Late Miocene thrust tectonics of the Latin Valley: insights from seismic lines (Central Apennines, Italy)

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Late Miocene thrust tectonics of the Latin Valley: insights from seismic lines (Central Apennines, Italy)

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In west-directed subduction zones, as the compression moves towards the foreland, the accretionary prism progressively expands to follow the hinge migration towards the east. Although late Miocene foreland propagation implies the shift of the thrust front, in the central Apennines, the effects of the Messinian compression can be observed on a much broader area, implying out-of-sequence thrusting in the rear.

In order to understand the Messinian involvement of the previously formed Tortonian belt-foredeep system, a regional reinterpretation is here provided. The analysis of publicly available 2D seismic reflection lines across the upper and middle Latin Valley and 10 wells enables the identification of two main seismostratigraphic units: i) the Meso-Cenozoic neritic carbonates and ii) the upper Tortonian siliciclastic pelitic and arenaceous turbiditic associations of the Frosinone Formation.

The most evident reflectors are the upper Cretaceous and upper Serravallian top paraconformities, which, due to tectonic repetition can be followed at different depths. We find that minor reflectors can be attributed to the several thrusts affecting folded Meso-Cenozoic neritic carbonates. This observation allows us, together with field and well evidences, to trace several thrust sheets characterized by a general top-to-the NE sense of shear. In a few sections from the Latin Valley (e.g. Line FR-309-80), we recognized the Meso-Cenozoic neritic carbonates being thrusted together with the Tortonian Frosinone Formation, on top of a laterally variably thick siliciclastic succession. This further syn-orogenic unit could be related to the early Messinian sandstones of the Torrice Formation, implying that out-of-sequence thrusting took place in the Latin Valley during the wedge-top sedimentation. The thin-skinned fold-and-thrust fabric is defined by en-échelon distributed thrusts, NNE- and ENE striking tear faults and minor pop-up structures often determining ideal traps for hydrocarbon and geothermal fluids. Finally, conjugated NW-striking high-angle normal faults crosscut the orogenic heritage and sets a horst and graben structure associated with continental deposition and the Volsci Volcanic Field.

The limited oil exploitation over the past century has targeted only the shallower siliciclastic traps and some evidences in the shallower neritic carbornate thrust sheets. At the light of our new interpretation, the deeper carbonate units could be a new focus for hydrocarbon accumulation

and may furnish targets for geothermal and/or hydrocarbon research in the area. Future work aims at quantify the Tortonian and Messinian amount of shortening by taking into consideration the adjoining Volsci Range. Finally, our findings bear implications on geodynamic reconstructions and may represent an example of the geometry and kinematic evolution of platform derived thrust sheets and similar belts worldwide associated with W-directed subduction zones.