

# SIGNIFICANCE OF NATURAL AND CORING-INDUCED FRACTURES IN THE TRAVIS PEAK FORMATION FOR RESERVOIR STIMULATION

Stephen E. Laubach<sup>1</sup>

## ABSTRACT

Efficient hydraulic fracture treatment of low-permeability sandstone gas reservoirs depends on an assessment of natural-fracture length, width, and abundance and on reliable predictions of the stimulation-fracture strike, which generally is parallel to the maximum horizontal stress. Analysis of 565 natural and coring-induced fractures in more than 1,800 ft of whole core from seven wells in the Lower Cretaceous Travis Peak Formation in East Texas (Fig. 1), together with borehole televiewer and other fracture-imaging logs from three wells, shows that (1) the abundance, physical properties, and orientation of natural fractures could potentially affect the success of hydraulic fracture treatment and (2) the orientation of coring-induced petal and petal-centerline fractures can be used to infer the direction of stimulation-fracture propagation. Reservoir sandstone in the Travis Peak contains subvertical natural extension fractures that are locally open in the subsurface with widths of as much as 0.2 in (5 mm) (Fig. 2) at depths of greater than 9,900 ft in hydrostatically pressured rocks. Fractures are more abundant in the hinges of gentle monoclines and in sandstone with pervasive quartz cement. Natural fractures strike east-northeast (Fig. 3), but they are not precisely parallel to the direction of stimulation-fracture propagation. During hydraulic fracture treatment, these characteristics will tend to cause fracture branching, curvature, and development of auxiliary fractures. The resulting tortuous fracture network, variable fracture widths, and potential for leakoff of treatment fluid could promote screenout and, consequently, inefficient fracture treatment, if not considered in fracture treatment design.

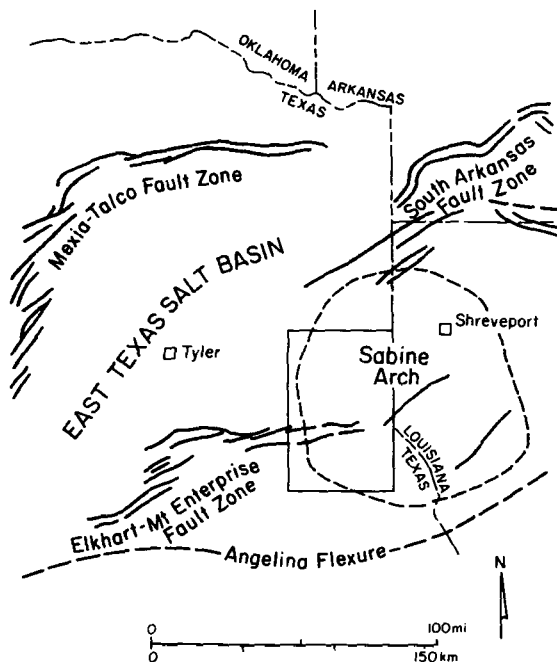


Figure 1. Structural setting of the study area (outlined by box) in the northern Gulf of Mexico basin.

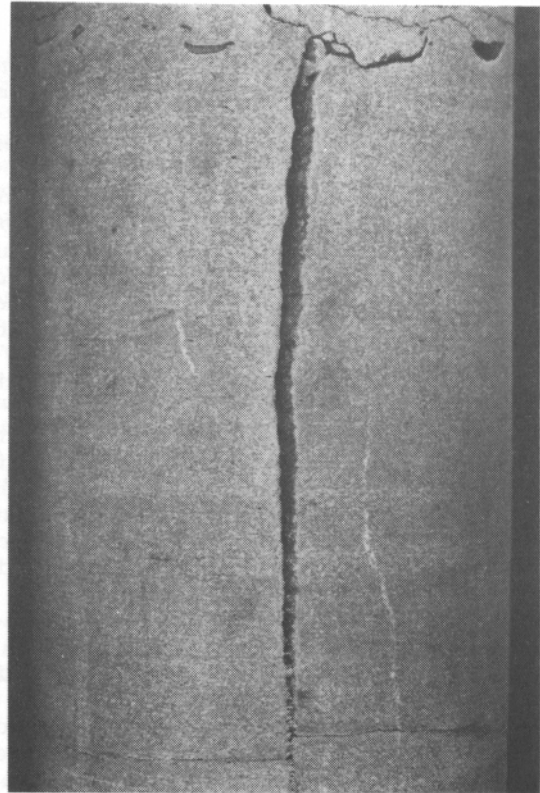


Figure 2. Natural extension fracture in Travis Peak Formation sandstone at 9842 ft (3000 m), S.A. Holditch & Associates SFE No. 2, Nacogdoches County, TX. Long dimension of the photograph is 4.7 in (12 cm).

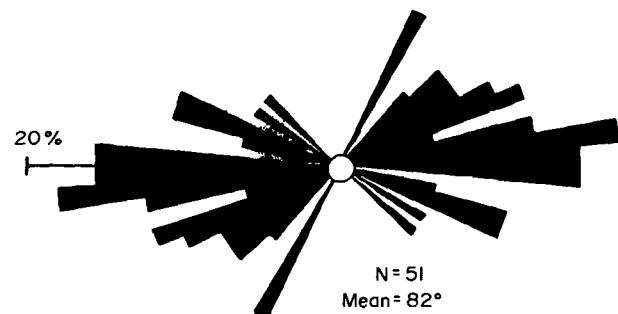


Figure 3. Rose diagram of natural extension-fracture attitudes in the Travis Peak Formation, East Texas.

<sup>1</sup>Bureau of Economic Geology, the University of Texas at Austin, 78713

Study funded by the Gas Research Institute under contract no. 5082-211-0708.