

DEFORMATION AND METAMORPHISM OF THE
ROUGH RIDGE FORMATION,
LLANO COUNTY, TEXAS

BY

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THESIS

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ABSTRACT

Detailed field and petrographic study of the Precambrian Rough Ridge Formation of the Packsaddle Schist documents a more complex tectonic history for the Llano Uplift than has previously been reported. The Rough Ridge Formation was affected by two metamorphic events and four phases of deformation. Mineral assemblages in pelitic and mafic lithologies are characteristic of the amphibolite facies, and the presence of cordierite in preference to almandine indicate low pressure during part of the metamorphism. Inclusions of staurolite in a Mn-rich garnet, coupled with the absence of staurolite elsewhere in the rock suggest that pressure may have ranged from medium to low during metamorphism. Textures indicate that post-tectonic recrystallization occurred as a consequence of either slow cooling or of reheating after dynamothermal events. The first phase of deformation (D1) was a complete transposition of original sedimentary layers, with a pervasive foliation (S1) forming parallel to the axial planes of isoclinal folds. D2 is characterized by small folds and a crenulation cleavage S2. D3 formed a crenulation cleavage S3. D4 formed the prominent folds in the area, with a pervasive axial planar cleavage S4. Isolated occurrences of a pre-S1 metamorphic foliation are evidence of still earlier deformation. In one pelitic unit, oriented inclusions show that garnet growth was post-D2, while cordierite growth was post-D4. Growth and recrystallization of micas, quartz and feldspar span all the deformations.

The timing of deformation events is bracketed by the pre- to syn-tectonic intrusion of the 1167 +/- 15 m.y. old Red Mountain Gneiss,

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and the post-tectonic intrusion of a 1080 +/- 15 m.y. old melarhyolite dike.

The results of this study demonstrate that rocks of the Llano Uplift have undergone a complex tectonic and metamorphic history similar to that seen in other Grenville Age rocks of North America.