A View from Space - Latest Remote Sensing Technology for Supporting Exploration and Related Applications

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ABSTRACT

The latest remote sensing technology and analysis is making an important contribution to exploration and related operations through improved efficiency and the reduction in risk. With the technological advancement in optical and radar satellite sensor technology, in parallel with the deployment of satellite constellations, the contribution of remote sensing to oil and gas related applications has grown in recent years. These technological advancements include increases in spatial, spectral and temporal resolution and the capability to derive high accuracy Digital Elevation Models (DEMs).

A number of exploration focused case studies and project examples will be presented including geological interpretation, offshore oil seep mapping, terrain assessment and monitoring, assisting with high grading areas and the efficient targeting of field surveys and seismic collection. Remote Sensing techniques are particularly valuable where operations are occurring in remote areas with difficult or hazardous access where personnel, equipment or the environment may be put at risk during field activities.

For an exploration area, existing geological surface mapping may be at an unsuitable scale or accuracy, with potentially prospective structures absent or inaccurately positioned. The use of satellite data for geological interpretation, verification and refinement is well established and can be performed at a range of scales, from regional down to an individual license block or structure. Satellites offer the capability to acquire data in parts of the electromagnetic spectrum beyond the range of human vision, aiding lithological discrimination and with long wavelength radar sensors, providing information in the shallow subsurface for areas with dry substrate.

The presence of natural oil seepage provides a potential exploration target together with further insight into subsurface geology. Although satellite techniques have been applied to identify oil seeps both onshore and offshore, in general, offshore techniques are seen as a more established and operational approach. The extent and distribution of offshore seepage slicks is relevant both before and after the acquisition of geophysical data. During the design of a seismic survey the location of natural seeps can be used to focus resources and during the interpretation the presence, or absence, of seepage can add further insight and confidence to features of interest, such as correlation with direct hydrocarbon indicators. In addition, the sampling of sea surface slicks for geochemical assessment can be guided more effectively by providing slick locations in near-real-time from interpreted radar data. In shallow water depths optical data can be used for the assessment of seabed characteristic and depth variation for pipeline and facility planning applications.

Onshore, the assessment of controls on the acquisition of seismic data and the establishment of accessible areas, such as the distribution of terrain, infrastructure and landcover can be rapidly undertaken with satellite derived information and the use of GIS analysis.
During operations, both onshore and offshore, the increased revisit times offered by modern sensors are allowing routine monitoring to become increasingly feasible, particularly when linked to online data delivery system. In parallel to monitoring, effectively extracting useable

intelligence from large volumes of data can be addressed through advanced change detection techniques.

Technological development in remote sensing is set to continue. New operators in both the government and commercial sectors are likely to result in greater data availability. The nature of sensor platforms is also likely to diversify with small low cost satellites operating in constellations and technologies such as High Altitude Pseudo Satellites (HAPS) and geostationary platforms, creating new possibilities for oil and gas related applications. Coupled with an increase in data volumes, effective online delivery of data and derived intelligence is required to maximise the value of remotely sensed information.