Complex Stratigraphy and Sedimentology of an Inner Shelf Shoal and Nearshore along the Northeastern Gulf of Mexico, USA

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EXTENDED ABSTRACT

The inner shelf and nearshore region of the northeast Gulf of Mexico (GOM) has been well documented as a massive sheet sand known as the Mississippi-Alabama-Florida (MAFLA) sand sheet (Doyle and Sparks, 1980). This transgressive deposit is believed to be homogeneous throughout the region, is a result of re-worked sediment during the latest transgression (Ludwick, 1964), and is economically important in terms of borrow sources for beach/barrier island restoration projects. While many studies of sediment stratigraphy, sedimentology, and lithology offshore exist around the Apalachicola region and from Pensacola west to Louisiana, few papers have documented the sediments and stratigraphy offshore the central Florida Panhandle. Hyne and Goodell (1967) interpreted shallow stratigraphy (the uppermost portion of the MAFLA unit) of two inner shelf shoals off Choctawhatchee Bay, Florida (Fig. 1). However, the relationship of the MAFLA deposit to earlier, late Quaternary deposits is of interest, in particular to beach restoration projects. In addition, the decreased rate of sea level rise (approximately the last 3000 yr) due to tectonic stability of the region has fostered an interest in the effects of modern hydrodynamics on the MAFLA and other late Quaternary deposits offshore. Therefore, the objectives of this study are to (1) delineate the sedimentary units and lateral facies relationships of the inner shelf and nearshore, (2) interpret the geologic history and depositional environments during the late Quaternary, and (3) to evaluate the modern seafloor topography and sedimentology, due to effects of sea level and modern hydrodynamics. It is proposed that the stratigraphy and sedimentology of this region is a product of transgressive processes during the last sea level rise and modern hydrodynamics, particularly those during storms.

This study utilizes approximately 1100 km (~684 mi) of sub-bottom seismic profiles along the inner shelf shoal and nearshore. The seismic profiles are high resolution CHIRP and ORE Geopulse “boomer” profiles. In addition, 257 vibracores were collected on separate cruises from the shoal and nearshore. The cores are approximately 5-6 m (~16-20 ft) in length and were split longitudinally, logged and photographed. Bathymetry was obtained during all cruises (seismic and coring) and integrated with bathymetry from the National Geophysical Data Center. The cores were sampled at 46 cm (1.5 ft) intervals for granulometric analysis. Granulometry was performed by dry sieving using the GilSonic AutoSiever GA-6 Model. Granulometry was calculated according to Folk and Ward (1957). Percent carbonate was determined by acid digestion.