[PS]Mexican Frontier Hydrocarbon Basins*

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Abstract

While current interest in Mexico is focusing on sales for blocks offshore Gulf of Mexico and in adjoining onshore productive basins, now is the time for explorationists to turn their attention to the frontier basins, shown in **Poster 1**, where, after a few more bid rounds in the oil producing areas, there will likely be calls for nominations leading to awarding of exploration contracts. This paper summarizes the present state of evaluation of these under-explored areas in preparation for such future bid rounds.

First of all, it is important to realize that these are not entirely virgin basins. Since the 1940s, Pemex geologists have undertaken extensive field mapping of the whole country and identified potential source and reservoir quality rocks in a number of localities. Magnetic surveys identified deep basins, and seismic surveys picked out structural prospects. Some wells were drilled which often resulted in oil or gas shows. Success, however, has been very limited, with commercial production being established only in the Sabinas Basin. Pemex has since concentrated their exploration and development efforts on the offshore and near onshore basins around the Gulf of Mexico. Little additional exploration has occurred in the frontier basins. We review the findings in all the frontier basins in the hope that a few basins will be found to be productive in the future.

In the Cenozoic Pacific margin-type basins, gas shows and possibly oil shows in the U.S. extension, have been encountered so far. Potential source rocks have been identified in these basins. Structural and stratigraphic trapping has been suggested and sandstone reservoirs have been encountered. Paleozoic back-arc basins on Mexico's High Plateau may have had their traps breached by the Laramide orogeny and later extensional faults. Mesozoic basins have been similarly inverted except for the extension into Mexico of the Peten Basin. The Yucatan Platform remains stable and for the most part immature, but it has curious oil and gas shows in the area of a major meteoric impact crater.

In general, active petroleum systems have been found in eleven out of the fifteen frontier basins, but as these areas were thought to have low probabilities of encountering commercial hydrocarbons, Pemex abandoned further investment in them.

All of the above conclusions are based on limited information. These frontier areas are ripe for re-examination and renewed thinking, especially applying up-to-date geological concepts and exploration and production technologies. These under-explored basins offer potential source rocks of different ages, a variety of tectonic regimes resulting in numerous potential traps, and the potential for both clastic and carbonate reservoirs.

Perhaps some of them will merit being nominated for future bid rounds. One or two might be the location of discoveries of commercial hydrocarbons.

Summary Data on Poster 2
Vizcaino
Salton-Altar Basin
Mazatlan Basin
Chihuahua-Pedregos
Borderland Basin
Purisima-Iray basins
Obregon Basin

Summary Data on Poster 3
Parras Basin
San Luis Potosi Platform
Yucatan Platform
Tlaxiaco Basin
Tehuantepec Basin
Chiapas-Peten South

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HOW WOULD *YOU* UNLOCK THE HYDROCARBONS IN THESE FRONTIER BASINS WITH NEW TECHNOLOGY?

MEXICAN FRONTIER HYDROCARBON BASINS

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Michele Bishop and Edwin Moritz: Gustavson Associates, Boulder, CO, United States

Poster 2

ABSTRACT

While current interest in Mexico is focusing on sales for blocks offshore Gulf of Mexico and in adjoining onshore productive basins, now is the time for explorationists to turn their attention to the frontier basins, where, after a few more bid rounds in the oil producing areas, there will likely be calls for nominations leading to awarding of exploration contracts. This paper summarizes the present state of evaluation of these under-explored areas in preparation for such future bid rounds.

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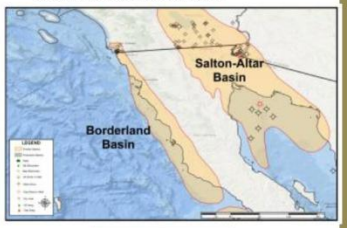
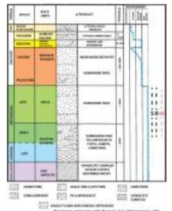
BORDERLAND BASIN

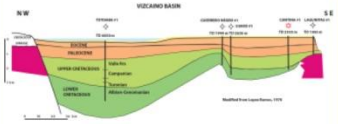
- Source Rock: Cretaceous marine shales and Miocene diatomaceous strata.
  O & G shows in wells drilled in the 1920's and 30's onshore CA.
- Reservoirs: Cretaceous through Tertiary deep-water clastics
- Traps: Potential fault and stratigraphic traps
- Seals: Interbedded shales
- Risk: Commerciality
- New Technology needed: Calibrated seismic attributes



