Salt Tectonics and the Influence on Sedimentation Patterns, North-Central Green Canyon Area, Gulf of Mexico

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ABSTRACT

Recent advances in 3D seismic acquisition and processing have revealed numerous structural features beneath allochthonous salt bodies not previously well imaged or seismically modelled. These include salt wings, salt welds, salt stocks, and subsalt minibasins or perched basins. Seismic data examples from the central Green Canyon Area are presented, and some geologic models are discussed.

Regional mapping of salt bodies and welds are used to interpret salt emplacement and evacuation, and to define both minibasin and subsalt basin-fill architecture. Salt evacuation provides the local accommodation space for the initial phase of coarse-grained basin fill within the minibasins. The depositional systems associated with the initial basin formation are characterized by symmetrically convergent, high amplitude continuous reflective packages consisting of ponded sheet sand and nested channel-fill sequences deposited in the basin center. Their areal extent is controlled by paleogeography, and by variations in accommodation space relative to sedimentation. The stratigraphic convergence towards the basin margins forms a significant component of the lateral seal as the sandstone beds pinch out. During this phase of basin fill, each minibasin develops independently.

As accommodation space decreases relative to sedimentation, the sand architecture transitions into a mixture of sheet and channel-fill facies. This transition is accompanied by a change from symmetrically convergent to directionally convergent packages, and generally thickens towards the salt body. This change in external seismic facies geometry marks the beginning of initial salt welding. Basins that once developed independently begin to converge into one basin as accommodation space in the basin decreases with continued salt withdrawal. Sedimentation transitions into predominantly by-pass facies assemblages when the basins are fully welded. Bypass facies are comprised of laterally discontinuous channel/levee deposits, slumps, debris flows, and slope hemipelagic shale. Their external geometry is characterized by wedging to tabular packages across the basins, and may form good top seals because of their generally fine-grained nature. As salt is evacuated from the adjacent minibasins, sutured salt canopies form over the older adjacent primary or subsalt minibasins. Mapping welds, stocks, and base salt canopies defines the total subsalt accommodation space, and can be used to define general sediment fairways across the slope and basin plain. Common depositional systems include both confined channel/levee/overbank systems to distributive sheets and lobes.

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