Geochemical Anomalies Characterization by Microbial and Trace Elements Analysis related to hydrocarbon migration, Neuquén Basin, Argentina

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Organothroph bacterial accumulation and trace elements present in soils and sediments are good indicators for active oil reservoirs, due to microseepages of light hydrocarbon gases and other geogases that reach the surface through pore spaces or fracture systems at both local and crustal scales. Trace elements like V, Cr, Ni, Co, among others, are also carried upwards in the shape of microbubbles by means of diffusion and effusion.

In an area of northern Neuquén Basin, a geochemical exploration survey took place, based on transects with sampling points of 400 meters distance from one another. Transects were perpendicular to the structures present in the area. Geological formations were taken into account when sampling the soil surface, identifying traits like texture, development and origin. Satellite Image processing with NDVI and Tasseled Cap algorithms were used to discriminate plant photosynthetic efficiency and soil moisture. Soil samples for microbial analysis were taken at 40 cm depth and placed in sterilized jars. Using a modified MPOG method, edaphic bacterial colonies were counted in UCF/g. Also samples were taken from the same depth to make the trace element analysis.

The results turned to be positive and made possible to indentify two types of geochemical anomalies:
a) those belonging from reservoirs and having background levels induced by mature source rock and,
b) mostly derived from reservoirs and minimal background values (immature source rock).

Trace elements like V led to verify the hypotheses of uplifting pushed by microbubbles of carrier gases, because of the known high V content of the oil and its high values close related to bacterial anomalies.
This element was present both with bacterial anomalies (active microseepage) or without bacterial activity (ancient and inactive microseepage). Trace elements and microbial analysis both showed high correlation over the faulting zone and led to discriminate sharply between reservoir derived anomalies from reservoir and source rock derived anomalies.