Hydrocarbon Exploration Survey Strategies for Frontier Basins

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Frontier basins and other underexplored onshore basins are well suited for hydrocarbon detection surveys using a variety of surface geochemical and non-seismic geophysical hydrocarbon detection methods. These methods can reliably detect surface or near-surface occurrences of hydrocarbons and their alteration products. The noninvasive, low-impact nature of these techniques makes them ideally suited for use in an early-stage evaluation of remote and sometimes environmentally sensitive areas in jungles, deserts, grasslands or in the Arctic. Properly designed surveys can document the presence of a petroleum system, and quickly identify those parts of the area possessing the highest petroleum potential. Use of such an exploration strategy protects the greater part of the area from more costly and more-invasive exploration methods by focusing attention and resources on a relatively small number of highpotential sites.

Geochemical exploration techniques can be direct or indirect, and measurements can be instantaneous or integrative. Direct techniques analyze small quantities of hydrocarbons that occur in the pore space of soil, are adsorbed onto clay minerals, or are incorporated in soil cements. Indirect methods detect seepageinduced changes to soil, sediment, or vegetation. Non-seismic geophysical methods for detection of hydrocarbons or their alteration products include satellite image analysis for seep-induced alteration, high-resolution aeromagnetic data to identify sedimentary magnetic anomalies that form in the seepage environment, radiometric surveys, radar and laser detection of hydrocarbon gases in atmosphere, and passive electromagnetic and telluric measurements.

Onshore hydrocarbon microseepage surveys in frontier basins require careful planning and implementation. Microseepage data are inherently noisy data and require adequate sample density to distinguish between anomalous and background areas. Defining background values adequately is an essential part of hydrocarbon anomaly recognition and delineation. This presentation will .be illustrated with examples from North Africa, Asia, South America, USA, and Canada.