

Outcrop Studies of Faulted Depositional Sequences of Indio Mountains, South West Texas

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What are mechanisms which accommodate expansion of stratigraphic section into an actively subsiding basin? Units may onlap and truncate against the basin margin, or tilted older sediments. Individual units may thin, with earlier layers tilting and thickening into the basin. Syn-sedimentary faults may accommodate thickening by either slow subsidence that gradually thickens the each unit, or by punctuated subsidence that results in thickening of individual units. In the Indio Mountains along the border between the United States of America and Mexico, syn-depositional faults block rotation accommodate thickening of sediments in Aptian and Albian rift fill.

In the region, the sedimentary package varies from 120 m at the margin of the formation to over 3 km in the trough interior. A continuous outcrop extends over 30 km oblique to the basin margin with abrupt change in thickness. Depositional environments range from alluvial fans through coastal to shallow marine and represent a transgression. Yucca Formation, Bluff Mesa Formation, Cox Sandstone and Finlay Formation represent the waning stages of this Jurassic to Cretaceous extensional basin. Both antithetic and synthetic syn-depositional faults have been observed. Evidence of syn-depositional tectonism is quite conspicuous as change in facies across the synthetic fault can be easily observed. Measured sections from the Cox Sandstone show variation in facies across the syn-depositional fault. Carbonate beds, mostly bioclastic grainstone are found on the hanging wall and are completely absent in the footwall. Similarly, cliff forming trough cross stratified white sandstone of the upthrown side correlates higher in the section on the downthrown side. It is evident that marine strata were deposited on the downthrown side and then eroded during fluvial deposition on the upthrown side. South of the fault, on the hanging wall of one fault, the marine strata reappear and lap onto the top of the underlying Bluff Mesa formation. Surveying with a GPS unit indicates a 6 degree rotation of the footwall. It is evident that the block rotated during deposition. The important mechanism for thickening is rotation of the strata that were deposited during highstands followed by truncation along the sequence boundaries. For example, shale beds thicken within the rotated strata and accommodate some of the tilting which varies from 18m to 70m within a 2 km distance.