

Development of Petroleum Systems in Northern Alaska – Timing of Petroleum System Events Controls Presence of Accumulations

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The Alaska North Slope, including the adjacent Beaufort and Chukchi continental shelves, is one of the remaining petroleum exploration frontiers, and is estimated to contain most of the undiscovered oil and gas resources in the North American Circum-Arctic (Gautier et al., 2009). We present a calibrated 3D model of the Alaska North Slope region that reconstructs, quantifies, and evaluates the development of the individual petroleum systems, burial history, and thermal evolution, as well as migration, accumulation, and preservation of hydrocarbons.

The geologically complex Northern Alaska petroleum province evolved through the tectonic stages of passive margin, rift, foreland basin, and foreland fold and thrust belt. Petroleum was generated from several source rock units, and many reservoirs show evidence of mixing of hydrocarbon source types. Rift-related structures and a regional, break-up unconformity (LCU – Lower Cretaceous Unconformity) are critical trapping and migration components of the largest oil and gas accumulations. In addition, stratigraphic traps that developed during extensional and compressional tectonic regimes show significant resource potential in Jurassic through Cenozoic shelf and turbidite sequences.