

Offset to the Morales Unconformity along the Russell Fault, Cuyama Basin, California—Seismic and Stratigraphic Evidence

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A recently acquired 3-D seismic survey shows a 0.75 to 1-mi-wide fault zone along the strike of the Russell Fault in the vicinity of the South Cuyama oil field (223 MMBO, 234 BCFG) and the Russell Ranch oil field (68 MMBO, 49 BCFG). Instead of a single or main trace, deformation is spread over numerous faults within a relatively narrow, graben-like structure. The seismic data show that the Morales unconformity, separating the Miocene Santa Margarita Formation from the overlying Pliocene Morales Formation, is offset along this zone by apparent normal faults. Localized thickening of both the Santa Margarita and Morales Formations observed in well logs indicates that movement along the fault zone continued into the Pliocene. Seismic data suggest also that the Pleistocene alluvial deposits unconformably overlying the Morales Formation are not offset. The seismic and well data confirm that this mid-Miocene and Pliocene-aged deformation was part of the long history of displacement of the Russell Fault. This final phase of movement along the Russell Fault zone resulted in the creation of a linear extensional structure that helped provide critical southwestern closure for Russell Ranch and South Cuyama oil fields. Movement along the Russell fault zone continued after the Pliocene Morales unconformity and appears to have ended prior to the Pliocene/Pleistocene unconformity.