When Seismic is Not Enough: Improving Success by Integrating High-Resolution Surface Geochemical Data with Seismic Data

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Seismic data are unsurpassed for imaging trap and reservoir geometry, however, in many geological settings seismic data yield no information about whether a trap is charged with hydrocarbons. In other settings, the quality of seismic data is poor due to unfavorable geology or surface conditions. For this presentation we will review the results of integrated seismic and geochemical surveys (1) over pinnacle reefs East Texas, (2) in the Ft. Worth basin of North Texas, and (3) across Pennsylvanian channel sandstones in Oklahoma and Texas.

Geochemical data acquired over the pinnacle reefs clearly discriminates between hydrocarbon-charged reefs and dry or non-commercial reefs. In the Fort Worth basin, geochemical evaluation of a seismically defined Ordovician Ellenburger structural trap identified a minor seepage anomaly associated with it and an extensive microseepage anomaly over a nearby structural low. Subsequent drilling yielded a dry hole on the “high” and discovered a new Park Springs Conglomerate (Pennsylvanian) field in the area of the seismic “low.” The channel sandstone examples demonstrate the use of gridded microbial surveys to discriminate between hydrocarbon-charged and uncharged Pennsylvanian channel sandstones.

Applications such as these require close sample spacing and are most effective when results are integrated with subsurface data. The need for such integration cannot be overemphasized. High-resolution microseepage surveys offer a flexible, low-risk and low-cost technology that naturally complements traditional geologic and seismic methods. Properly integrated with 2-D and 3-D seismic, their use has led to the discovery of new reserves and the drilling of fewer dry or marginal wells.