

Koning et al., 2007 -- Geological Society of America, *Abstracts with Programs*, Vol. 39, No. 6, p. 495.

TECTONIC EVOLUTION OF THE ESPAÑOLA BASIN AND ABIQUIU EMBAYMENT, RIO GRANDE RIFT, NORTH-CENTRAL NEW MEXICO

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Comparison of the stratigraphy and geochronology of the Española Basin relative to faults and stratal tilts elucidate its rift tectonic evolution. Our data indicate activity along basin-margin faults early in rifting and that middle Miocene development of the Santa Clara fault may possibly have allowed linkage of a central fault system (CFS) that accommodated rift inter-basinal strain in the late Miocene through Quaternary. The east-dipping Pajarito (PF), Santa Clara (SCF) and Black Mesa (BMF) faults divide the basin into a west-tilted, eastern half-graben and the structural bench of the Abiquiu embayment. East-down faulting along both basin margins occurred early in rift development (late Oligocene) and probably accompanied westward tilting and basaltic volcanism at 25-26 Ma. Some Laramide reverse faults were probably reactivated as extensional faults during late Oligocene time. A compressed stratigraphic section overlying an angular unconformity on the PF footwall indicates late Oligocene-Miocene movement along that structure. In the northeastern basin, comparison of stratal thicknesses and tilts parallel to and across structures suggests subsidence along faults and monoclines between 18 and 15 Ma. Good exposures east of Española show dips decreasing up-section, indicating west-tilting during mid-Miocene deposition. Stratal thickness differences between the footwall and hanging wall of the SCF become progressively more pronounced between 16 and 10 Ma, particularly after ~12.7 Ma, indicating increased throw rates on this fault. The significant post-12.7 Ma rate increase, plus stratigraphic evidence supporting 11-13 Ma movement along faults between the SCF and PF, may possibly have accompanied development of a linked central fault system (CFS) accommodating inter-basinal strain between the San Luis and Albuquerque basins. The SCF produced approximately 430-500 m of stratigraphic separation after 10 Ma. The Pliocene-age Puye Fm is locally tilted 3-5° W adjacent to east-down faults near the CFS; Pliocene strata further east are tilted 0-1° W near Santa Fe. Local transverse folding in the immediate hanging-wall of the SCF may have begun in the late Miocene, but mostly developed in the latest Miocene through early Pliocene, and probably accompanied a component of lateral slip along the CFS.