Modern Geochemistry Methods to Prove Working Petroleum Systems: Applications for Offshore Myanmar

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Abstract

Modern geochemical methods for offshore exploration can reduce exploration risk in frontier areas. Onshore, finding oil from seeps was the first method for oil and gas exploration. The hand-dug wells at oil seeps in the Yenandaung field in the Central Burma Basin that were certainly discovered far earlier but noted by Western visitors in 1755 are no exception. The Yenandaung oil fields are still producing today. In the hydrocarbon province to the west on the eastern margin of the Rakhine basin natural oil and gas seeps are present on Ramree and Cheduba Islands. Modern geochemistry methods are designed to find the offshore natural seeps and sample the seeps to provide information about source, maturity, and migration. This is conceptually easy but is more difficult, yet achievable, in practice. The perceived unreliability of offshore geochemical methods is largely attributed to deficiencies in sampling equipment and procedures that used to be common practice. Submersible and ROV studies show that the zone of active hydrocarbon seepage on the seafloor, as indicated by chemosynthetic communities, is relatively small.

An improved and effective method for conducting marine geochemical surveys use data acquired from modern multibeam echosounders, which can cover large areas quickly in deepwater, to locate seepage. Indications of seepage are interpreted from seabed morphology and attributes (backscatter) that can help determine where hydrocarbon-consuming chemosynthetic communities may be present. To sample the seep, coring devices are attached with a transponder and positioned using ultra-short baseline navigation. With navigation accuracy of 1% of water depth or better (20m at 2000m water depth), there is a high probability of sampling the target with a 6 m core barrel within the typical lateral geochemical gradient surrounding a natural seep. The first indications of a local working petroleum system can be determined during the survey through onboard analyses to be later confirmed at the shore-based laboratory through mass spectroscopy, isotopic, and biomarker analysis.