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Insights into the deformation of an underthrust tectonic mélange from the Northern Apennines, Italy

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The Sestola-Vidiciatico Tectonic Unit (SVTU) in the Northern Apennines is an underthrust tectonic mélange presently sandwiched between the Tuscan-Umbrian foredeep "flysch" units and the overlying Ligurian/Subligurian thrust-nappe. The SVTU has been generated during the collision between the European and the Adria plates and now it separates the oceanic accretionary wedge from the underlying fold–and-thrust belt formed by Adria sedimentary units. The collision caused an eastward migrating foredeep basin and the overthrusting of the frontal part of the Ligurian/Subligurian thrust-nappe/accretionary prism on the subducting Adria margin. Part of the inner lower-slope and marginal sediments of the migrating foredeep basin have been unconformably deposited on a newly developed frontal prism formed by material already accreted in the Ligurian/Subligurian prism and gravitationally and tectonically reworked. The frontal prism and its sedimentary cover have been progressively dragged down along the plate boundary zone generating the Sestola-Vidiciatico tectonic mélange on top of the underthrust turbidites. The mélange has been generated under conditions ranging from the shallow diagenetic environment at the toe of the prism to temperatures of around 120˚C. The research has been focused on the younger component of the mélange that has been deposited on the frontal prism generated by the tectonic and sedimentary reworking of the former Ligurian accretionary wedge. The underthrust lower-slope sediments incorporated in the mélange, as they were not completely lithified,, show a long deformation history ranging from continuous and pervasive soft-sediment deformation to brittle deformation concentrated along faults strongly controlled by the lithological proprieties of the components and by the cyclical evolution of the fluid pressure.

In the first deformational stage the marly component has been pervasively sheared

until the loss of the primary bedding, whereas the shaly component developed a penetrative scaly fabric. The sandstone beds have been cut crossed by hydroplastic conjugate shear bands with no grain breakage evolving to breaking concentrated on a sharp surface. During the last structural stage the mélange has been penetratively cross-cut by a spaced network of shear surfaces coated by calcite slikenfibres showing a characteristic crack-and-seal growth. The final state of strain of the mélange results in a stretching both parallel and perpendicular to the main direction of tectonic transport.