# Quantitative Comparative Sedimentology - Value Added for a Refined Interpretation

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## Abstract

The quantitative interrogation of modern and outcropping carbonates is a relatively new approach that adds value to a description and facilitates an improved interpretation of the depositional environment. Whether analyzing modern or fossil examples the quantitative approach produces results and insight that can improve an understanding of subsurface examples, and lead to better correlations between wells and to better geological and geocellular models. Modern sand bodies on Great Bahama Bank (GBB) were examined using Landsat and morphometric tools to compare their size, shape, complexity, distribution, orientation and topography. Profiles and spatial analysis tools enabled sandbar and channel spacing, position relative to the platform margin, connectedness, separation distances and density to be characterized. Certain aspects behave in a systematic and hence predictable manner, highlighting the potential to impart considerable insight to the characterization of grainstone systems because the examples are disparate in their overall extent and depositional settings. Six focus areas illustrating the variability of spatial patterns in reefal and related carbonates in Red Sea rift setting were mapped using Landsat imagery to define ‘‘carbonate bodies’’ that were analyzed for trends in orientation, relation to local fault networks, and size-frequency distribution. Fault lineaments are closely related to the orientation of carbonate bodies with areas exceeding 5 sq. km. Water depth and the occurrence of reefal frameworks and sediments are not systematically related. Used as an analog, these data from the contemporary Red Sea may provide insight into the orientation and scale of accumulation of carbonates in subsurface marine rift settings. An airborne LiDAR DTM and select outcrops show that the Pleistocene Miami oolite (MO) sand body in

South Florida consists of shoals (or bars) separated by tidal channels and is partly bounded on the ocean-facing side by a prograding barrier bar. Comparing the quantitative interrogation of the MO with that of the GBB sand bodies shows the Exumas to be a particularly compelling analogue with respect to length and overall visual comparison between the sand body morphology, shoal shape, number of tidal channels, channel length and width, and islands. The MO validates the concept of quantitative comparative sedimentology and in particular emphasizes how results from the modern can improve the interpretation of a fossilized example.

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