
Mesoproterozoic tectonic evolution of the western Llano uplift, central Texas: The story in an outcrop

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ABSTRACT

A small, but perfectly exposed outcrop of Mesoproterozoic rocks in the western Llano uplift displays lithologic and structural relations from which a sequence of geologic events has been determined. Detailed geologic mapping and petrologic studies combined with new U-Pb ages of key units are used to constrain the tectonic evolution of this little-studied region and provide a basis for comparison with the previously studied southeastern uplift.

The outcrop consists of layered mafic and felsic gneiss cross-cut by three generations of granitic dikes and sills. The sequence of events as deduced from cross-cutting relations and U-Pb geochronology is as follows: (1) generation of compositional layering (S_0) and parallel biotite foliation (S_1) in the gneisses at 1256 Ma; (2) emplacement of the first set of granitic sills and dikes at 1253 Ma; (3) transposition, isoclinal folding, amphibolite facies metamorphism, and fabric formation (S_2) between 1253 Ma and 1126 Ma; (4) emplacement of pegmatitic granitic dikes at 1126 Ma; (5) open folding and boudinage between 1126 Ma and 1076 Ma; and (6) emplacement of aplitic granitic dikes at 1076 Ma. Four U-Pb ages of titanite, two each from the gneiss and pegmatitic granite, are concordant at ~ 1114 Ma indicating that the region had been sufficiently hot to reset titanite ages in the gneiss and that the region had cooled below the titanite blocking temperature by this time.

The tectonic evolution of this outcrop is remarkably similar to that of other areas of the Llano uplift, suggesting that the entire uplift experienced a similar evolution.

KEY WORDS: Llano uplift, Precambrian, Grenville, Mesoproterozoic, U-Pb geochronology.