OROCLINAL BENDING AND STRAND ABANDONMENT ALONG THE PINTO MOUNTAIN FAULT ZONE—IMPLICATIONS FOR FAULT INTERACTION WITHIN THE EASTERN CALIFORNIA SHEAR ZONE, SOUTHERN CALIFORNIA

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Introduction

This research outlines:

- ❑ The reasons behind the abandonment of the eastern Pinto Mountain fault zone and its relationship to dextral faulting
- ❑ Why fault abandonment shifted from east to west
- ❑ The origin of the oroclinal bend

Materials and methods

- Follows Dixon and Xie (2018) and Hatem and Dolan (2018)
- Geologic map and aerial imagery interpretation
- The National Map https://apps.nationalmap.gov
- Google Earth Pro

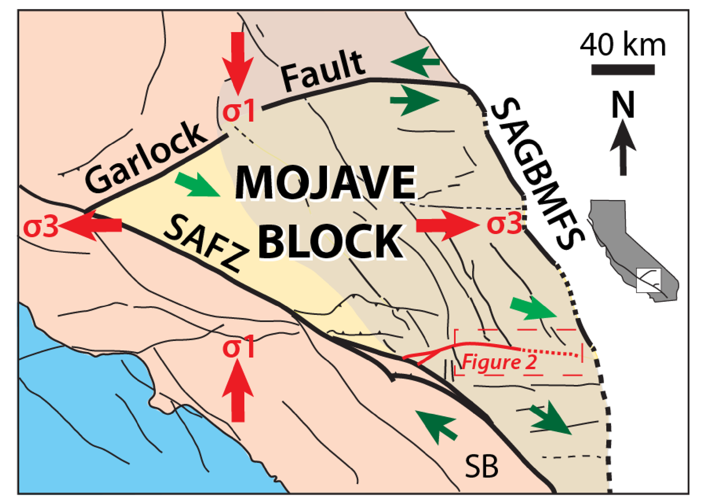

Figure 1. Location and tectonic setting of the Mojave block showing selected faults, fault names, and Eastern California shear zone, maximum and minimum stress axes (σ1 and σ3 respectively), red arrows) and approximate transport direction of Mojave Block crust (green arrows) and Salton Block. Red dashed box shows area in Figure 2. PMFZ denotes Pinto Mtn fault zone, SAFZ, San Andreas fault zone, SB Salton Block, and SAGMFS Soda-Avawatz-Granite-Mts fault system.

Figure 2. Explanation

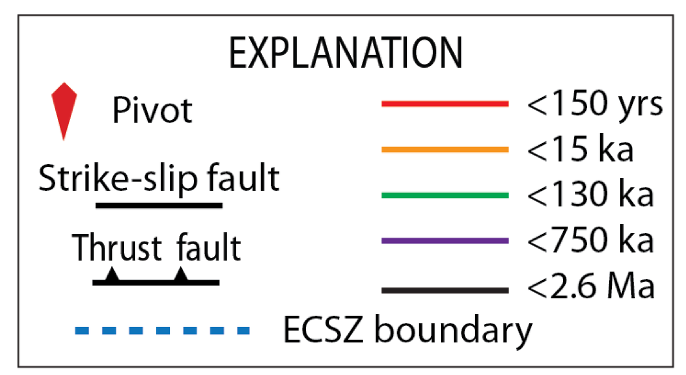

Table 1. Rotation angles and slip contribution in kilometers from oroclinal bending with respect to a pivot at 34.15° N, -116.23° W.

Strand	Length (L)	Rotation angle (θ)	Slip Contribution $g=L/\cos(\theta)-L$
Old Dale	75.71 km	6.3°	0.47 km
Humbug Mountain	60.63 km	12.9°	1.57 km
Dog Wash	41.27 km	8.8°	0.49 km
Eastern PMFZ	31.75 km	10.7°	0.56 km

