

Interpretation of Reimaged Basin-Scale Long-Offset, Long-Record Length 2-D Seismic Data from the Northern Gulf of Mexico

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Reimaged regional, Gulf of Mexico 2D seismic data reveals a complex structural and stratigraphic history in the Mesozoic and Lower Tertiary, and improved imaging of salt features helps clarify timing and styles. Results are presented of a pre-stack depth migration (PSDM) reimaging effort of existing 2D regional lines from the Gulf of Mexico. The dataset comprises 19,000 line-km, of merged land, streamer and ocean-bottom cable data, with long-offset (mostly 9 km) and long-record length (mostly 18 sec). The basin-scale merged data were reprocessed in a consistent manner and improvements were made to the standard PSDM workflow by instituting greater integration of geologic data and perspective during the imaging process data, while at the same time maintaining objectivity through the application of start-of-the-art algorithms. Geologic input was incorporated through a systematic line-by-line review of all nearby wells with salt penetrations to independently constrain top salt positions. Through a collaborative approach for evaluating salt interpretation, geoscientists with regional expertise provided continuous guidance to imaging geophysicists. Working in this manner allowed for alternative salt floods to be tested and evaluated. A similar approach was implemented for base salt and salt flank picks. Together with global tomography, 2D Reverse Time Migration was extensively used in the velocity model building process. The use of 2D RTM provided several benefits including diminished noise and higher amplitude top and base salt, enhanced imaging of steeper dips on salt flanks, and improved final imaging of subsalt strata. The final depth images clarify the understanding of salt timings and the effects on contemporaneous sediment deposition in the Lower Tertiary to Miocene. The structuring of the Mesozoic and Lower Tertiary shows a complex history. Superior image quality of deep features shows that extensional and contractional structures caused by gravity sliding and spreading are observed throughout the survey. The effects of extensive salt evacuation events contribute to a complex structural history for the Mesozoic and Lower Tertiary. These features affect the Eocene to Oligocene sedimentation fairways into the ultra-deep setting.