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# Deformation in a subduction channel (1): anatomy of the shallow portion (T$<$ 150˚C) of an ancient analogue in the Northern Apennines of Italy

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In the Northern Apennines of Italy, an underthrust tectonic mélange represents the ancient analogue of a shallow subduction channel. This mélange (the Sestola Vidiciatico Tectonic Unit) has been formed during the collision between the European and the Adria plates and it is presently sandwiched between the former oceanic accretionary wedge – Ligurian thrust nappe - and the underlying fold–and-thrust belt formed by Adria sedimentary units. It has a thickness of about 500 m and it is representative of a portion ranging from the shallow diagenetic environment to temperatures of around 150˚C, a critical temperature recognized in most of the subduction zones as coincident with the up-dip limit of seismogenesis.

The main portion of the material forming the subduction channel is the product of frontal erosion taken place at the toe of the Ligurian prism, including its sedimentary cover, reworked through sedimentary and tectonic processes (i.e. frontal prism). Basal erosion is represented by blocks of Ligurian prism tectonically incorporated in the subduction channel and found in the upper part of the mélange.

The younger deformation phase, as defined by cross-cutting relationship, is characterised by a strong difference in lithification of the various components which causes a clear partitioning of the deformation. The softer, less lithified components at the time of entrance in the subduction channel record the whole deformation evolution showing clear evidence of continuous and pervasive soft-sediment deformation passing to discontinuous brittle deformation concentrated along faults at deeper levels. Instead the components already hard at the time of entrance in the subduction channel show

only the last and brittle stage of deformation. The latter developed when lithification of the softer blocks became as such that the mélange started to show a homogeneous behaviour as shown by the deactivation of the blocks' boundaries as detachment surfaces. The strain regime in the shallow part of the subduction channel is extensional suggesting a very weak nature of the plate boundary. This character seems to be controlled by the presence of fluid and, for the deeper part, by the cyclical variation of the fluid pressure (fault-valve behaviour).