

## **Classifying Digital Imagery of Modern Isolated Carbonate Platforms for Facies Conditioning of Reservoir Models: Examples from Offshore Belize and Yucatan**

Lodge, Jason J.<sup>1</sup>; Leverington, David<sup>2</sup>; Holterhoff, Peter F.<sup>2</sup> (1) Mewbourne Oil Company, Tyler, TX. (2) Geosciences, Texas Tech University, Lubbock, TX.

Modern isolated carbonate platforms in offshore Belize and Yucatan are used in this research as analogs to develop a quantitative analysis of sediment distribution. Alacran Reef is located 75 miles north of the Yucatan Peninsula in the southernmost region of the Gulf of Mexico, sitting on the edge of the Campeche shelf. The Belize isolated platforms (Banco Chinchorro, Glovers Reef, Lighthouse Reef, and Turneffe Islands) are part of a 600 km long reef system, which includes the Belize Barrier Reef, the fringing reefs off eastern Yucatan, and Arrowsmith Bank. These platforms have been extensively studied and have been well characterized with regard to sediment distribution patterns, which allows for robust calibration and classification of facies using satellite imagery. Using a modern carbonate environment as an analog for the subsurface is common practice in the petroleum industry today. However, qualitative analysis of the scales of facies heterogeneity and spatial dimensions of these environments leaves much room for interpretation.

At each modern isolated carbonate platform, each facies generally reflects incident radiation in a characteristic manner, and the diverse reflective properties of reef materials allow for the classification and statistical analysis of the platform. Platforms were characterized in this study using a supervised classification method involving selection of training sites on the basis of previously published sample data. The utilized satellite imagery was generated by the Landsat Thematic Mapper sensor (30 meter pixel size, 7 separate spectral bands), along with limited data generated by the Ikonos sensor (1 meter panchromatic and 4 meter multispectral pixels). Image bands of special interest in this study included those generated in the blue, green, red, and near-infrared regions of the electromagnetic spectrum. After classification, statistics were generated to produce facies frequency and uncertainty maps using bins of different scale.

The potential impact of image resolution on aspects of image analysis and the characterization of facies is of considerable interest in this study. Empirical evaluation of resolution effects at Glovers Reef was accomplished through additional analysis of high-resolution imagery generated by the Ikonos sensor. Results generated using the Thematic Mapper and Ikonos images were compared, along with basic depositional characteristics throughout each platform.