



Understanding Migration and Trapping in Unconventional Plays

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Summary

I will present a collection of evidence for HC migration and trapping at various scales in unconventional plays. Production data from millions of wells displayed in the geological context show spatial distribution of hydrocarbons conform to structure, faults, and depositional facies boundaries, indicating same geological and physical controls are at play in shale reservoirs as in conventional reservoirs. Production of higher maturity fluids from low maturity, or immature strata, and production of different fluids from adjacent, or interlaced zones show mixing and/or interlacing of high maturity and low maturity fluids. Migration and mixing can lead to in situ phase separation and in turn excessive gas production in an oil play. Long distance migration can be inferred from production data as well.

We will also demonstrate that capillary seals are a very important and required element for unconventional plays, as the quality of the seals controls the saturation of hydrocarbons. This compares with conventional reservoirs where seals control mainly the column height. Homogeneous shales do not retain sufficient hydrocarbons, even where maturity, TOC, porosity, and clay content, etc. are favorable.

Traditional sweet spot analysis for shales have been mainly focused on source rock quality and maturity. This may have led to incorrect predictions due to lack of consideration of migration and phase behavior as a factor. We believe exploration for unconventional plays need to consider migration and trapping mechanisms by examining structure, stratigraphic traps as well as seals. In other words, the same evaluation criteria apply to conventional and unconventional plays at various scales.