VIZCAINO

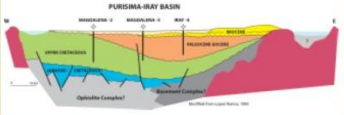
- Source Rocks: Cretaceous-age Alisitos Formation argillaceous rocks, Type II and Cretaceous-age Valle formation argillaceous rocks, TypeII and Type III.
- Gas discoveries,
  - Cantina #1, 1976, gas in UK Valle Formation, FARO 885 mcfpd.
  - Bombas #1, 1977, gas in LK Alisitos Formation, FARO 256 mcfpd.
- Reservoirs: Cretaceous sandstone, shows in Paleocene sandstone.
  - Valle Formation.
  - Alisitos formation.
  - Bateque Formation.
- Traps: Stratigraphic and structural.
- Seals: Interbedded shale.
- Risks: Trap definition.
- New Technology Needed: Seismic.





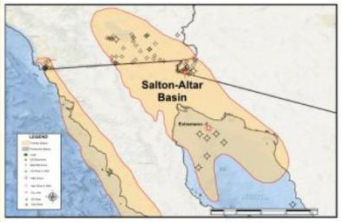
PURISIMA-IRAY BASINS

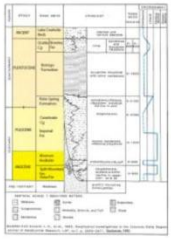
- Source Rock: Mature Cretaceous Valle Formation argillaceous rocks.
- Reservoirs: Cretaceous sandstone.
  - Valle formation.
  - Alisitos Formation.
  - Bateque formation.
- Traps: Stratigraphic and structural.
- Seals: Interbedded shales.
- Risks: Trap definition.
- New Technology Needed: Seismic, seismic data from 1956 onshore and 1972-73 Offshore.



SALTON-ALTAR BASIN

- Source Rocks: Miocene and Pliocene marine shale, lacustrine shale.
  - Discoveries
    - Extremeno #1 gas-condensate discovery, 1980
    - 4,802m TD, drilled in 40 meters of water depth
    - Miocene sandstone reservoir
    - Flowed 5.7 MMCFPD plus condensate
    - Estimated gas in place 50 BCF
    - Pozo Altar #1 gas discovery, 1983
    - Miocene sandstone reservoir
  - Gas and oil shows in Arizona and California portion of the basin.
- Reservoirs: Miocene sandstones (discoveries).
- Traps: Vtrench fault, folds, and stratigraphic.
- Seals: Interbedded shale.
- Risks: Trap definition.
- New Technology Needed: Seismic.



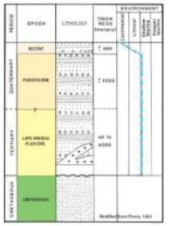


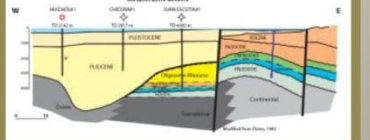
OBREGON BASIN

- Source Rock: Cenozoic
- Reservoirs: Miocene and younger marine and continental clastics
- Traps: Structural and stratigraphic
- Seals: Interbedded shales
- Risks: Trap and seal

MAZATLAN BASIN

- Source Rocks: Pliocene, TOC 1-2.59, TypeII, Miocene Monterey source rock equivalents possible.
- Discovery
  - Huichol #1, 3142 m TD, tested non-commercial gas from Plio-Pleistocene reservoirs.
- Oil seeps on Isla Isabel from basalt.
- Reservoirs: Pliocene-Pleistocene sandstones.
- Traps: Fault, fold, and stratigraphic.
- Seals: Interbedded shale.
- Risks: Trap.
- New Technology Needed: Seismic.

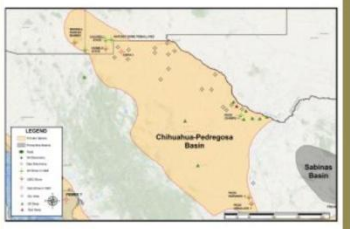


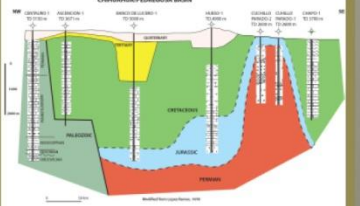


CHIHUAHUA-PEDREGOSA BASIN

"SHALE GAS POTENTIAL", PEMEX

- Source Rocks: Jurassic marine oil prone, Pennsylvanian gas prone.
- Reservoirs: Pennsylvanian-Permian carbonates, Jurassic-Cretaceous carbonates and sandstones.
- Traps: Laramide fold and fault traps in inverted Chihuahua trough, post-Laramide reactivation, diapiric evaporites.
- Seals: Evaporites, shales.
- Risk: Structural reactivation, intrusions and volcanism.
- New Technology Needed: Seismic, hydrofraced horizontal wells.

