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Seismic-Sedimentologic Interpretation of Fluvial Sedimentary Architectures: Focus on Development*

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Abstract

When focusing on the exploration of thin beds problems in the development of thick fluvial reservoirs, which require more attention, could be overlooked. “Homogeneous” thick sandstones are heterogenetic on a reservoir development scale. This study shows why and how we make seismic-sedimentologic characterizations of thick fluvial reservoir architectures.

Seismic forward modeling and outcrop study with ground penetrating radar (GPR) are employed to study the reflection characteristics of different fluvial architectures. Thickness and sedimentary architectures of sandstone are considered. The results from outcrop study and seismic forward modeling are used in the well-seismic integrated fluvial reservoir characterization in Tiger Shoal, Gulf of Mexico. Stratal slices tell us how to identify real geological information from seismic data which is the focus in the real seismic data study.

The characterization of the point bar complex in Tiger Shoal shows (1) two phases of river deposition developed in the study unit; (2) a widely-distributed thin shale layer deposited between the two phases; and (3) lateral migration and reconstruction of the river created deposition of each sedimentary phase complex.

We conclude that (1) thickness, sedimentary architecture and seismic frequency are the three important factors influencing reservoir’s seismic reflections in thick fluvial reservoirs; (2) stratal slices provide more sedimentary information than seismic sections; (3) seismic reflection geometries may change with frequencies for the same sand body. Seismic data with the ‘proper’ frequency is needed in seismic-sedimentologic interpretation not the one with the highest main frequency; and (4) stratal slices

are not a picture of reservoirs just as satellite images are not for modern deposition. Therefore, a different interpretation method is needed. It is important to identify real information from fake information, like shadow channels on stratal slices.