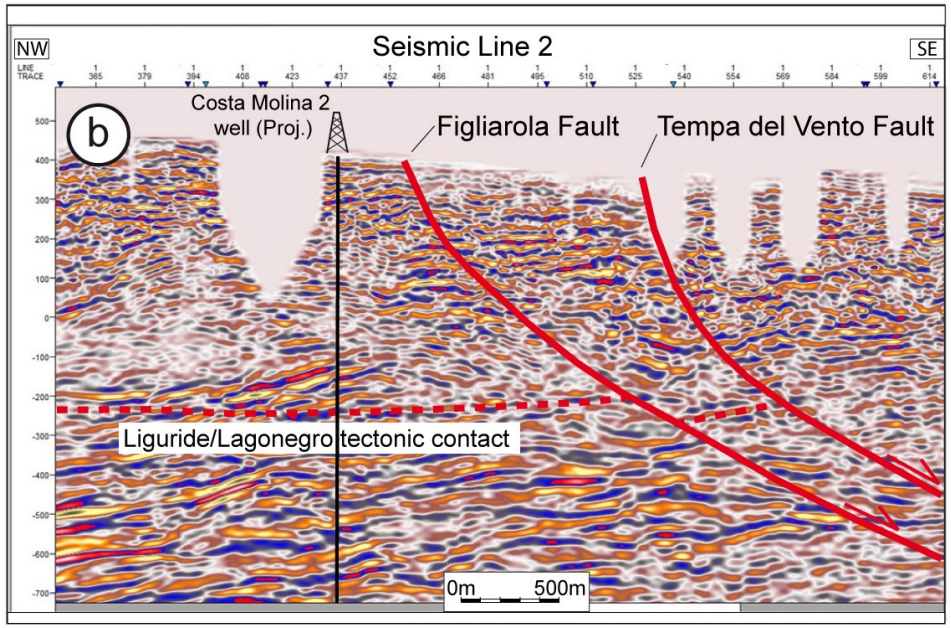


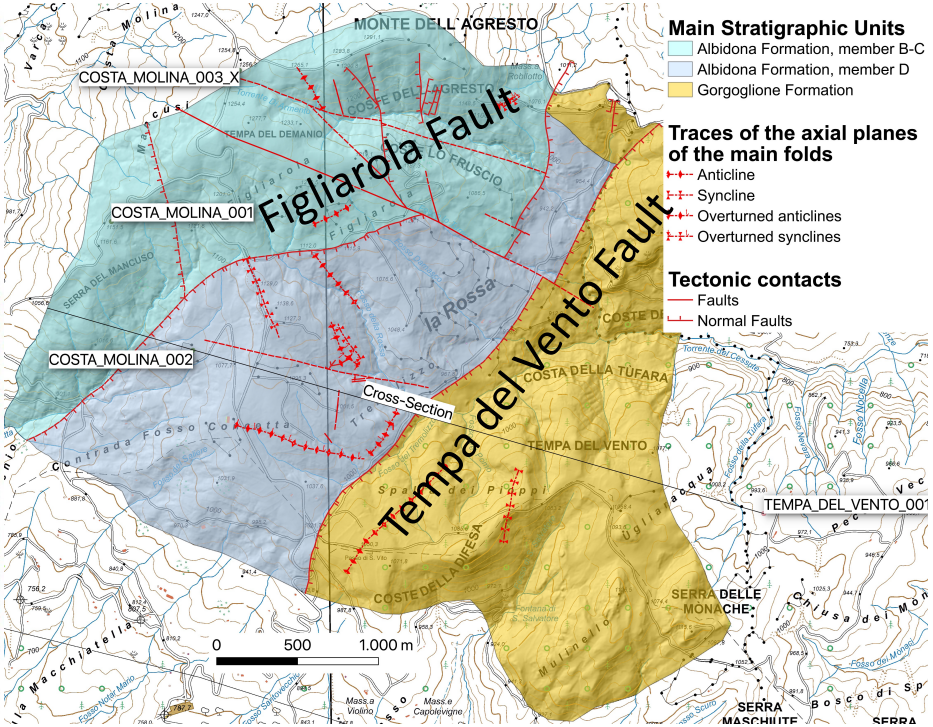


Minor antithetic faults, identified by letters A to D, in the Gorgoglione Formation exposed at the hangingwall of the Figliarola Fault. a) outcrop photograph. b) interpretation showing the position of two scanlines measured along two main sandstone beds. c) diagrams of the fracture intensity measured along the two scanlines. d) stereoplots showing the orientation of fault planes and fractures in each fault-bounded block shown in b).

