



The transition from frontal accretion to frontal erosion: evidence from a fossil subduction complex in the Northern Apennines of Italy

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Subduction accretion and erosion are two different types of tectonic processes that can characterise a subduction zone. These processes can be distinguished on the base of the characteristics of the forearc. In an accretionary margin the forearc is formed by a prism made up of material transferred from the subducting plate. Accretionary prisms are generally characterised by overall compression and uplift. Erosive margins, instead, are characterised by upper plate basement reaching the lower slope and by a frontal prism connecting the basement to the trench. The frontal prism is composed by reworked material from the slope. Also, the erosive margins are characterised by general extension and subsidence of the forearc. Tectonic accretion and erosion can coexist along the same margin, or they can alternate in space and time, producing, respectively, total growth or reduction of the upper-plate mass.

Studies in the Northern Apennines of Italy revealed the evolution of an accretionary prism toward tectonic erosion conditions. In particular paleotectonic and sedimentary records revealed how, during the early Miocene, the frontal part of the Ligurian prism, so called sub-Ligurian units - SLU - has been removed through tectonic erosion. The SLU are Late Cretaceous-middle Eocene oceanic sediments deposited in the easternmost portion of the Ligurian oceanic domain. The mesostructural analysis of the different components of the SLU demonstrates that they have been scraped off from the subducting plate and transferred to the toe of the Ligurian prism during the middle Eocene where they have been unconformably overlain by Oligocene slope deposits

(Petriagnacola and Ponte Bratica turbidite sandstones).

The SLU and the overlying Oligocene slope deposits have been underthrust in the late Oligocene – early Miocene (sub-Ligurian tectonic phase) and they are now sandwiched between the Ligurian thrust-sheet and the underlying Tuscan foredeep units.

The removal of the SLU from the toe of the Ligurian accretionary prism by frontal tectonic erosion, produced a destabilization of the system marked by distinct large-scale tectonic and sedimentary events. These phenomena are well recorded in the sedimentary infilling of the external slope basins on the Ligurian prism (epi-Ligurian sequence) where extensive gravitational mass wasting processes involved the epi-Ligurian sediments older than the Aquitanian. As a consequence of this mass wasting event – the Canossa Event - large submarine debris flow deposits, deriving from the underlying Ligurian Units, have been generated. These deposits are unconformably sealing the Ligurian substratum and few remnants of pre-Aquitania epi-Ligurian deposits.