

A Mega-Regional Perspective of the Northern Gulf of Mexico, Linking Stratigraphic and Structural Framework of Shelf Margins to Sands and Plays in Deep Water

Barbara Radovich¹, Don Howard, Ed Haire, and Gulce Dinc

¹Silver Grass Enterprises

ABSTRACT

Characteristics of deep water plays are often obscured because a critical part of the geologic story, the shelf margin, is located onshore where old and missing information is common. The stratigraphic and structural frameworks of the on-shore Mesozoic/Tertiary margins of the northern Gulf of Mexico are shown on a unique mega-regional, onshore and off-shore PSDM seismic dataset that for the first time illustrates the full scope of sediment progradation, linked extensional to contractional systems of the Gulf basin, and the complex response of salt. The onshore dataset is unique as no other seismic grid like it exists on any margin in the world today. The grid is comprised of onshore strike and dip lines composited from over 470 segments of reprocessed legacy onshore data, connects from the Texas/Mexico border to the Florida Panhandle, and from the onshore shelf to long offset OBC/streamer data extending into ultra-deep water. These data highlight the foundered Mesozoic and Paleogene margins, with expanded shelf sediments filled into the accommodation space created by salt evacuation and extensional listric faulting, thus potentially trapping considerable sediment volume onshore. This framework affects each margin, including the Cotton Valley, Cenomanian, and Wilcox, to a different degree and impacts the volume and type of sediments transported into deep water. A major allochthonous salt weld formed in the Upper Eocene to Oligocene, and these margin expansions were also trapped in a large area of onshore to nearshore, thus offering a new explanation for the missing Late Oligocene lowstand, predicted by eustatic sea level charts. Regional maps illustrate the development of the great fan plains of the Miocene in the Gulf of Mexico, and compare to those of offshore Nigeria. The Miocene shows many classic criteria of successful deepwater fan plays including extensive line-sourced shelf margins vulnerable to many sea level falls and rises, broad slope sediment wedges, and multiple pathways into deep water.