TECTONIC FACTORS AFFECTING THE AUSTIN CHALK PLAY

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The Austin Chalk play occurs within brittle, naturally fractured Upper Cretaceous lime micrites. The best production occurs in a band from Dimmit County to Burleson County, where the chalk is buried from 4,000' to 6,000' at present. The origin of the small faults and fractures that are the source of permeability is not definitely understood, but may be related to autogenous hydrocarbon generation and concomitant overpressuring in an overall extensional environment. The Austin in this belt is today in the zone of oil generation, suggesting that much fracturing may be fairly recent (Neogene) in origin.

The trend occurs in two different contemporary stress regimes. In the areas northeast of Gonzales County (and possibly in part of Atascosa County), the trend overlies Jurassic salt and is downdip of the peripheral graben system, which marks the breakaway of the Mesozoic-Cenozoic sedimentary sequence from its Paleozoic substrate. In this region, all stress indicators (borehole breakouts and fracture orientations) uniformly show strong extension towards the Gulf and away from the peripheral graben system. This is consistent with sliding of the sedimentary column towards the Gulf of Mexico Basin. In the Giddings area, this would indicate a maximum compressive stress about N45E. West of Atascosa County, however, the trend occurs updip of the mobile salt layer, and is attached to Paleozoic basement. Gough and Bell (1981) interpreted the borehole breakouts reported by Schafer (1980) to be aligned N39E in the Pearsall area to indicate that the maximum compressive stress today is oriented N51W, consistent with information from the Llano Uplift (N33W; thrust or strike-slip solutions) and West Texas (Zoback and Zoback, 1980). This stress regime is incompatible with either the observed fracture trend in the Austin Chalk or the Balcones normal faulting. If this is true, does this indicate a post-Miocene change in plate stress regimes?

In the southwesternmost part of the Pearsall trend, the Frio River Line is crossed (Ewing, 1987), and structures are affected by Laramide NE-directed compression. Fractures in this area (including the Chittim Anticline area) may be Laramide in age and fold-related rather than related to Gulfward sliding of sediments. Laramide fracturing may, however, have bled off overpressuring and reduced autogenous fracture effectiveness.

We need more systematic study of borehole breakouts and the azimuths of natural and induced fractures place the contemporary and paleo-stress fields of South Texas in a tectonic context.

REFERENCES

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