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3-D Kinematics and Growth Strata Architecture of the Frampton Anticline, Atwater Valley-Southern Green Canyon Area, Deep Water Gulf of Mexico

The Frampton growth anticline is part of the Atwater Valley-Southern Green Canyon frontal fold belt. The anticline is located basinward of the allochthonous Sigsbee Salt Nappe near the Sigsbee Escarpment. The timing and mechanism of frontal fold formation has been investigated using palinsparically restored depth sections and by the analysis of the growth strata architecture preserved on fold limbs.

The Frampton anticline is cored by autochthonous Middle Jurassic Louann salt and its western limit is bounded by the Green Knoll diapir. The fold geometry varies along strike from a symmetric detachment box-fold in the east to a breached detachment fold to the west. Fold shape was controlled by a pre-existing salt ridge, which developed further during Late Jurassic-Early Cretaceous compressional pulse. This acted as a buckling instability for a later major fold amplification phase during the Tertiary. The presence of the Green Knoll diapir to the west of the Frampton anticline influenced deformation, leading to interactions between fold segments and thrust faults. A landward vergent reverse fault accommodated shortening adjacent to the diapir whereas folding was the main mechanism of deformation in the eastern section of the anticline. Analysis of growth strata suggests that the detachment anticline developed according to a kinematic model of progressive limb rotation with minor hinge migration.

The model proposed in this study can be used as an analogue applicable to less well imaged frontal growth folds in the deepwater province of the Gulf of Mexico, which are partially obscured by overlying allochthonous salt sheets.