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Unlocking Key Factors of Shale Play Sweet Spotting Appraisal - Field Case Studies From China and North America

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This study proposes the controlling factors of shale play sweet spotting under different maturation stages and various hydrocarbon composition in China and North America, including some typical examples with best practices, such as the Silurian Longmaxi shale gas in Sichuan Basin in Southwestern China, the Triassic Yanchang liquid-rich oil in Ordos Basin in North-central China, the Permian Lucaogou liquid-rich oil in Junggar Basin in Northwestern China, the Cretaceous Eagle Ford liquid-rich oil & shale gas in Gulf Coast Basin in Southwestern USA, the Devonian-Mississippian Bakken liquid-rich oil in Northern USA and the Devonian Marcellus shale gas in Northeastern USA. Key geological factors for evaluating shale plays are 1) the presence of natural fractures in specific tectonic and depositional setting; 2) organic matter maturation-Ro; 3) fluid quality and mobility-API, GOR, permeability and pressure

gradient; 4) resources potential-TOC, porosity, hydrocarbon saturation and net thickness; 5) shale type-mineralogy and diagenesis; 6) rock brittleness and stress regime-clay content, Young's Modulus, Poisson ratio, and minimum horizontal stress difference. These key factors can change with thermal maturation and shale type (marine and lacustrine). However, for all of these examples, given tectonic setting good for hydrocarbon accumulation-preservation and natural fracture occurrence, fluid mobility with lower viscosity, higher GOR and higher formation pressure, and definite thickness with higher TOC and higher porosity, are the common and foremost factors contributing to high economic profits. Successful field case studies demonstrate that, applying shale play sweet spotting appraisal rapidly and correctly may enable to develop more resources globally.

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