

STEP-faults and their role in Mediterranean geodynamics

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The surface expression of slab edges are horizontal terminations of subduction trenches. Here, ongoing tearing of the lithosphere is a geometric consequence. We focus on the tectonic evolution of such Subduction-Transform Edge Propagators (STEPs), which play an important role in the evolution of the Mediterranean realm. We address the implications of STEP faults for the deformation, rotation, topography and sedimentary basins, as derived from our 3D deformation models. Surface velocities are substantially affected by nearby STEP; GPS velocities suggest that STEP faults show intermittent behavior that is related to slab dynamics. We discuss results for STEP faults on both the northern and southern ends of Ionian subduction zone. The southern STEP, just north of Sicily, represents the fault zone formed by the Southern Tyrrhenian strike-slip duplex. We propose that the STEP propagated along this zone until it encountered the Malta escarpment, where it changed direction to the location of the present trench edge. STEP propagation has relevant implications for the upper mantle structure as imaged by seismic tomography. The north Calabrian STEP is less visible in the geology and, in our mechanical models, is assumed to connect the 41-degrees Fault with the north end of the Calabria trench. Finally, we address observations related to the STEP-related tectonic evolution along the South Carpathians and along the Aegean slab.