Figliarola and Tempa del Vento Faults

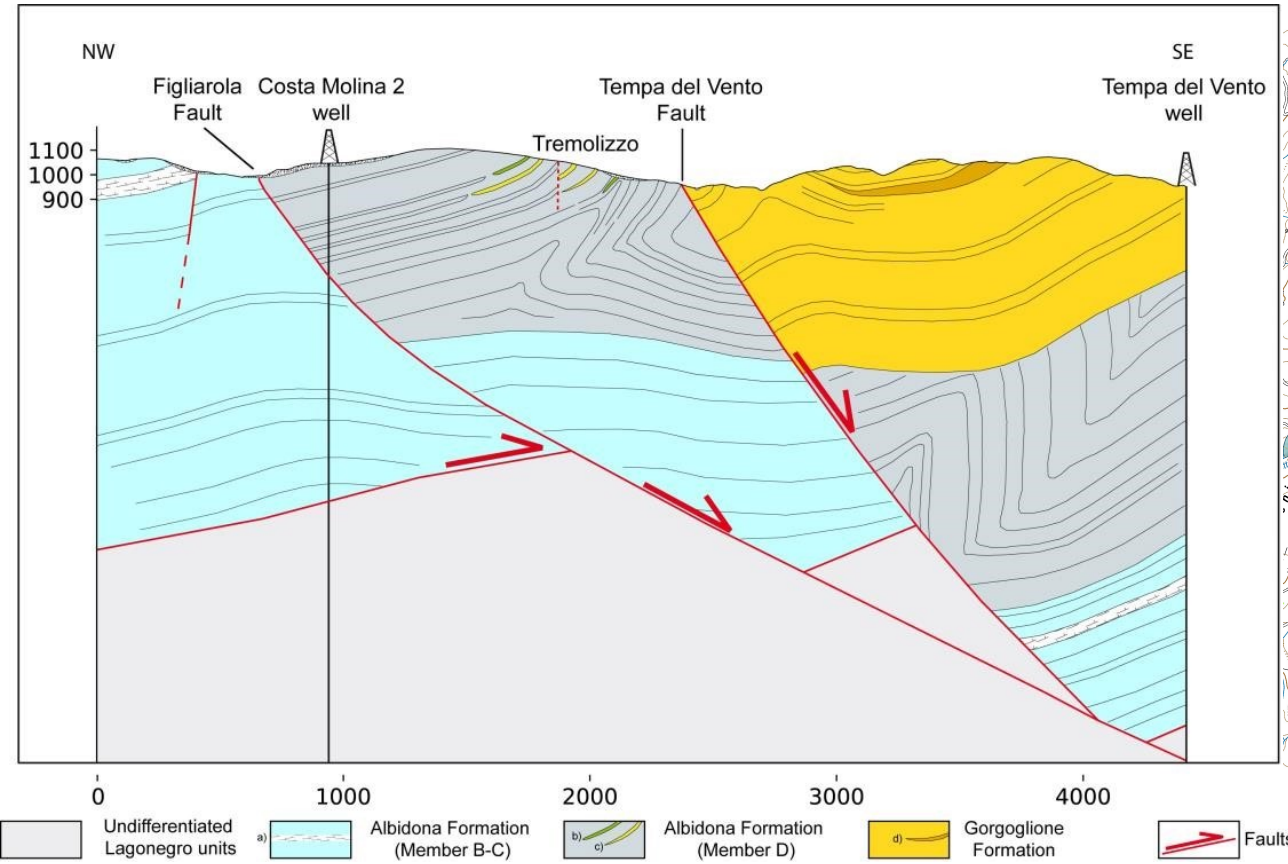


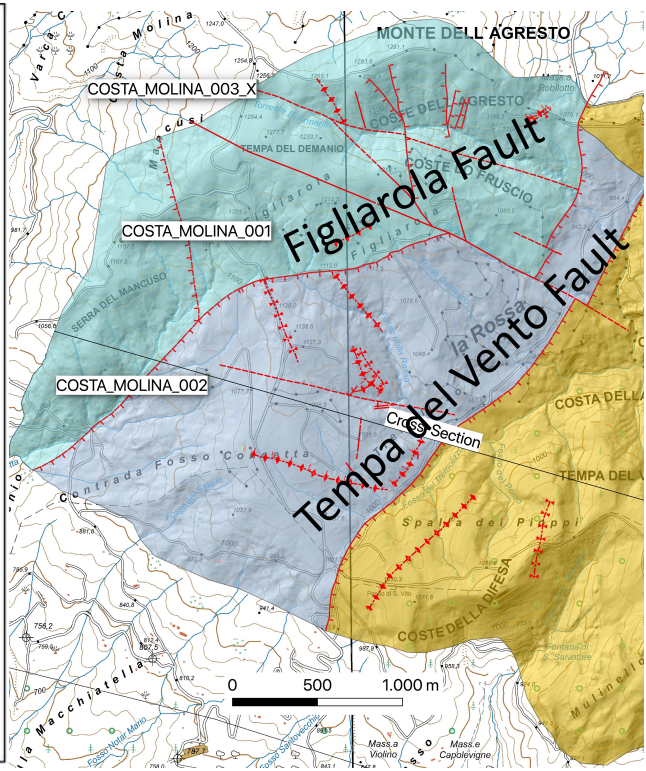




Interpretations of two seismic lines (a,b; kindly provided by Eni SpA) crossing the Tempa del Vento and Figliarola faults in the study area. The rollover anticlines at the hanging wall of the Tempa del Vento and Figliarola faults, are consistent with a listric geometry of the fault trajectory. A series of antithetic normal faults affecting the rollover anticline likely resulted from crestal collapse.

Tectonic evolution of the study area





Detailed stratigraphic and field study of the Albidona Formation on the Agri Valley allowed to provide some hints on the tectonic evolution of this sector of the Southern Apennines.

1) Two folding phases affect the Albidona Formation, including E-trending overturned folds (D1) and NW-trending opem folds (D2).

2) major NE-trending normal faults, were documented for the first time in the study area. These structures, named respectively as Figliarola and Tempa del Vento faults, are characterized by km-scale vertical displacement and provide indications of significant along-axis styretching during the development of the Southern Apennnines thrust and fold belt.