



Fundamentals of hydrocarbon movement and entrapment: Progression in understanding of hydrocarbon movement

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Summary

This year's Gussow Conference has the theme of 'Subsurface Hydrocarbon Movement'. Migration is generally broken down into two or three distinct stages. Primary migration is concerned with the movement of hydrocarbons out of the source rock. Although it is generally lumped with the expulsion of hydrocarbons from kerogen, these are distinctly different processes. It has long been known that fractionation of petroleum occurs during primary migration with expulsion of hydrocarbons favoured over polar compounds that remain in the source rock. The present-day importance of unconventional petroleum systems, where primary migration is either limited or does not occur, has led to a renewed interest in the movement of hydrocarbons in fine-grained rocks, on how efficient this process is, and on how much of the hydrocarbon charge is retained in the source rock. Secondary migration is the vertical movement, due to buoyancy, of the expelled hydrocarbons from source rocks in carrier systems to traps that range from less than kilometer to hundreds of kilometers away from the source rock. Geochromatography has been suggested in the past as means of indicating migration distance and while this occurs, there are too many variables for any definitive estimate distance. The role of water in secondary migration still remains controversial, although the majority of geochemists believe hydrocarbons migrate as separate discrete phase. The movement of hydrocarbons that are not trapped but escape to the surface as seeps is sometimes referred to as tertiary migration. These hydrocarbons can be those leaking from traps, as most seals are permeable on a geological time-scale, or those that were never trapped. Detecting seepage using only geochemical analyses, especially in marine sediments, can be difficult which has led to the development of exploratory microbiological methods including genomics.

This introductory talk will endeavor to set the stage for the rest of the meeting by briefly highlighting what is known and not known about subsurface hydrocarbon movement. It is evident that migration remains probably the least understood process of petroleum system analysis, a reason why it remains difficult to model accurately.