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Oil-Prone Lacustrine Source Rock Potential in Central Indonesia

Although lacustrine source rocks and their associated oils are well-known in western regions of Indonesia (e.g., Sumatra), they are not widespread in central Indonesia. Previous studies have inferred a lacustrine origin for a few central Indonesian oils, but do not confirm their lacustrine character using modern isotopic and molecular geochemical analyses. Here, we present data for eastern Borneo and western Sulawesi oils which show a partial or total lacustrine signature, and discuss oil play concepts involving freshwater and hypersaline lacustrine source rocks.

Typical central Indonesian oils which contain a partial or complete lacustrine signature include those from the Pantai-1 well (just offshore the east coast of Borneo) and the Pangkat-1 well (south Makassar Strait, centrally located between Borneo and Sulawesi). Both oils contain elevated levels of 4-methylsteranes and lacustrine-definitive tetracyclic hydrocarbons. In addition, the Pangkat-1 oil contains beta-carotane, elevated sulfur levels (S=2.1%) and unusually light carbon isotope ratios (d13C=-30.3 o/oo). These observations, along with the very low maturity levels for this oil, suggest that it may be a product of early generation from a Type I-S kerogen deposited in a hypersaline setting. In contrast, molecular and elemental evidence for other central Indonesian oils reveal a lacustrine source rock signature indicating a freshwater depositional setting. Paleogene rifting between Borneo and Sulawesi appears to have provided appropriate environments for lacustrine deposition and the potential development of oil-prone lacustrine source rocks. Our results suggest the possibility of heretofore unrecognized lacustrine plays in the region.