TECHNICAL IMPLICATIONS OF THE POLYDEFORMED MIDDLE PROTEROZOIC COAL CREEK SERPENTINITE, LLANO UPLIFT, TEXAS

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ABSTRACT

The Middle Proterozoic Coal Creek Serpentinite (1.2 - 1.0 Ga) of the southeastern Llano Uplift, Gillespie County, Texas, is the only known serpentinite of Grenville age and is a critical part of tectonic models for Texas and North America during the Precambrian. The Coal Creek Serpentinite is considered to be the altered remnant of the ultramafic tectonite portion of an ophiolite. Detailed mapping of the Coal Creek Serpentinite and adjacent Packsaddle Schist and Big Branch Gneiss has demonstrated that the serpentinite and adjacent rocks have been multiply deformed synchronously with amphibolite facies metamorphism, indicating a complex post-emplacement (and perhaps emplacement) history.

Folds of the pervasive NW-striking regional metamorphic foliation (layering) trend predominantly WSW and SSE. Near the contact with the serpentinite, boundarige with extension in N-S and E-W directions affects the Packsaddle Schist, recording high extensional strains. Coal Creek Serpentinite is massive, with two orientations of cross-cutting mineralogical layering, to schistose, with up to four foliations. Chloritized Coal Creek Serpentinite shows two crenulation cleavages that correspond in orientation to folds within the Packsaddle Schist.

The polyphase deformation of the Coal Creek Serpentinite is consistent with the complex synmetamorphic deformational history documented elsewhere in the Llano Uplift. If the Coal Creek Serpentinite is indeed evidence of Grenville-age subduction, its subsequent deformation history requires collision of an island-arc or continental mass with the Texas craton prior to 1.0 Ga.

TECTONIC ORIGIN OF MONTGOMERY TERRACE SCARP OF SOUTHWESTERN LOUISIANA

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ABSTRACT

In Southwest Louisiana, a prominent coastwise scarp, called the "DeQuincy Scarp" in this study, trends east-west across southern Beauregard and northern Calcasieu Parish. The scarp is about 25 ft (8 m) high and 25 miles (40 km) long.

The purpose of this study was to determine whether the origin of this scarp is tectonic in nature or related to Quaternary sea level changes. The study area consisted of 60 square miles within Calcasieu and Beauregard Parishes near DeQuincy.

This study used both geomorphic and subsurface data. The mapping of surfaces and features used soil surveys, topographic maps, and aerial photography. The mapping was checked by limited fieldwork. The subsurface investigations used foundation borings and the electric logs of water wells, salt water disposal wells, and oil wells to define the subsurface stratigraphy. The available biostratigraphic data were incorporated into the subsurface investigations used foundation borings and the electric logs of water wells, salt water disposal wells, and oil wells to define the subsurface stratigraphy. The available biostratigraphic data were incorporated into the subsurface investigations used foundation borings and the electric logs of water wells, salt water disposal wells, and oil wells to define the subsurface stratigraphy.

The subsurface data demonstrated that the fault associated with the DeQuincy, Perkins, and east Perkins Oil Fields extends to the base of the DeQuincy Scarp. First, regional studies show that this major normal fault very closely parallels the DeQuincy Scarp. Second, between 2300 to 6500 ft (700 to 2000 m) below sea level, cut points on electric logs define the depth and throw of the fault. The fault plane projected from these cut points intersects the surface within the base of the DeQuincy Scarp. Finally, abrupt changes in the elevation of specific stratigraphic units between closely spaced wells indicate that strata from 200 to 2900 ft (60 to 700 m) below sea level are offset by faulting.

The geomorphology of the study area suggests a tectonic origin of the DeQuincy Scarp. The bottom part of the DeQuincy Scarp exhibits distinct tonal and topographic lineaments often associated with the surface expression of faulting. Also, the Prairie Terrace of Beckwith Creek and the floodplain of Cowards Gulley exhibit features that suggest possible movement along the DeQuincy Scarp contemporaneous with their formation.

Two distinct periods of movement have occurred along the fault. The period of initial movement was contemporaneous with the deposition of Upper Eocene to Lower Oligocene strata according to regional studies. The fault was inactive for the remainder of the Oligocene, all of the Miocene, and most of the Pliocene. During the Late Pliocene or Early Pleistocene, the fault was reactivated. Faulting contemporaneous with sedimentation has produced an upward decrease in throw and an increase in thickness of section on its downthrown side. For example, the fault has offset the base of the 500 ft Sand (the Citronelle Formation) by about 90 ft (27 m) and the base of the Beaumont Clay by about 40 ft (12 m) within the study area. The Intermediate Terrace was displaced by about 25 ft (8 m) to form the DeQuincy Scarp. Geomorphic features suggest that faulting continued into the Wisconsinan Stage and possibly later.

The tectonic origin of the DeQuincy Scarp is significant to geomorphic and stratigraphic studies within the Gulf Coastal Plain. This study indicates that studies of landform evolution within Gulf Coastal Plain need to consider neotectonic processes. The tectonic origin of this scarp and recent revisions of Midwest Quaternary geology suggest that a one to one relationship between geomorphic surfaces and Quaternary sea level fluctuations is unlikely.

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