USING RADAR REMOTELY SENSED DATA FOR HYDROCARBON EXPLORATION

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ABSTRACT: Imagery and remotely sensed data is one of the most efficient tools for the assessment and monitoring of earth resources. Since the advent of cheap and declassified satellite images in the late 1970s and early 1980s, mineral and hydrocarbon explorations have begun to use satellite imagery to map not only the visual light spectrum over exploration processes, but spectra which are beyond the visible. Satellite based spectroscopes allow the modern hydrocarbon explorations, in regions devoid of cover and vegetation, to map minerals and alteration directly. Improvement in the resolution of modern commercially based satellites has also improved the utility of satellite imagery.
RADAR imagery which is one of remotely sensed data is an acronym for radio detection and ranging. This object-detection system which uses electromagnetic waves specifically radio waves to determine the range, altitude, direction, or speed of both moving and fixed objects. The radar dish, or antenna, transmits pulses of radio waves or microwaves which bounce off any object in their path. The object returns a tiny part of the wave's energy to a dish or antenna which is usually located at the same site as the transmitter.
For example GPR which is a geophysical method that uses radar pulses to image the subsurface uses electromagnetic radiation in the microwave band (UHF/VHF frequencies) of the radio spectrum, and detects the reflected signals from subsurface structures. This system can be used in a variety of media, including rock, soil, ice, fresh water, pavements and structures. It can detect objects, changes in material, and voids and cracks.
Using remotely sensed imagery in the process of hydrocarbon exploration accelerates whole the process enormously. The best situation that this method is highly recommended is in hydrocarbon exploration in vast areas as the basis of further studies.

1. INTRODUCTION

Hydrocarbon seepages on the surface of both land and ocean seem to be direct indicators of the existence of a petroleum system in deep land or water basins. Such detection processes helps in lowering the cost and risk usually involved in the whole process of exploration. Ability of radar method is verified several times in different researches for onshore and offshore seepages. This branch of remote sensing in petroleum exploration is a cost effective mean of locating oil reserves. In offshore petroleum detection, it's considered that seeps are surface expressions of migration pathways of hydrocarbons where oil and gas seep out of faults opening in the sea bed. Their buoyancy in the form of thin oil films covering bubbles of gas makes their transport to the sea surface. Oil film layer formation at the sea surface, is the result of gas bubbles burst on ocean surface.

2. PIXEL UNMIXING PROCEDURE

Normally, because of ocean surface reflection, the capillary waves which reach the sea surface reflect in high percentage and produce a bright image. However, if oil was present in the sea surface, it is detected as a dark area on a bright surface since it dampens the wave signature. As the oil decreases the aerodynamic roughness of the ocean and consequently decreases the radar backscatter, the amount of the backscattered radiation in the oil covered region detected by the RADAR sensors is less than the surrounding sea. Also, identified seepages from RADAR data must be investigated to remove suspicious signatures which are generated due to ship or tanker pollution layers or biogenic signatures created by some algal species. Generally effect of wind speed must not be neglected. Additionally dissimilar shape, scale and aspect ration of the slicks and stains could have dissimilar manner.

3. MIXED PIXELS DECOMPOSITION

Since RADAR images generally have higher spatial resolution, but spectral one is too low, using multispectral images which could present an acceptable spectral resolution is an efficient analysis method which is named *Imagery Data Fusion*. In this respect the negative characteristics of multispectral images which are *low spatial resolution* and *no acquisition of microwave signals* is going to be compensated.
Receiving reliable analysis results of the images need high match and registration accuracy. In some experiences matching error of the pixels and element space will result in 50 percent of the false changes. Reduction the error rate till 10 percent, matching error on the image must have less than 0.2 pixels space.
In another hand, RADAR images have noise dot, in order to enhancement, improvement the accuracy of registration, and uniform selection for homonymy points, using a polynomial correction, in the solution.
Multispectral images' digital number contains surface features optical information by the electromagnetic spectrum between 0 and 255 gray values. RADAR images recorded form 0 to 65535 between the integer values in the microwave band features the return value. Dissimilar gray represents the relative characteristics of dissimilar features. Different images digital number (gray value) is

not comparable, pixel gray value for fusion will bring about the corresponding error. Sensor characteristics, through the use of physical corresponding model and the reflectivity of the true features and value after the scattering, effect the images fusion and information extracted.

Combination is fulfilled, using the fusion algorithm integration of wavelet and inverse transform which is totally done by the software. RGB composition of the result image considering acceptable bands for a true or false color can be useful in hydrocarbon detection, doubtlessly. In other words, for much more precise detection, it is possible to consider the spectrums which are more applicable in hydrocarbon detection.

It should also be considered that in many cases, spectral characteristics analysis, due to the fact that subsidence land are composed of green scenes, water zones and building land, its spectral characteristics can not describe as a unified model, based on the direct use of spectral characteristics is never easy to extract.

The elevation changes in land surface exploration area is the main altimetry considerable issue which is the essential feature of the ground collapse; therefore we can use interfere RADAR images to establish DEM, while use the existing DEM data to compare the measured values of interfere with the field measurements. This aspect of ground data is doubtlessly improving in the process of exploration.

4. CONCLUSIONS

Using RADAR images in combination with multispectral data for land surface information monitoring in mining area, established the land resources remote sensing classification system, and comprehensive results of previous studies on the extraction of land resources in the mining area. Further discussed the method of microwave remote sensing for petroleum and generally hydrocarbon exploration, it is pointed out that the RADAR images can be efficient in quantitative analysis. Research shows that the use of multi-source and multi-temporal images, fusion technology of RADAR images and multispectral data, could be favorable in this respect.

5. REFFERENCES

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