A 'Sea-Floor to Basement' Kinematic Model for Green Canyon and Western Atwater Valley, Central Gulf of Mexico

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Recent advances in seismic imaging & processing techniques, including reverse time, 'wide' or 'rich' azimuth& anisotropic migration techniques have led to a dramatic improvement in our ability to see and interpret well-constrained models for the structural evolution of complex multi-level salt source, feeder and allochthonous systems and their wall rocks. Some of these high-quality depth seismic volumes have been merged and used to constrain the timing of emplacement and advance of canopies, the formation of structural closures & impact of the complex evolving geometry on petroleum and depositional systems. A framework of sequentially restored, decompacted, isostatically & thermal-subsidence corrected interpretations will be presented which describe the evolving structural geometries. The contemporaneous evolution of small stock canopies & large counter-regional feeder sourced salt-tongue canopies will be illustrated. A well-constrained kinematic model for the timing of propagation of compression around and up-dip of the frontal fold train and the impact of wide-area deflation of the sub-Sigsbee compressional & stock canopy zone will also be shown. Canopies sourced from long-lived feeders with a large salt budget will be contrasted with diapirs/local small canopies driven by foldbelt crestal faulting, erosion and squeezing of isolated fold-core salt. 3D mechanical coupling of the system allowing propagation of gravity-driven compression over wide areas despite open feeders up-dip of the compressional zones will also be illustrated. Integration of the 'sea-floor down' kinematic models with petroleum systems modeling techniques and depositional frameworks has provided a more robust approach to understanding prospectivity, producing field hydrocarbon type and flow heterogeneity and also enabled better- constrained pore-pressure predictions for well planning.