Organic Geochemistry Detects Hydrocarbon Signatures in Surficial Samples to Locate and Identify Deeply Buried Exploration Targets

Dale Sutherland

Activation Laboratories Ltd., Ancaster, ON, Canada.

Surficial soil surveys analyzed for inorganic elements have proven to be a useful predictive geochemistry in determining the location of deeply buried exploration targets. Organic components have also been sited as a potentially useful geochemical tool. Bacteria that leach and metabolize compounds from mineral deposits or petroleum plays at depth eventually release hydrocarbons that migrate to the surface. Surficial samples such as soil, sediments, peat, humus, etc. act as collectors of these hydrocarbons. Past researchers have used very volatile compounds in the C1 to C4 carbon series range, and have also hypothesized the use of heavier hydrocarbons. Research with these heavier hydrocarbons has resulted in a more robust geochemistry, defined as Soil Gas Hydrocarbons (SGH), which extracts the organic compounds absorbed on the surface of soils, sediments, humus, peat, and even snow, for the heavier organic compounds in the C5 to C17 carbon series range. The flexibility of SGH to be able to use a wide variety of sample types is important when sampling in difficult terrain. These SGH compounds may migrate from depth in a volatile form but are not gaseous at ambient temperature and pressure. The SGH technique analyzes each sample for over 160 specific hydrocarbons at a detection limit of one part-per-trillion (ppt). These specific hydrocarbons are now proven to be the remnants of direct bacterial interaction with the deposit or play. The data is reviewed forensically resulting in specific combinations and ratios of the hydrocarbons which defined different organic signatures found to be directly related to the target. The surficial geochromatographic dispersion of various classes of organic compounds has also been researched and found to be able to vector to the location of buried exploration targets. SGH is thus a dual purpose deep penetrating predictive geochemistry that both locates and identifies the type of target that may be present. The SGH geochemical signature has been demonstrated at successfully locating Oil, Gas and Coal plays at depths of up to 1,000 metres. Mineral targets of Uranium, Gold, SEDEX, VMS, Nickel, Copper, PGE, Kimberlite and Rare-Earth formations have also been identified at depths of up to 700 metres from actual surveys.