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John P. Land¹, Richard L. Coons², J.David Lazor³ (1) J.P. Land Associates, Inc, Houston, TX (2) Resource Technologies, Katy, TX (3) Lazor Enterprises Inc, Houston, TX

Near-Surface Magnetic Anomalies, Potential Indicators of Seepage and Deep-Seated Faulting

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John P. Land, Sr., R.L. Coons, and J.D. Lazor

Modern magnetic surveys are able to record the full spectrum of the magnetic field, from high frequency events of the shallow sediments to the lowest frequency events of magnetic basement at the base of the sedimentary section.

Near-surface alteration zones produced by the microseepage of hydrocarbons are one significant cause of measurable high frequency magnetic anomalies. When magnetic survey specifications are set to capture the total magnetic spectrum, the interpreter is provided the means to describe prospect leads having the special potential of being seep-related.

The profile analysis of magnetic data allows a detailed examination of the recorded field and the symmetry of the near-surface magnetic responses. Residual profiles are developed by filtering off the surface produced by the lowest frequency events. Line to line correlation then shapes the anomalies considered diagnostic of local structuring of the sediments and, potentially, the seepage of hydrocarbons.

There are several types of anomalies produced by the line to line correlation of profile anomalies - linear, curvilinear, circular and sub-circular. Of special interest are the linear anomalies and trends of such anomalies perpendicular to regional strike. It should be noted that this evidence of locally anomalous rock properties is not common to maps produced by the contouring of gridded data.

The object of this paper is to not only demonstrate a method's ability to map apparent relationships between near-surface magnetic anomalies and deep-seated faults but also, to stress the fact that many of these features will probably prove to be seep-related.

Examples from the Gulf Coast, Gulf of Mexico, East Texas and West Texas will be shown. .