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Late Mesozoic Underthrusting of Continental Crust Southwest of the Colorado Plateau

An extensive mylonite terrain, which has generally yielded early Tertiary K-Ar cooling ages and consistent sub-horizontal foliations and northeast-southwest lineations, is exposed across western Arizona and southeastern California. A reconstruction of the crust prior to uplift and listric normal faulting of Tertiary age places Precambrian crystalline terrain above the extensive mylonite terrain. Along its northeastern edge, the mylonite terrain appears to plunge to the northeast beneath the Precambrian crystalline terrain of the transition zone between the Colorado Plateau and the Basin and Range provinces. Petrology of synkinematic intrusions in the Whipple Mountains part of the mylonite terrain suggests that the mylonite formed at depths of 10 km or more. This mylonite terrain is interpreted as a major zone of mid-crustal dislocation that is related to northeasterly directed shallow subduction of Late Cretaceous-early Tertiary age. At higher levels in the crust exposed elsewhere in southwestern Arizona, late Mesozoic supracrustal thrusting occurred (Cordilleran orogeny). Displacement of lower crust to the northeast (underthrusting) in response to subduction resulted in a thickened crust. Subsequent isostatic uplift produced a broad, northwest-trending arch across Arizona and southeast California in the early Tertiary. The Paleozoic and Mesozoic sedimentary sections (both continental platform and thrust hinge-zone rock) were eroded from the arch through the early to mid-Tertiary. Apparent termination of the erosional arch along a northeast-trending zone through the Lake Mead area suggests that the zone may mark a break in the subducting plate. The mylonite terrain was exposed by local intense Oligocene-Miocene vertical tectonism and denudation. Similar local intense tectonism in south-central and southeastern Arizona was accompanied by neomylonization and plutonism that may have obliterated or obscured earlier tectonic fabrics.