Using Ultrasensitive Hydrocarbon Mapping to Reduce Exploration Risk and Optimize Production in Offshore Fields: Gulf of Mexico Shelf and Northern South America Case Studies

Rick Schrynemeeckers [1]

[1]Amplified Geochemical Imaging, LLC

Abstract

Amplified Geochemical Imaging (AGI), an ultrasensitive hydrocarbon mapping tool, can be used to dramatically reduce exploration and development risk, when combined with 3D seismic programs. Ultrasensitive hydrocarbon mapping technology uses a specially engineered oleophilic (i.e. oil loving) adsorbent encased in a microporous polytetrafluoroethylene (ePTFE) membrane. These membrane pores are small enough to prevent soil particles and water from entering, but are large enough to allow hydrocarbon molecules to pass through. The result is an ultrasensitive technology that is approximately 1,000 times more sensitive than traditional methods. Sensitivity becomes critically important when assessing the presence of a potential petroleum system, particularly when macroseeps are not present.

Two case studies, one in the shallow GOM and a second off the northern coast of South America, will be shown that illustrate how ultrasensitive hydrocarbon mapping can augment seismic data and add to the geologic and structural understanding of complex fields.

In the GOM case study the survey took place on the shelf of the Gulf of Mexico in a water depth of <150 ft. The target reservoir section was Tertiary in age at a depth of ~8,500 – 9,000 ft and 20 ft cores were taken with an average spacing of ~1/2 mile. Previously 6 dry wells and 2 producing wells had been drilled. The resulting hydrocarbon probability map showed gas condensate in the central structure and delineated a proposed gas/water contact line. The map also indicated areas of very low gas condensate probability and correctly predicted the dry wells. Additionally, the data showed charged structures to the east and west of the main structure. Two producing wells were drilled post-survey and corroborated the AGI results.

For the northern offshore South America case study the objective was to assess the possible presence of a petroleum system in a frontier area. Additionally, if hydrocarbons could be detected, secondary objectives were to determine hydrocarbon thermal maturity and to evaluate the distribution of potential accumulations within the survey area. The hierarchical cluster analysis (HCA) data identified five primary groups of samples indicating both thermogenic and background hydrocarbon signatures in the area; thus, affirming the actual presence of a petroleum system in the frontier area. The data identified an active petroleum system which was expelling hydrocarbons via both macroseepage and microseepage. Mapping of the hydrocarbon abundances revealed areas in the south-central portion of the survey area contained elevated hydrocarbon levels. The areas in the central portion of the survey area, and particularly the south and western portions, seemed to be most prospective. The eastern portion of the survey area reflected primarily background signatures and did not appear to be prospective, thus keeping the client from drilling dry or uneconomic wells on nonprospective areas.