

Empirical Observations from Global Surface and Subsurface Calibration Geochemical Database

Abrams, Michael A., University of Utah Energy & Geoscience Institute, Salt Lake City, UT

A worldwide surface geochemistry (SG) calibration dataset with over 20,000 surface core and well locations from over 30 petroleum and non-petroleum bearing basins, both onshore and offshore areas, has been organized as part of an industry supported research project. The SG calibration dataset includes both published and proprietary surface geochemical survey data, regional (site specific) and prospect delineation (grid) surveys, and detailed hydrocarbon (gas and oil) molecular data from near-surface soil and sediment measurements and subsurface exploration tests.

The global SG calibration database demonstrates key problems with several surface geochemical methods currently undertaken by many commercial contractors. Most of the collection and analytical procedures provide hydrocarbon compositions significantly different than hydrocarbons collected in petroleum reservoirs. Several SG calibration surveys with positive petroleum indicators based on contractor interpretations were found to have no hydrocarbons at depth. These differences are in part related to analytical procedures used to extract light and high molecular weight hydrocarbons from surface soil and sediments. In addition, interpretations often confused background, transported, and reworked hydrocarbons with localized migrated hydrocarbons. Proper interpretation of near-surface geochemical data requires the recognition of many problems such as background versus anomalous, recent organic matter interference and sorption, transported or reworked hydrocarbons, bacterial alteration, mixing with hydrocarbons from multiple origins, laboratory or field contamination, and fractionation-partitioning effects. It is also very important to understand basin geology to properly use near-surface geochemical measurements as a predictive exploration and prospecting tool especially in areas of structurally complex geology and multiple fluid flow directions.