

Managing Exploration Risk: Lessons Learned from Surface Geochemical Surveys and Post-Survey Drilling Results

Schumacher, Dietmar, Geo-Microbial Technologies, Inc, Ochelata, OK

It has been long known that most oil and gas accumulations leak, that this leakage is predominantly vertical, and can be detected with any of several direct and indirect methods. It has also been documented that the areal extent of the surface geochemical anomaly can approximate the productive limits of the reservoir(s) at depth. How reliably this can be done depends on the geologic setting, the choice of method, survey design and sample spacing. Proponents of surface geochemical surveys contend that proper use of surface geochemistry leads to better prospect evaluation and risk assessment. This may be true but the significance of surface geochemical anomalies in hydrocarbon exploration is not always readily apparent.

How can one quantify the value added by surface geochemical data when it is integrated with conventional exploration methods? One way to do so is to compare survey results with results of subsequent drilling. The results of such a comparison are summarized here for more than 1000 U.S. and International wells, all drilled on conventionally developed prospects after completion of surface geochemical surveys. The prospects are from both frontier basins and mature basins, onshore and offshore, and a wide variety of geologic settings. Targets ranged in depth from 300 meters to more than 4700 meters and covered the full spectrum of trap styles. Prospects were surveyed using a variety of geochemical exploration methods including free soil gas, sorbed soil gas, microbial, radiometrics, micromagnetics, etc.

Of wells drilled on prospects associated with positive geochemical anomalies 83% were completed as commercial discoveries. In contrast, only 13% of wells drilled on prospects without an associated geochemical anomaly resulted in discoveries. Had drilling decisions included consideration of the geochemical data, exploration success rates would have more than doubled!