Integration of Geophysical Data with Amplified Geochemical Data To Reduce Risk of Reservoir Seal and Charge

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Exploration risk evaluation involves analysis of reservoir,trap,seal and charge.Historically,as seismic techniques have evolved in recent years, the emphasis has been placed on reservoir and trap. Arguably, a significant part of exploration failure can be attributed to inadequate knowledge of reservoir seal and charge conditions.

Through integration of geophysical data and the amplified geochemical signal that occurs from microseepage, a more advanced understanding of the actual reservoir conditions and a more reliable geophysical interpretation may be achieved. This integration of data becomes increasingly more important as challenging geological conditions such as evaporites and volcanics are encountered in the subsurface. It also provides confidence in geophsical interpretation in areas of relatively flat reflectors.

Previous efforts to characterize trapped subsurface accumulations using surface methods have relied on measuring and interpreting gaseous flux (continued rate of flow) or concentration. These measurements are short-term (often only C1-C6 saturated compounds) and transitory in nature and subject to considerable unaccounted variability affecting quantification and interpretation.

A methodology which delineates the time-integrated geochemical signature (up to iC20 phytane) through the stratigraphic column and measured over a survey area provides an adequate broad range data set which allows delineation between areas of charge and areas exhibiting background signature . Geochemical survey signatures are correlated with known geochemical signatures of the stratigraphic column at selected productive and dry wells, which respectively characterize reservoir geochemistry and background geochemical signal (fingerprint). Chemical signatures composed of ~90 organic compounds provide compound-rich data, which surmounts the variability of flux/concentration measurements. A dataset is obtained that allows differentiation between the productive geochemical signature and background hydrocarbon signature (source rock and other organics).

This data collection methodology, typically not inhibited by weather or climatic variations , is in worldwide use in permafrost, desert, temperate, and tropical conditions. Data acquisition and interpretation are not limited by difficult lithology (e.g., massive salt, volcanic and fracture sequence stratigraphy).

Survey results are typically incorporated with geophysical data to locate prospective areas within a concession, high grade prospects, identify

basin-centered “sweet-spots”, and define accumulation margins. Risk reduction case studies highlighting surface geochemical integration with traditional geophysical results are presented.