

Aeromagnetic Gradient Anomalies Help Locate New Oil and Gas Reservoirs, Harold Robert Beaver, Saint Joseph Petroleum Inc., 7378 Cockrill Bend Blvd., Nashville, TN 37209, hrbeaver@comcast.net

Aeromagnetic measurements traditionally are used to provide basement structure, depth, and lithology data. Horizontal gradient studies of aeromag total field measurements can be used to map small direct current anomalies in the subsurface caused by chemically reduced zones above oil and gas reservoirs. These direct current anomalies can sometimes be seen on the spontaneous potential measurement of electric logs taken of wells drilled into oil and gas reservoirs. These small direct current anomalies also have a very small effect on the total earth magnetic field. With a special horizontal gradient operator, these effects can be filtered and mapped as a derivative anomaly.

Case histories using aeromag data flown in the 1950's with a fluxgate magnetometer prior to the discovery of oil and gas in certain areas are documented. These studies disprove the possible contamination of aeromag data by oil field flow lines, tank batteries, or casing dipoles.

Other case histories using more recent aeromag data using a proton precession magnetometer after 1975 illustrate the method and its use over newer oil and gas reservoirs in the Appalachian Basin, Cincinnati Arch, and the Michigan Basin. Before and after case histories are provided proving the effectiveness of the theory and method.

Strengths and limitations of the method are presented in a detailed summary.