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Are Major Deltas Complete Petroleum Systems Unto Themselves?

Large deltas can dominate their respective basins and are often hosts for prolific hydrocarbon accumulations. A petroleum system is usually defined as one that encompasses an active source rock and all related oil and gas deposits, including all the geologic elements and processes required for hydrocarbon accumulation. Essential elements include source, reservoir, and seal facies, and processes include trap creation and the formation, migration and trapping of hydrocarbons. All of these elements and processes may be found in large deltas, particularly if viewed as part of linked systems, extending from highstand to lowstand deltas and ultimately to associated deposition in deep-sea basins. Within these systems, a great variety of non-marine, estuarine, and marine reservoir, source, and seal facies develop. Both stratigraphic and structural traps form naturally during deltaic evolution. Gravity driven tectonics from sediment loading creates growth faults and coupled extensional-compressional systems, forming traps and vertical migration pathways. Although all elements and processes for a successful petroleum system may be present within a large deltaic system, a critical consideration is the timing of their development. Source facies for some large deltaic accumulations are still enigmatic, and the delta may simply host hydrocarbons generated from unrelated source rocks. Sediment loading can catalyze the formation of a hydrocarbon system, by interacting with salt or mobile shale to create migration pathways and traps, or by the burial and subsequent maturation of a pre-existing source facies. This session will address the concept of whether large deltaic systems comprise complete petroleum systems.