

**STRUCTURAL EVOLUTION AND GEOCHRONOLOGY
OF THE SOUTHEASTERN LLANO UPLIFT,
CENTRAL TEXAS**

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The Llano Uplift, central Texas, exposes Middle Proterozoic crystalline rocks that were deformed and metamorphosed during Grenville orogenesis. New U-Pb zircon geochronology from the Valley Spring Gneiss and Packsaddle Schist in the southeastern Llano Uplift, combined with previous data, demonstrate that several map units contain disparately aged constituents. Three new units are differentiated: the Comanche Creek Gneiss, Coal Creek Formation, and Inks Lake Gneiss. Results show that younger Packsaddle Schist lies in structural contact above older Valley Spring Gneiss. Also, zircons in a Valley Spring Gneiss unit are the oldest yet found in the uplift (~1360 Ma). Their age is consistent with those of the Western Granite-Rhyolite Terrane. The map distribution of U-Pb data shows four age suites of rocks of distinct tectonic origin. A 1248-1244 Ma

Packsaddle Schist is structurally wedged between 1270 Ma northerly Valley Spring Gneiss, and southerly ~1300 Ma Big Branch Gneiss and older Coal Creek units. Younger meta-intrusive rocks intrude the metamorphic pile. Grenville orogenesis is constrained to have occurred between 1215 Ma and 1098 Ma.

Detailed structural mapping shows that these rocks record a polyphase deformational history progressing from 1) NE-directed, collision(?) -related ductile thrusting and shortening (D2), to 2) regional-scale polyphase folding (D3, D4, D5), indicating continued N- to NE-directed contraction, to 3) late-stage, post-collisional N-S extension. D2 deformation was partitioned, with ductile thrust zones accommodating NE-directed shearing, and intensely folded units representing shortened and flattened zones. Strong development in different areas of different post-D2 fold generations suggests that these areas are in regional-scale fold hinges. Thus, the southeastern Llano Uplift consists of multiple generations of regional-scale folds. N-S extension is recorded by quartz vein fibers oriented normal to a WNW-striking, variably dipping extensional crenulation cleavage and subparallel to the stretching direction of boudins. The timing and orientation of these structures is consistent with late-stage N-S extension.

The Llano Uplift represents the metamorphic core of a Grenville-age continental collision zone. Island-arc, accretionary complex, oceanic, and arc-flank/continental-slope assemblages were contracted between continental-scale blocks and emplaced onto North America's southern margin. Ductile thrusting and polyphase folding accommodated deformation of this material and its tectonic transport continentward. Increasing pressure-temperature conditions of

dynamothermal metamorphism toward the orogenic core are attributed to greater crustal thickening related to continental margin underthrusting and tectonic stacking.