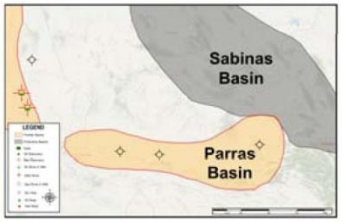


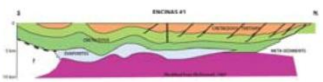


Poster 3

PARRAS BASIN

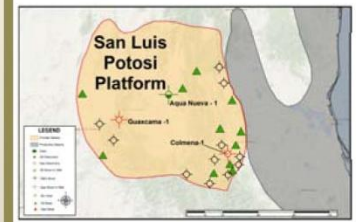
- •Source Rocks: Late Jurassic marine.
- •Reservoirs: Cretaceous and Jurassic fractured carbonate, sandstone.
- •Seals: Carbonates and shales.
- •Traps: Laramide anticlines, fault, overthrust.
- •Risks: Trap reactivation.
- •New Technology Needed: Seismic.





SAN LUIS POTOSI PLATFORM

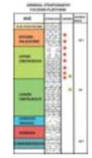
- •Source Rocks: Microbial LK source rocks in center; marine UJ source rocks on flanks.
- •Reservoirs: LK thin microdolomites; MK dolomites, porous in outcrop.
- •Seals: LK anhydrite.
- •Traps: Thrust-faulted anticlines.
- •Risks: Trap definition.
- •New Technology Needed: Seismic imaging through thick evaporites.



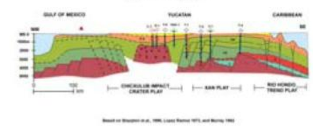
SAN LUIS POTOSI PLATFORM

YUCATAN PLATFORM
P50 Resources: 300 MMboe (Pemex)

- •Source Rocks: LK microbial source rocks; Possible Paleocene euxinic shale in crater basin.
- •Reservoirs: LK microdolomites; UK carbonate breccias.
- •Seals: LK anhydrites.
- •Traps: Impact crater margin faults; drape over half-grabens, anticlines related to wrench-related pop-up structures.
- •Risk: Trap definition by seismic; regional seal.
- •New Technology Needed: seismic imaging through surface karst.



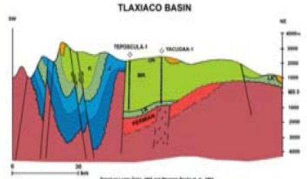
YUCATAN PLATFORM



TLAXIACO BASIN

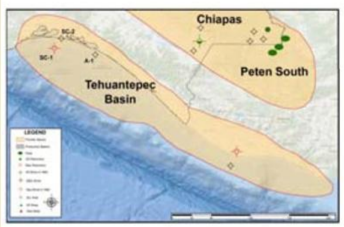
- •Source Rocks: UJ marine source rocks, abundant oil seeps.
- •Reservoirs: No porous beds known.
- •Seals: Unknown.
- •Traps: Faults.
- •Risks: Inverted basin; traps breached; reservoir quality.
- •New Technology needed: Oil shale and shale oil extraction.

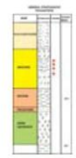
TLAXIACO BASIN



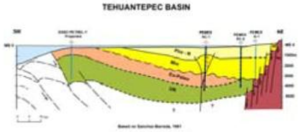
TEHUANTEPEC BASIN

- •Source Rock: Possibly Turonian marine shales.
- •Reservoirs: Upper Miocene sands with gas shows.
- •Seals: Upper Miocene interbedded shales.
- •Traps: Wrench fault system, pop-up structures.
- •Main Risk: Commerciality.
- •New Technology needed: Calibrated seismic attributes.



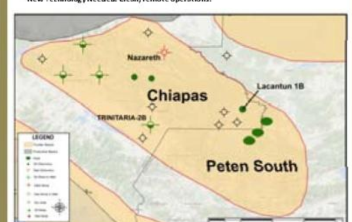


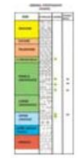
TEHUANTEPEC BASIN



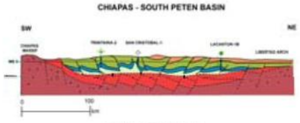
CHIAPAS-PETEN SOUTH

- •Source Rocks: LK microbial source rocks in east; UJ marine source rocks in west.
- •Reservoirs: LK thin microdolomites; UJ porous dolomites.
- •Seals: LK anhydrites.
- •Traps: Thrust-faulted anticlines.
- •Main Risks: Political, environmental, logistical.
- •New Technology Needed: Clean, remote operations.





CHIAPAS - SOUTH PETEN BASIN



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