

HYDROCARBON GENERATION AND MIGRATION ROUTES IN THE EAST TEXAS BASIN

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ABSTRACT

The East Texas basin is a prolific, mature hydrocarbon province, producing oil and gas from several reservoirs and a variety of trap types. Much of the liquid hydrocarbons discovered in the basin are trapped in structures related to movement of the underlying Louann Salt. By determining the structural evolution of the basin, a framework was constructed to model the generation of hydrocarbons and map migration routes. Oil to source rock correlations in the basin indicate there are three major source horizons; the Bossier shale (Jurassic oil), shales in the Pearsal Group (Lower Cretaceous oil), and the Eagleford shale (Upper Cretaceous oil). The Bossier shale is mature throughout the basin and began to expel oil approximately 88 ma. The distribution of Jurassic oil in Cretaceous reservoirs shows that vertical migration routes predominated. Lower Cretaceous source rocks are only mature in the deep, central portion of the basin where expulsion commenced around 47 ma. Distribution of this oil type points to lateral migration routes controlled by porosity trends in Lower Cretaceous carbonates and vertical routes where faults intersect porous zones. The Eagleford shale is immature in the main part of the basin, but it is mature south of the Angelina-Caldwell flexure where it reached peak generation approximately 20 ma. Lateral migration explains the distribution of this oil type. Migration routes to the giant East Texas Field may be 60 miles or more.

Modelling of this basin suggests an exploration approach in mature basins of defining migration pathways and seeking traps astride them. Traps in this position have a better probability of being filled; and all else being equal, are likely to be better fields than traps located away from the major migration routes. Exploration efforts concentrated in these areas ought to bring a greater reward for each exploration dollar spent.

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