

Geochemical Exploration Case Study of Fifteen Frontier Indonesian Deepwater Basins

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TDI-Brooks, under contract with TGS-NOPEC, conducted an extensive Surface Geochemical Exploration (SGE) survey in 15 deepwater areas offshore Indonesia in 2007/2008. Core sites were selected based on multibeam bathymetry/backscatter anomalies and combined with 2-D seismic data. More than 1,200 piston cores were acquired during the study, each positioned with an USBL navigation system to within 25 m of its pre-selected seabed target.

Sediment extracts were qualified for the presence of oil and gas seeps using standard geochemical screening for aromatic and saturate hydrocarbons. An unusually high percentage (13% of samples) of oil seeps detected attests to the potential of the region as well as to the quality of the targets selected. In addition, sediment samples canned for interstitial gas measurements indicate that 46% of the cores contained evidence of thermogenic gas.

Qualified samples were further analyzed for biological markers and stable carbon isotopic compositions of selected gases. These more detailed analyses were used to match hydrocarbons in the sediment extract with a specific maturity or age of oil or source rock. For example, the study produced solid evidence for mature lacustrine source rocks of Miocene age in seeps from more than one basin, distinct from another set indicating a paralic/deltaic/coaly source rock of the same age. Other sets of extract biomarkers indicated seep oils derived from a Mesozoic (Jurassic?) carbonate-rich source with a maturity level well within the oil window.

There is also dramatic evidence for a unique mature source in this region. There is also compelling evidence of a common source of gas from one basin to another in the samples analyzed as part of the overall program. These seep samples portend the discovery of reservoir gas of unique composition, source, and maturity, and may have significant ramifications for future exploration in Eastern Indonesia. When viewed as a whole, the geochemical data can be used to constrain the presence, distribution, extent, and even maturity of the known hydrocarbon systems in Indonesia. The large number of oil and gas shows in a project of this scale is unprecedented.