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Fluid trajectories during accretion in sediment-dominated margins: insights from the coherent units of Northern Apennines, Italy.

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The existing studies on active subduction margins have documented the close association between accretionary processes and circulation of fluids derived by sediment dehydration, lithification and diagenesis. Fluid migration interacts with deformation causing important changes in the physical and mechanical properties of rocks and sediments, which, in turn, change their response to deformation. One of the main factors controlling either the deformation processes during accretion, or the fluid budget and activity, is represented by the thickness of sedimentary successions carried by the lower plate into the accretionary system.

We report on a detailed structural study carried out in the Internal Ligurian Units (ULI, Northern Apennines), in which the occurrence of a huge thickness of oceanic sedimentary cover and turbiditic succession testifies to the sediment-rich nature of the ligure-piemontese oceanic crust. In selected accretion-related thrusts, the deformation mechanisms, connected with fluid migration, have been studied through a detailed structural analysis of the syn-tectonic vein systems. Subsequently, a fluid circulation model has been developed.

Three veins systems have been distinguished, based on their texture and on geometrical relationship with the deformational phases. Hydrofracturing occurs mainly through development of the first system of dilatant fractures grossly parallel to the decollement zone, which is favored also by the regional stress field characterizing the wedge. However, mutual relationship between different veins generation and different deformational phases, suggest that fluid injection is transient, and determines local fluctuations of differential stress, and cyclical variation of permeability and cohesion states of rocks and sediments. This allows to cyclical variation of deformation mechanisms and to development of crosscutting veining episodes. Moreover, the close association between deformation phases and vein development, and the peculiar features of each identified vein system, has suggested that deformation interplay intricately with lithification, dewatering and diagenesis processes.

The proposed model provides a “ramp-flat” migration of fluids with the less cohesive layers acting as *décollement* levels in which permeability is high and fluid flow enhanced. The more competent layers (i.e. the sandstones) are truncated by ramps that permit connection between horizontal conduits. Most of the fluid loss is then accomplished by the layer-parallel system, according to what postulated for active margins.