Laboratory Evaluation of Hydrocarbon Sensing Devices with Potential for Seep Detection: A Comparison with Conventional Analytical Methods

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Marine surveys for the detection of hydrocarbon seeps, indicative of sub surface hydrocarbon accumulations, use a number of strategies to map and sample these features. Equipment used can typically include echo sounders, side scan sonar, multi-beam swath bathymetry, sub-bottom profiling, conductivity temperature depth (CTD) water sampling casts and sediment coring.

Water samples collected via CTD casts over areas identified as seepage features are subjected to analytical methods to distinguish thermogenic hydrocarbons from other hydrocarbon sources in marine waters. These include the use of headspace gas sampling or liquid-liquid extraction of hydrocarbons from waters, followed by gas chromatography and mass spectroscopy. These methods are either performed on-board or post-survey in the laboratory and can provide a detailed hydrocarbon fingerprint of the petroleum biomarkers when hydrocarbons are present. During water sampling there is often no chemical information available to verify that a valid sample has been captured and the analytical results are often acquired well after the survey vessel has left the survey area.

Currently a number of hydrocarbon sensors are commercially available on the market for varied applications. These devices use a number of detection strategies and have a range in detection limits, response times and hydrocarbon compound classes detected. These instruments have the potential to provide almost online and specific information on the hydrocarbons present in marine water samples allowing potential seeps to be targeted for further detailed analysis, thus increasing the number of successful water samples acquired over areas of active seafloor hydrocarbon seepage.

In this study we compare and contrast sensing devices currently available and their utility for the detection of seeped hydrocarbons in the marine environment. The result of laboratory evaluations of these sensing devices in the presence of dissolved hydrocarbon compounds from a range of oils in synthetic seawater will be presented. In addition we will present the results of tests performed on spiked and unspiked natural waters from a range of environments and compare these to results obtained via analytical methods.