

2010 AGU Fall Meeting

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Tectonics at the Transition from Subduction to Collision at the Calabrian Arc

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The Calabrian Arc project has taken a multidisciplinary approach to the tectonics of southern Italy. Seismic imaging using receiver functions shows bending of the Adria plate from the shallow subduction zone to a steep slab. Above this transition, the surface tectonics switches from an uplifting plateau (Sila Plateau) to an extensional basin (Crati Valley). The image also shows a thick low-velocity zone below the Plateau, interpreted as underplated sediments offscraped from the downgoing plate. The flank of the Sila Plateau and margins of the Crati Valley preserve Gilbert deltas and marine terraces that record rapid uplift. Fading-corrected IRSL dating of feldspars from these deposits provide consistent results back to 400 ky indicating an uplift rate of 1.2 mm/y. The observations also suggest that these deposits were deposited on an escarpment that was exhumed by the uplift but was not actively faulting during this time. Mapping indicates no fault at the scarp, but we found evidence of active faulting within the Crati Valley. A GPS transect reveals approximately 2 mm/y extension across Calabria. Additional extension near Crotona, on the Ionian margin, may be a shallowly rooted failure or more deeply rooted. The Crotona forearc basin, located between the accretionary wedge and the Sila Plateau backstop, records the tectonic history of the last 10 Ma. This basin was remarkably quiescent from the Tortonian into the Pliocene (except for tectonic effects related to the Messinian Salinity Crisis) during the rapid rollback of the Calabrian Arc. Starting in the Mid- to Late Pliocene there was longitudinal (along arc) compression. This was followed by longitudinal extension starting in the mid-Pleistocene. We interpret this as Calabria reaching the narrow gap between two continental blocks (Apulia to the NE and Africa to the S) and undergoing first longitudinal compression as it squeezed through. We interpret the subsequent longitudinal extension as evidence that Calabria passed the narrowest part of the gap and is now expanding in length. We conclude that Calabrian subduction has not halted and will continue into the future as it has safely navigated past the constriction. The slowing of Calabria and its rapid uplift appear to both begin ~1 Ma. One possible explanation is that when rollback slows, the slab steepens, resulting in both forearc extension, as seen in the Crati Valley, and uplift as seen in the Sila Plateau. Many questions remain, but new observations are beginning to fit into a coherent picture of Calabria tectonics, clarifying fundamental issues about rollback subduction and collision – the trademark of Mediterranean tectonics.

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