Integration of Remote Sensing, Underwater Gliders and Geophysical Indicators of Fluid Migration: From Observation to Prospect De-Risking

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Abstract

Seismic DHIs are often regarded as key proxies used to reduce the geological risk of exploration wells. Evidence of a mature working petroleum system may also come from a suite of other fluid indicators, which when integrated give better consistency for the de-risking of prospects. To better assess the presence of mature source rocks in offshore basins, the idea is to gather different techniques and data in order to detect, sample and analyze visible traces of hydrocarbons. The workflow follows a top to bottom approach, from space to subsurface. At the sea surface, information comes from synthetic aperture radar (SAR) satellite data for the detection of active oil seepage. However, the SAR system is unable to distinguish between natural oil seeps and false positives such as algal blooms or pollutions. It is also unable to detect gas and it is strongly dependent to the wind speed. To overcome these limitations and to completement oil seeps SAR observations, we have developed a new method for the exploration of liquid and gaseous hydrocarbons in the water column by the means of underwater gliders fitted with dedicated oil and gas sensors and equipped with passive samplers. On the seabed and in the subsurface, the analysis of specific geophysical anomalies (seafloor mounds, complex shape and irregular pockmarks for instance) highlighted by high-resolution sub-bottom profiling surveys and by exploration 3D seismic improves the identification of the origin of the oil slicks. Additionally, geochemical analyses of piston cores collected on the seafloor can confirm the

presence of thermogenic seeps. The presentation will provide different examples of the integrated approach combining the analysis of sea-surface oil seepages imaged with satellite imagery, glider surveys, geochemical core-set and seafloor/sub-seafloor geophysical indicators of manifestations of oil.