Insights on the Evolution of Backstop Zones Related to Salt Tectonics in Analogue Models

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ABSTRACT

A conspicuous structural feature that has been interpreted from seismic studies of the fold-and-thrust belt in the deepwater area of the Gulf of Mexico is the presence of a backstop at the edge of the salt deposit. Gravitational and salt tectonics in the western margin of the Gulf of Mexico has resulted in thickening of the salt sequences and intensive shortening deformation in the sedimentary cover above the backstop area. The evolution of the process is complex and is influenced by sediment loading, the flow of salt, and the geometry of the basement. We have made a series of simplified analogue models to explore the resulting styles and indirectly study the evolution of this area. The models were constructed in a plexiglas box with a geometrical scale of $L^* = 2x10^6$ and simplify the geometry of the backstops areas. The mechanical behavior of salt was simulated using silicone SGM36. Colored and rounded quartz sand was used to simulate the brittle behavior. Loading effects were included by adding sand in time intervals. The results show the deformation styles can vary depending on the percentage of shortening and the sedimentary loading. Structures in the model propagate predominantly to the foreland as detachment folding before fault propagating folding at ca. 25% of shortening. Faulting and thrusting of the frontal flank of folds activates at around 35% of shortening. Finally, we analyzed the growth of secondary structures influenced by the mechanical anisotropy of the cover.

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