Deep-Water Hydrocarbon Seep Exploration: Underwater Chemical Sensors Come of Age

David Lavallee[1], Leslie Baksmaty[1], Benjamin King[1], Michael Whiticar[2], Jamshid J. Gharib[3], Ed Biegert[1], Gary Sharman[3], Andrew Ross[4]

[1]Innovation, Research and Development, Shell, Houston, TX, United States.
[2]School of Earth and Ocean Sciences, University of Victoria, Victoria, BC, Canada.
[3]Fugro Geoconsulting, Houston, TX, United States.
[4]Energy, CSIRO , Perth, WA, Australia.

ABSTRACT

We present our key scientific, operational and performance findings from 3 years of research and development into using underwater chemical sensors for deep-water hydrocarbon seep exploration. Chemical sensors have a particular role to play when using underwater vehicles for deep-water hydrocarbon seep exploration. This work developed viable, value-generating scientific and operational practice for deploying chemical sensors on underwater vehicles. Our laboratory testing has calibrated the systems to 4.5 km water depth and our field trials have taken these technologies to water depths of 2.6 km in the Gulf of Mexico. We have learnt that critical to the use of chemical sensors is understanding how the natural environment allows propagation of dissolved hydrocarbons in the ocean. We have used chemical sensors to detect hydrocarbons at significant distances from seeps. We will discuss, the overall performance of the systems, real-time calibrated measurement of dissolved gases, essential supporting sensors, operational considerations and how the hydrocarbon measurements compare to those found in proximal water/sediment. When underwater chemical sensor data is assessed in real-time, it can add value in efficiently finding the seep location and discriminating between potential sampling locations.