Remote Sensing & The Science Behind Direct Hydrocarbon Mapping – "DHM"

What is Remote Sensing:

Remote sensing is the acquisition of information about an object without making contact with it, generally using aerial sensor technologies e.g. aircraft or satellites. More specifically Remote Sensing, is a study of electromagnetic waves and their interaction with objects on or near the earth's surface.

Data collected is in the form of electromagnetic energy (EME) – the energy emitted, absorbed, or reflected by objects and this data is recorded in the form of wavelength which is traditionally measured in micrometers or nanometers.

The data collected can be from the visible or other parts of the Electromagnetic Spectrum e.g. Ultraviolet, Infrared and Microwave.

Different "bands" from within the Electromagnetic Spectrum can be used for various purposes including identifying rocks and minerals, delineating healthy versus unhealthy or fallow vegetation, distinguishing among vegetation, soil and rocks. This can be applied to a number of industries / applications for example meteorology, hydrology, geology, agriculture, forestry and topographic mapping. We of course are interested in applying remote sensing to oil and gas exploration.

What is Remote Sensing:

The data collected by satellite can be displayed on a computer as an image by taking the average reflected / emitted radiation for a given area and translating this into what is known as a “Digital Number” (DN), which is then applied to a pixel on the image representing that area.

DN values are sometimes referred to as Brightness Values and on an 8-bit scale there is a value range of 0-255 i.e. 256 levels each representing the intensity of the reflected / emitted radiation. On the image this translates to varying shades of grays where 0 = black and 255 = white.

Brightness as seen on a satellite image is therefore a visual representation of the electromagnetic energy recorded for the area of concern. Satellite images can as a result be used to identify variations in the Electromagnetic radiation of an area.

How does Scotforth Apply Remote Sensing to the Oil Industry Through DHM?

The science of sub-surface hydrocarbons causing changes in surface landscapes is long proven and well known. These changes happen as a result of the self-organising system of natural geophysical, geochemical, bio-geochemical and geo-botanical processes that occur in nature. Their effects are proven both theoretically and empirically and have been written about in numerous published scientific journals / papers (See AAPG Studies in Geology No. 48, by example).

Scotforth utilises its own unique Remote Sensing Direct Detection of Hydrocarbons (RSDD-H) technology to recognise and captures these hydrocarbon-induced changes and produce our Direct Hydrocarbon Mapping ("DHM") surveys. We do this by using processing which has been developed through decades of research and development and which analyses many sets of satellite images to identify variances therein which can be indicative of the presence of hydrocarbons. Scotforth has built a large inventory of proven field examples of such "Hydrocarbon Footprints" around the world, in numerous onshore basins and in most of the primary ecosystems of the planet. These attest to the merits of RSDD-H in detecting undrilled hydrocarbon prospects.

As these variations or "Anomalies" in radiation are from across the Electromagnetic Spectrum they are not typically recognisable to the naked eye on the visual bandwidth of satellite images or apparent on an area-wide basis in the natural landscape, as viewed by the eye.

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Identified Anomalies range in quality, characteristic and size and are tested against high resolution landscape composite images to determine whether they coincide with any particular landscape unit or terrain condition. They can then be classified progressively into likely “true” hydrocarbon anomalies, false positives or false negatives.

Once false positives / negatives have been removed the remaining Anomalies are then mapped to provide an inventory of exploration leads and prospects (the “Prospect Inventory” or “PI”) which are then exploration risked and geologically modelled for their possible petroleum resource potential (PRP”).