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### **Best Practices for the Collection and Analysis of Seabed Geochemical Samples**

The collection of marine sediment cores within zones of shallow seepage or key migration pathways is a relatively standard practice to evaluate key petroleum systems elements (presence of a mature source and migration). The methods evolved over the past years as the concepts and equipment advanced. The early days of grid surveys with shallow cores (less than 1 meter) and no real-time seismic are replaced by the utilization of sophisticated remote sensing and high-resolution geophysical acquisition to identify areas of petroleum leakage, real time seismic to locate core sites during coring operations, deeper coring equipment to sample below the ZMD (zone of maximum disturbance), and better navigation-subsurface locating devices to more accurately place the core body within targeted feature.

Sample preparation and analysis remains similar to procedures used 20 years ago. Most sediment samples are frozen in a specially modified can with processed water and an inert gas headspace. The three main screening analytical procedures used in most recent offshore surveys include headspace gas (hydrocarbon and non-hydrocarbon gas composition), total scanning fluorescence (aromatic hydrocarbons), and extraction gas chromatography (presence of thermogenic high molecular weight hydrocarbons). Recent studies indicate limitations with these analytical procedures. Other analytical methods such as blender gas, occluded gas, thermal sediment extraction, and modified chemical extraction provide additional information that will help evaluate the presence of migrated hydrocarbons and better characterize the molecular signature (organic matter type and maturity), especially in locations with low migrated hydrocarbon seepage relative to in-situ recent organic matter (ROM).