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## **LATE OLIGOCENE-MIOCENE STRUCTURES IN AND WEST OF THE SANTA FE EMBAYMENT, NEW MEXICO, AND INFERENCES REGARDING TECTONISM AND PALEOTOPOGRAPHY**

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Study of well cuttings and outcrops south and southwest of Santa Fe, New Mexico, allow insights about three important structural features in and west of the Santa Fe embayment, as well as inferences regarding paleotopography and tectonic activity in the late Oligocene-Miocene.

The first structural feature is the Cerrillos uplift, bounded on its west side by the proto La Bajada (i.e., Tetilla) fault zone. Along the La Bajada escarpment between the Santa Fe River and Tetilla Peak are exposures of middle(?) Miocene fluvial strata consisting of overbank sediment intercalated with coarser channel fills containing latitic gravel; paleosols are lacking and paleoflow indicators indicate a predominant WNW transport direction. These strata reflect erosion of older Espinazo Fm from a structural and paleotopographic high (the Cerrillos uplift) that trended N-S between Tetilla Peak and the Cerrillos Hills. Farther east, fans of volcanoclastic detritus (basalt and latite gravel, sand, and mud of lithosome E, Tesuque Fm) shed from these highlands extended towards the center of the Santa Fe embayment in the late Oligocene but receded westward in the Miocene, perhaps due to progressive erosion and lowering of these highlands during the Miocene.

Second, stratigraphic correlations from well data agree with previous aeromagnetic, gravity, and seismic reflection data (Black, 1984) indicating a north-plunging, broad syncline near the center of the embayment under the Plio-Pleistocene Ancha Fm. Slight thickness changes in early-middle Miocene units suggest that this syncline was actively subsiding during the early-middle Miocene.

Third, our data support the existence of a north-facing, curvilinear hinge line near the modern Bonanza Creek (Phillips and Grauch, 2004). South of this hinge, erosion caused significant paleotopographic relief (as much as 110 m) on top of the Espinazo Fm prior to burial by rift-basin fill in the Miocene through Pleistocene. At the New Mexico State Penitentiary, late Oligocene-Miocene basin-fill strata of the Santa Fe Group strike 270-275°, with calculated dips of 7-8°N for the top of lithosome E and overlying Tesuque Fm. A subunit within lithosome E thickens slightly to the north, which is suggestive of syn-depositional tilting. The top of the underlying Espinazo Fm dips greater than 14°N, implying that northward tilting in this part of the basin occurred between deposition of the Espinazo Fm and lithosome E (i.e., within the late Oligocene through early Miocene), although this interpretation is complicated by erosional paleotopography. The approximate coincidence of a younger depositional boundary between lithosomes A and S of the Tesuque Fm with the hinge line implies that early-middle Miocene tectonic tilting continued along this line.

We also infer the following from these relations: 1) the lack of paleosols and the preservation of fining-upward packages of channel fill-overbank deposits in middle(?) Miocene strata west of the Cerrillos uplift suggest that basinal deposition was relatively continuous on the downthrown, west side of the proto La Bajada fault zone, which was probably located 2-4 km east of the modern La Bajada fault zone; 2) the syncline in the Santa Fe embayment may have resulted from flexure during protracted footwall uplift along the La Bajada fault zone; and 3) formation of the Cerrillos uplift was probably due to a combination of this footwall uplift and remnant constructional topography from Oligocene shallow intrusions and volcanism.