

DEFORMATION AND METAMORPHISM
OF THE RED MOUNTAIN AREA
LLANO COUNTY, TEXAS

by

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THESIS

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Abstract

The Red Mountain area in the southeast corner of the Llano Uplift shows evidence of four different deformations in the Precambrian Click Formation of the Packsaddle Group, and a single shear-related deformation in the Big Branch and Red Mountain gneisses. The first phase of deformation produced tight folds with an axial planar metamorphic foliation. D_2 , the most intense and pervasive deformation, produced the regional metamorphic layering, transposition of bedding, and mylonitic textures in the gneisses. During this deformation, numerous microscopic to outcrop-scale isoclinal folds, and a well-developed axial-planar foliation also formed in the schists. The third deformation is characterized by tight to isoclinal, west-verging folds with an axial-planar differentiation crenulation cleavage. The last phase of deformation, D_4 , resulted in a NNW-trending differentiation crenulation cleavage which is axial planar to small NE-verging folds. Growth of cordierite over all foliations indicates that low-pressure metamorphism postdated all four deformations.

Latest in the deformational history are two sets of brittle faults trending NNW and NE. Both sets cut through all ductile Precambrian structures and show cataclastic textures. The NNW-trending fault zone caused dextral offset and in one area displaces an undeformed melarhyolite dike dated at 1080 ± 15 Ma, giving a maximum age of faulting. This zone affects rocks over a surface area of 4.8 km by 250 m. The NE-trending faults are typically narrow zones showing identical

brittle textures with normal offset associated with uplift during the Paleozoic.

Ductile deformations occurred after the intrusion of the Red Mountain and Big Branch gneisses dated at 1167 ± 30 Ma, and before the intrusion of the melarhyolite dike at 1080 ± 15 Ma. Both fault zones post-date 1080 Ma.

u/Pb 1238 ± Ma (Eisen)
1098 ± 10 Ma zircon

This study expands and further supports recent work indicating that the Llano Uplift has undergone a complex, multiphase deformational history with major transposition of bedding due to isoclinal folding and ductile shearing.