

# **Basement and Continental Margin Dynamics Commence, Maintain, and Terminate Hydrate Accumulations along the Seafloor of Prolific Continental Margins Such as the Northern Gulf of Mexico**

Allen Lowrie  
Consultant, Picayune, MS.

Hydrate accumulations on the seafloor and shallow sub-surface appear as resultants of extrusions from deeper hydrocarbon reservoirs, some of commercial size. Migrating free gas converts into hydrates depending on appropriate temperatures and pressures. Regional dynamics, from basement and within the sedimentary wedge as well as mobilized salt and shale, expels these buoyant hydrocarbons.

Hydrate accumulations remain in stable portions of the seafloor. Along the upper slope of the northern Gulf of Mexico continental margin, stresses are complex and competing. The extension-filled shelfbreak yields at greater depth to slump blocks in varying stages of descent in turn to salt domes elevating the seafloor. Hydrate accumulations often overlie salt domes. Salt domes are ever buoyant with continuing sedimentation.

An evolutionary schema for seafloor hydrates is that the ascending salt domes force hydrocarbons from whatever reservoir they are in. Hydrocarbons may rise along the normal faults, created by the advancing salt, which serve as migration routes. The free gas can then be converted to hydrates. Hydrate accumulations continue to evolve as new faults, serving as migration routes, come into existence and as older faults become closed. The loci of hydrate accumulation continues to rise with further sediment deposition and salt dome ascent.

This advancing pattern continues as long as a general equilibrium is maintained between hydrocarbon resources, continued deposition, and salt advance, all within suitable T-P regimes. Should there be a major break in any of these inputs, then the overall continuum ends until a new equilibrium arises.