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Case Studies Relating Soil Iodine Geochemistry to Subsequent Drilling Results

One means to evaluate the effectiveness of a surface geochemical method for petroleum exploration is to compare the results of the method used with drilling success. Four case histories show how one surface technique, which measures the concentration of iodine in soils, relates to post-survey wildcat and development success. The four cases are in separate basins in the onshore U.S.: the Denver-Julesburg Basin in Colorado, the Powder River Basin in Wyoming, the Williston Basin in North Dakota, and the Illinois Basin in Illinois. In each case, properly processed soil iodine data demonstrate a correlation between soil iodine anomalies and petroleum accumulations.

The distribution of iodine values in the soil is not straightforward. Evidence indicates that some spurious samples may be taken that are not attributable to sampling or laboratory error. A method of defining a soil iodine anomaly that partially compensates for this effect is presented. This method relies on a moving weighted average of the data, where substitute values (indicator values) are averaged rather than the iodine data. The thresholds for the different indicator values are selected from histograms and cumulative frequency plots.

In the Dolley Field area in the Denver-Julesburg basin, all producers and dry holes are correctly predicted by the method. In the Prairie Creek area in the Powder River Basin, all dry holes and one of two producers are correctly predicted by the method. In the Eland Field area in the Williston Basin, all producers are correctly predicted, but three of the four dry holes are on soil iodine anomalies. In the Springfield East area in the Illinois Basin, all but one dry hole is correctly predicted but only two of the six producers are correctly predicted.

Overall, a correlation between soil iodine anomalies and hydrocarbon accumulations is strongly indicated by the cases presented in this paper.