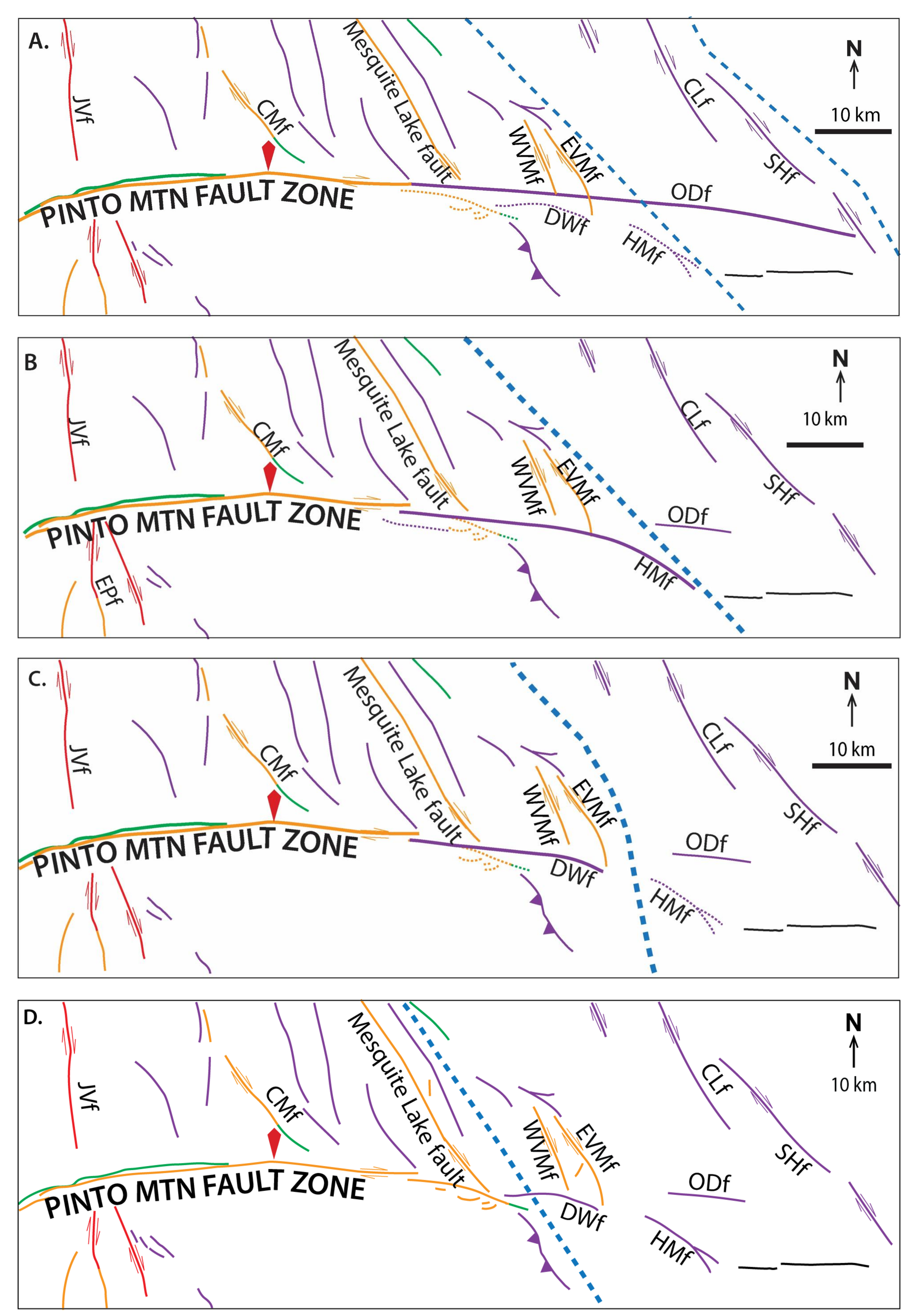

Figure 2. Graphic reconstructions showing the westward progression of the abandoned segment of the Pinto Mountain fault zone at three time intervals beginning in early Quaternary time as the Mojave Desert crust passes beyond the zone influenced by a ductile shear zone at depth (DSZ). JVF denotes Johnson Valley fault, CMF Copper Mountain fault, WVMF West Valley Mountain fault, EVMF East Valley Mountain fault, DWF Dog Wash fault, HMF Humbug Mountain fault, ODF Old Dale fault, CLF, Cleghorn Lake fault, and SHF Sheep Hole fault.

(A). The Pinto Mountain fault zone extends to the east end of the Pinto Mountains. Here, the eastern limit of the zone of active faulting (AFZ) was at the dextral SHF where dextral slip rotated the eastern PMFZ strand, ODF, ~6.3° clockwise (CW) which contributed 0.47 km of slip. Subsequently, the SHF moved east of the AFZ, was abandoned, and unable to interact with the PMFZ. Thus, it too was abandoned.

(B). Early Time 2. The eastern limit of active faulting had now shifted to the vicinity of the EVMF where dextral shear rotated the Humbug Mountain fault strand ~12.9° CW, which ultimately gained 1.57 km sinistral slip, and was abandoned.

(C). Late Time 2. Slip from an apparent local westward shift in dextral faulting rotated the Dog Wash fault strand 8.8° CW, which gained 0.49 km sinistral slip, and was subsequently abandoned.

(D). Time 3 at approximately 130 ka. The eastern part of the modern PMFZ has rotated 10.7° and gained 0.56 km of sinistral slip.

Conclusions

1) This model explains the pattern of faulting within the ECSZ as the Mojave Block crust passes east-southeast over a dextral DSZ in lower lithosphere.
2) PMFZ activity influenced by interaction with dextral faults.
3) Dextral faults transfer strain to PMFZ by bending the eastern part clockwise which lengthens it.
4) PMFZ becomes inactive when interacting dextral fault passed east of the DSZ.
5) Although currently inactive, the presence of dextral faults in San Bernardino Mountains suggests they are over DSZ.
6) Future work includes developing a model that incorporates how strain is transferred to the Pinto Mountain fault zone by conjugate slip from the SAFZ and dextral faults and oroclinal bending.

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Further information

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