

## **Operational applications of RADARSAT-2 for the environmental monitoring of oil slicks in the Southern Gulf of Mexico**

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The Cantarell Complex, located in the Campeche Sound is one of the most important oil fields in Mexico. Petróleos Mexicanos (PEMEX), Mexico's state-owned petroleum company, began production in this area in 1981. In 2000, with the intention of establishing the origin and magnitude of the hydrocarbon contributions of the natural seeps in this area, the Northeast Marine Region (RMNE) of PEMEX Exploration and Production (PEP), with the support of Corporate Unit of Geographic Information Systems (SICORI) developed with MDA Geospatial Services and the RADARSAT Resource Center (CBRR) in Brazil a progressive application of the RADARSAT-1 satellite to evaluate oil seep potentiality in detection and measurement, establishing a proven method for the monitoring of oil seep behavior. The methodology includes a regional criterion for the selection of images, basic and advanced digital analysis utilizing the Unsupervised Semivariogram Textural Classifier (USTC), and meteo-oceanographic calibration. The methodology also correlates geologic and environmental information.

New improvements to the analysis were anticipated with launch of RADARSAT-2 on December 14, 2007. RADARSAT-2 is Canada's second-generation commercial Synthetic Aperture Radar (SAR) satellite and is designed with powerful technical advancements that provide enhanced capabilities for environmental monitoring and emergency response. RADARSAT-2 offers new imaging capabilities and a faster turn-around schedule for data acquisition and product delivery. New imaging capabilities include: a finer resolution (3m), flexibility in selection polarization, and left- and right-looking imaging. In addition, RADARSAT-2 has superior data storage and more precise measurements of spacecraft position and attitude.

With the completion of the commissioning phase of RADARSAT-2 on April 25, 2008, PEMEX began to use a combination of both, RADARSAT-2 and RADARSAT-1 imagery for offshore monitoring. The RADARSAT-1 imagery was acquired in H-H polarization and the RADARSAT-2 imagery in V-V polarization. Both sensors acquired in ScanSAR Narrow A and B, Wide 1 and Extended Low 1 beam modes. Fine 7 Quad-Pol beam mode was also acquired with RADARSAT-2. All images were delivered to PEMEX with Near-Real-Time Service, which is less than 4 hours of playback of the data to the Canadian Data Processing Facility (CDPF).

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There was a 4 month period to transition from RADARSAT-1 to RADARSAT-2. Methodologies were tested and applied using the RADARSAT-2 data. Upgrades to the digital analysis tools were also required for the RADARSAT-2 file formats. On August 2, 2008, when conversion parameters were addressed and met with 100 percent confidence, the last RADARSAT-1 image was acquired operationally for the PEMEX project.

In 2008, 214 RADARSAT-2 images were acquired with basic digital analysis. Sixty-eight of these images were further analyzed by applying the USTC methodology with meteo-oceanographic calibration. Three significant improvements were identified with the transition to RADARSAT-2: 1) enhanced target detection with V-V polarization; 2) reduction of delivery time of data; and 3) less lead time for programming the satellite. In conclusion, the new technical advances of RADARSAT-2 have resulted in improving oil slick interpretation and provided faster response time which is crucial in the event of oil spill. As we go into 2009, RADARSAT-2 is being utilized in a fully-operational manner for natural oil seep monitoring, by PEMEX, in the Southern Gulf of Mexico.