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3D geometry of NE-Friuli Quaternary faults (NE Italy)

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Interpretation of seismic industrial lines, matching with morphotectonic and wells subsurface data, allowed us to detect the main Quaternary active faults of NE Italy.
The study area is settled between eastern Friuli and western Slovenia, where the external fronts of SW-verging External Dinarides and S-verging Eastern Southalpine Chain meet. This area experienced a complex tectonic evolution.
- Dinaric phase: during late Cretaceous-Paleogene a NE-SW compressional regime caused the SW-propagation of NW-SE trending thrusts;
- Neoalpine phase: since middle Miocene an about N-S compressional regime was responsible of the formation of S-SE verging, WSW-ENE thrusts and the reactivation of favorably oriented old structures;
- starting from Pliocene, the activation of a NNW-SSE compressional regime caused the formation of new NW-SE strike-slip high angle faults that locally displaced and/or renewed the old structures.
According to focal mechanisms of seismic events, two different deformational systems can be distinguished: a western sector where reverse activity on WSW-ENE oriented thrusts prevails and an eastern sector characterized by strike-slip tectonics on high angle NW-SE oriented faults. Both are subjected to an about N-S compression, with velocities of the order of 2-3 mm/y (Serpelloni et al, 2016), responsible of their reverse or transcurrent/transpressive kinematics. Recent and historical earthquakes show that it is a seismically active region; at least three M>6 events struck the area in 1348 (Mw 6.63), 1511 (Mw6.32), 1976 (Mw 6.45) (Rovida et al, 2016). Nevertheless, the seismogenic role of the main tectonic structures is still not completely clear; in this context Quaternary activity has been assumed for the Susans Tricesimo thrust (Poli et al, 2018), while recent paleoseismological investigations revealed Quaternary dislocations on the Colle Villano thrust (Falcucci et al, 2018).
In this study, we present a 3D model block that depicts the tectonic buried setting of the eastern Friuli plain. The geometry of the main stratigraphical horizons and the main tectonic structures were reconstructed through ENI industrial seismic lines interpretation, together with well logs data, with 3D-Move software.
Moreover, the implementation of well logs data allowed the reconstruction of the 3D Quaternary surface and the detection of tectonic deformations. By merging these new data with morphotectonic observations, the 3D geometry of the main buried active faults of the area were reconstructed and possible estimates of their activity rates and seismogenic potential were performed.
Three main active tectonic structures were here recognized:
• The Pozzuolo-Medea thrust of the more external front of the External Dinarides Palmanova Thrust System;
• The frontal Udine-Buttrio thrust of the inherited NW-SE Trnovo Thrust System;
• The Borgo Faris-Cividale Fault System composed of dextral strike-slip faults and reverse SW-verging associated thrusts. Both transcurrent and reverse faults showing clear evidences of Quaternary activity.

References

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