

Methodology for Minibasin Ranking in the Deepwater Gulf of Mexico

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Deepwater northern Gulf of Mexico is characterized by extensive allochthonous salt sheets with isolated minibasins. Assessing the exploration potential of these minibasins requires an integration of all the petroleum systems elements. An analysis of minibasins in the Garden Banks, Green Canyon, Keathley Canyon and Walker Ridge protraction areas shows the relationship of stratal and structural architecture to the interaction of sedimentation and salt movement. Minibasins are broadly classified using stratal and allochthonous salt geometries into five basin types: (1) Ramp, (2) Welded, (3) Welded Listric, (4) Primary, and (5) Salt-floored,(see Figure 1) Basins that lack data for classification into the five types are carried as unclassified. The five basin types vary in their efficiency to collect and trap hydrocarbons, ramp basins being the most effective and salt-floored the least.

Except for primary basins, stratal geometries in all basins are influenced by movements of allochthonous salt. Ramp basins are characterized by a south-bounding, north-dipping salt ramp. They predominate on the slope in Garden Banks and Green Canyon. Most ramp basins have young thick depocenters adjacent to the counter regional ramp. Ramp basins tend to be asymmetric and larger in a real extent than other minibasins. Welded basins were previously underlain by allochthonous salt that has been fully or partially evacuated. They increase in frequency southward into the Walker Ridge and Keathley Canyon protraction areas. Welded basins have a multitude of patterns of internal faulting and sediment fill, some are symmetrical with bowl-shaped fill, others have multiple depositional axes and bi-directional stratal fill. Welded listric(Roho) basins have south-dipping arcuate faults that sole into the evacuating salt. Their depocenter remains located on the northern, upslope end of the basin downthrown to the listric faults.

Primary basins show no evidence of allochthonous salt and display continuous sedimentary fill from Cretaceous to Recent. Salt -floored basins are underlain by continuous allochthonous salt that isolates them from the underlying petroleum kitchens. Salt-floored basins occur along the leading edge of allochthonous salt near the Sigsbee escarpment and above very young salt sheets in Garden Banks and Green Canyon.

As basin fill changes through geologic time. Each of the basins has differing capability to receive and internally distribute the hydrocarbons it receives via a complex plumbing system from sources at greater depths below the basin. regional classification of the basin types combined with mapping the sequence stratigraphy framework within the basins provides a spatial and time framework for evaluating risk more effectively. In general, hydrocarbon entry points to basin strata are controlled through time by salt movement and geometry.

Using this basin ranking methodology, ramp basins have attractive plumbing and enhanced trapping focus. Welded and welded listric basins are dependent on the evacuation of the salt floor for charge to occur, therefore the age and areal extent of the weld formation are factors in ranking individual basins. Primary basins appear to have access to underlying sources but may lack effective focused migration pathways and trapping geometries. Salt-floored basins are the lowest ranked basins due to separation of

strata in the basin from hydrocarbon migration pathways.

Within the four protraction areas, most discoveries have been in ramp and welded (incl. Listric welded) minibasins (about 1 BBOE in each basin type) Primary, salt-floored, and unclassified basins have minor discoveries, none of significant size. The largest individual fields are found in ramp basins.

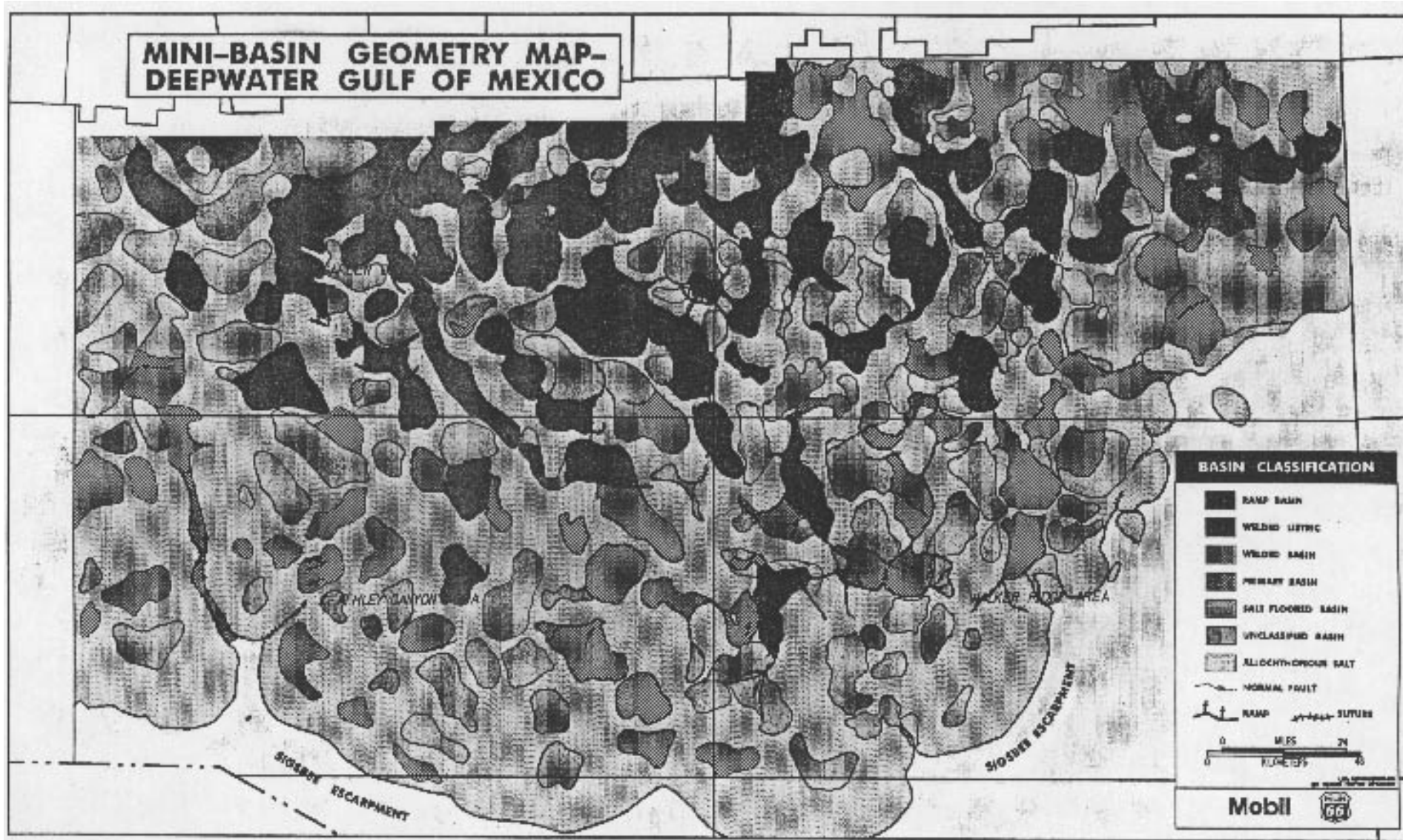


Figure 1 Mini-Basin Geometry Map-Deepwater Gulf Of Mexico