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Identifying Surface Alterations Caused by Hydrocarbon Microseepages in the Patrick Draw Area of Southwest Wyoming, Using Image Spectroscopy and Hyperspectral Remote Sensing

The detection of underlying reservoir accumulations using remote sensing had its inception with the identification of macroseeps, or pools of oil and tar at the surface. However, today we find ourselves relying on the detection of more subtle characteristics associated with petroleum reservoirs, such as microseeps.

Microseepages are the result of the vertical movement of light hydrocarbons from the reservoir to the surface through networks of fractures, faults and bedding planes, which provide permeable routes within the overlying rock. Microseepages express themselves in an array of near surface alterations and anomalies, such as chemical or mineralogical changes in overlying soils and sediments. The majority of these anomalies are found to be the result of near surface oxidation-reduction zones that initiate diagenetic Eh/pH controlled reactions caused by the long term leakage of hydrocarbons through microseeps. This influence on mineral stability and chemical reactivity can then be detected at the surface remotely.

This project has developed methodologies using NASA's Hyperion hyperspectral imaging sensors and ground truthing geochemical techniques to identify and map alterations caused by hydrocarbon microseepages and to determine their relationships to the underlying geology in the Patrick Draw area of Southwest Wyoming.