Geochemical Evaluation of Ocean Surface Slick Methods to Ground Truth Satellite Seepage Anomalies for Seepage Detection

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Synthetic Aperature Radar (SAR) has become a relatively standard tool for petroleum system validation in offshore frontier exploration areas. SAR sensors send out a radar signal and build an image from radiation reflected back to the satellite. The dampening of ocean surface capillary waves by films of oils (slicks), natural film from sea surface micro-layer, biological material, or physical processes such as current flow or wind will produce an anomalously low backscatter.

A field test program was undertaken to test a range of different sampling methods to determine the best way to ground truth ocean surface natural hydrocarbon seepage over a range of different sites and examine geochemical changes related to slick formation and aging. The field program was undertaken at the Coal Oil seep field using several ocean surface sampling methods; conventional headspace gas (C1 to C5) and gasoline plus range solid phase microextraction on ocean surface water sample in sealed containers; and surface contact methods which include the General Oceanics, Shell, and Gore samplers.

Our calibration studies have determined two sampling methods are required to properly collect both the lower boiling point (light hydrocarbons and gasoline plus range) and high molecular weight (C12 plus) hydrocarbons. The Gore Sorber slick sampler is a modified version of the soil sampling module which works best with fresh seepage that contains light hydrocarbon (C2 to C26) fraction. The General Oceanics Oil Sampler with a DCM solvent extraction works best for the higher molecular weight hydrocarbon (C15 plus) fraction including petroleum derived biomarkers.