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Tertiary Tectonostratigraphic History of Northeast Nevada

Concepts concerning the extensional history of the Basin and Range Province have changed dramatically in the past ten years or so. Seismic reflection profiling coupled with geologic mapping and structural studies indicate that low-angle normal faulting is widespread, especially in eastern Nevada. The character of the low-angle normal faults vary from listric normal faults to planar normal faults rotated to a low angle to extensive, low-angle detachment faults. Furthermore, detailed geochronological studies using a variety of techniques on rocks ranging from Tertiary volcanic rocks to mylonitic gneissic rocks have documented a complex pre-Basin-and-Range ductile-brittle extensional history. Both the ductile and brittle Tertiary structures can be integrated into a shear zone model which evolved through time. Mylonitic rocks, deformed in the middle crust in a kilometer-scale ductile shear zone, were dragged upward where these rocks experienced superimposed, brittle deformational processes. A continuum of deformational styles are, therefore, preserved in these ductile-brittle, Tertiary extensional shear zones. Such shear zones are apparently a key structural element in the tectonic extension of continental lithosphere.

Fortunately, an extensive Tertiary rock record is exposed in northeast Nevada which allows the integration of the structural model with stratigraphic history. An important conclusion from my studies in Elko County, Nevada, is that magmatism, although episodic, was synchronous with the inferred Tertiary extensional history which probably began about 45 Ma. This magmatism is manifested as a diverse suite of igneous rocks ranging from silicic ash flow tuffs and epiclastic equivalents to two-mica granitoids to bimodal basalt-rhyolite suites. Synchronous with ductile-brittle extensional faulting and widespread magmatism was a

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complex sedimentary response chiefly manifested as alluvial fan-lacustrine complexes, some including excellent Tertiary source rocks (e.g., Eocene-Oligocene Elko oil shale and platy limestone in the Miocene Humboldt Formation).