Rigorous Approach to Geological Analysis of Petroleum Potential in Frontier Basins: Dealing with Risk in Regions of Great Uncertainty

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Despite conventional wisdom, there are many sedimentary basins in the world where there has been little or no petroleum exploration. Geologically-based assessment of such basins requires risking the probability of viable petroleum systems and identifying appropriate analogs for the size and number of undiscovered accumulations. In order to do this in a rigorous, transparent manner, a 'basin evolution chart' has been constructed, in which a variety of basin characteristics (tectonic setting, structural style, paleolatitude, etc.) are interpreted through time. The resulting geological interpretation is then confronted with analog suites of subsidence, heat flow, and rates of clastic input from well known basins. The chart forces integration of diverse data and provides a cross-check that ensures compatibility of information from various sources. In addition, the basin evolution chart provides a consistent framework for determining the critical elements of possible petroleum systems and for directly generating quantitative input data for basin modeling programs. The basin evolution chart has been applied to analysis of the Upper Jurassic Total Petroleum System of Danmarkshavn Basin, offshore Northeast Greenland, an area of extreme uncertainty and great upside potential. The exacting approach maximizes understanding of petroleum potential from limited data.