

Fault timing in the Sierra Madre Oriental, northeastern Mexico

By

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Faults in the Sierra Madre Oriental (SMO) in northeastern Mexico can generally be demonstrated to predate the folding of the area. The SMO is a fold-thrust belt consisting of Mesozoic strata folded into tight-to-isoclinal “box” folds of kilometer-scale thickness and wavelength. Prominent in the section is the Cretaceous Cupido Formation, a platformal sequence of limestones and dolostones. More than three quarters of the faults in the Cupido Formation are thrusts, but they have normal displacement in restored bedding. They therefore make kinematic sense as either syn-folding thrusts, or pre-folding normal faults. Such normal faults could be expected to develop early, as a result of gravity-driven spreading of the Coahuila carbonate platform sediments, down the paleo-topographic gradient. This explanation of their development is supported by various lines of evidence. The extension directions of faults in restored bedding consistently trend roughly perpendicular to the edge of the carbonate platform, parallel to its slope. Also, the faults are often associated with changes in layer thickness and can be interpreted as syn-sedimentary growth faults. Some of the faults are crosscut by layer-parallel (burial-related) stylolites, and others are associated with shallowly developed solution-collapse structures. Fault traces are generally sharp, suggesting that most developed after the lithification of the host rock, but ductile faults have been found. In limestones, which are generally accepted to lithify quickly, this suggests a very early fault genesis.