



Subduction segmentation during slab rollback and the origin of Mediterranean oroclines

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The intimately linked processes of slab rollback, subduction segmentation and oroclinal bending have played a major role in the Cenozoic geodynamics of the Mediterranean region. The initiation of rapid rollback occurred after final collision in the Alps and the indentation of Adria onto Europe. The resulting Mediterranean subduction zones, rather than accommodating the convergence of Africa and Europe, have facilitated escape tectonics by laterally migrating away from the collisional zone. Subduction rollback gave rise to the formation of extensional backarc basins, and was accompanied by oroclinal bending, and progressive segmentation of the subduction zone by lithospheric-scale tear faults.

One of the most pronounced expressions of such tear faults is found in the area of the Tyrrhenian Sea, where progressive curvature of the retreating subduction zone resulted in vertical lithosphere tearing along tear faults and the development of a slab window beneath the central Apennines. Some of these tear faults provided pathways for asthenospheric-derived melting, giving rise to “tear-related” volcanism from the type recognized in Etna and Vulture. Lamproitic magmatism was possibly also associated with slab tear faulting, as demonstrated, for example, in the dextral strike-slip system of the northern Alboran domain. New data from one of these faults, the dextral Socovos Fault, show that clusters of lamproitic dykes along the fault zone become younger from east to west, in accordance with the westward propagation of the segmented subduction zone.

The segmentation of the Mediterranean subduction zone has played a primary role in the formation of oroclines. Such oroclines could potentially be subjected to tightening due to subsequent collisional processes, giving rise to a complex contorted orogenic structure. The “Mediterranean-type” oroclines, therefore, could be used as a template for understanding complex ancient oroclines, such as those found in Variscan Europe, Central Asian Orogenic Belt and the Australian Tasmanides.