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# geotech.org

**geotech.org** has developed methods that allow for true multivariate surveys that provide completely independent data sets. Therefore, each mapped variable does not simply represent a variation of all the variables analyzed. For instance, soil gas methods always have high correlation between homologs and yield few differences from one homolog to the next. geotech.org's hydrocarbon methods measure different aspects of the hydrocarbons in the near surface in order to develop a complete image of the seepage alteration associated with the reservoir at depth.

Surface geochemical exploration has been used for eighty years with a very significant success rate. However, over promotion and poor execution have tainted geochemistry as a legitimate exploration tool. Failures can often be traced to inadequate sample spacing, poor sampling procedure, and only one method being employed. geotech.org realized that

- Hydrocarbon reservoirs are generally heterogeneous, not homogeneous, so a close sample spacing is required.
- To avoid sampling irregularities, the sample should come from the very near surface with the least amount of soil aggregate disruption possible.
- That multiple, independent, and reproducible methods should always be used.

geotech.org has developed solid phase hydrocarbon detection methods that minimize or eliminate the variables associated with the vapor phase of soil gas methods. Traditional soil gas methods are affected by climate changes, seasonal variations, soil disturbance when sampling by agar or probe, and changes in physical characteristics of soils such as moisture, sand, silt and clay content. Chemical characteristics such as carbonate content, salt content, and soil amendments can also affect analytical outcomes.

After samples are prepared for analysis by drying and sieving, they are analyzed using any or all of the solid phase hydrocarbon detection methods. Hydrocarbons are measured by UV – Vis spectroscopy, Reduced Hydrocarbon Analysis, and Extractable Hydrocarbon Analysis.

*Detecting the past with today's technology.*



### **UV – Vis Hydrocarbon Analysis** [Click here for example](#)

The UV-Vis analysis detects the alteration product of the Fulvic acid fraction of the soil organic matter. Fulvic acid is the low molecular weight component of soil humins. The main chemical constituents are carboxyl acids and phenols. The compositional structure of Fulvic acids vary considerably due to attached aliphatic side chains. The interesting thing is that they can incorporate available organic material into large voids present in the molecules structure. Condensation reactions hold seepage related hydrocarbons and addition reactions that cause measurable alteration to the available soil organic matter.

### **Reduced Hydrocarbon Analysis** [Click here for example](#)

An important non-humin organic component of soils are the carbohydrates. Carbohydrates provide almost half of the organic carbon available in soil making them very susceptible to alteration. Soil carbohydrates are not an integral portion of the humic acid core. They are attached as peripheral side chains but more often occur as free polysaccharides. Monosaccharides and disaccharides are quantified using alkaline solutions of copper that reduce sugars having a free aldehyde or ketone group, resulting in a measurable color change that correlates with hydrocarbon concentration.

### **Extractable Hydrocarbon Analysis** [Click here for example](#)

This method complements the water extractable portion of soil organic matter. Using an alkaline extraction the humic acids are put into solution and measured spectroscopically. This compensates for the loss of the water soluble portion of the hydrocarbons in agriculturally disturbed or irrigated fields. Sample acquisition requires nothing more than a garden trowel and a ziploc bag.

These methods are more than just an alternative hydrocarbon method. The analysis of soil organics yields explanations for most of the alteration anomalies and phenomena identified over the last 80 years. Soil organic matter regulates

- the movement of halogens
- fragmentation and integration of aliphatic and aromatic hydrocarbons
- pH buffering
- oxidation-reduction reactions
- cation exchange capacity
- carbonate deposition
- the presence and growth of soil flora and fauna.

The relationship between soil organic matter and hydrocarbon alteration is obvious and the analytical methods that appropriately measure seepage phenomena are those currently in use by geotech.org.