

REGIONAL MODEL OF HYDROCARBON CHARGE, TIMING AND PRESERVATION IN THE SOUTHEAST PORTION OF THE GULF OF MÉXICO

Rodrigo MALDONADO¹, Rubén Dario GÓMEZ¹, Luis Manuel MEDRANO¹, Arnulfo SÁNCHEZ¹, José RUIZ¹, Fernando MARCANO² and Nestor CHIGNE².

1. PEMEX PEP, Edificio Admvo. 1, C.33 No.90, C.P.24180, Col. Burócratas, Cd. Del Carmen, Camp. México.

2. PLATTE RIVER ASSOCIATES, INC., 2790 Valmont Road, Boulder, CO 80304 USA.

The hydrocarbon charge model in the southeast portion of the Gulf of Mexico supports the geological risk knowledge for the exploration targets in Pemex, and provides a timing and hydrocarbon preservation model to the play analysis in this region.

BasinMod programs were used in order to accomplish the model, where the seismic 3-D interpretation of 10 horizons (altogether with its respective models of depositional environment distribution) was integrated to the geological, stratigraphical, lithological and geochemical information provided by 45 wells spread on an area of 50,000km², its extensions goes from Coatzacoalcos region in the Southwest toward the Plataforma de Yucatan border in the Northeast, all these information allowed the proper calibration of the model.

Tithonian Upper Jurassic rocks are the main source rocks in the area; they are present and reached the oil window everywhere, with the exception of a zone located to the north of the area. Highest maturity is found towards the south (onto Macuspana Basin) and the southwest (onto Veracruz Basin). This model shows the hydrocarbon migration from the Tithonian rocks towards the probable traps calculated as equipotential surfaces by the program in the horizons of Upper Cretaceous and the sequence boundaries named as 2.5 and 3.7. Figure 1 shows the trap distribution in the studied area and divides it according to those areas where temperature favors to the biodegradation in the cretaceous; the map shown in this figure can be a hydrocarbon preservation risk map because it matches with the oil quality found there.

This model suggest that hydrocarbon migration occurred 11my ago in the south where there is a higher heat flow than the rest of the area, more recently, at approximately 5.7my ago, migration is generalized in all the area, even in that portion at the North where the source rock is immature or it has not expelled any hydrocarbon yet. Formation of traps age is generally previous to hydrocarbon expulsion age, this favors timing but, in more recent plays where structuration is related to post-Chiapanecho faulting event during the Plio-Pleistocene, the possibility of oil and gas presence will depend on those hydrocarbons that escaped from traps in older structures.

The model results indicate that there is a high probability for the presence of hydrocarbons anywhere in the studied area, southward the source rock high maturity suggest a poor timing for the oil presence in plays from Pliocene and Pleistocene, in the other hand, hydrocarbon preservation represents a risk that must be considered in most of the plays. Another thing to consider is that seal efficiency will depend on both the lithological aspects and the fracture effect due to overpressure in the system related to the reservoir rocks diagenesis and to those areas with a high subsidence ratio in the tertiary.

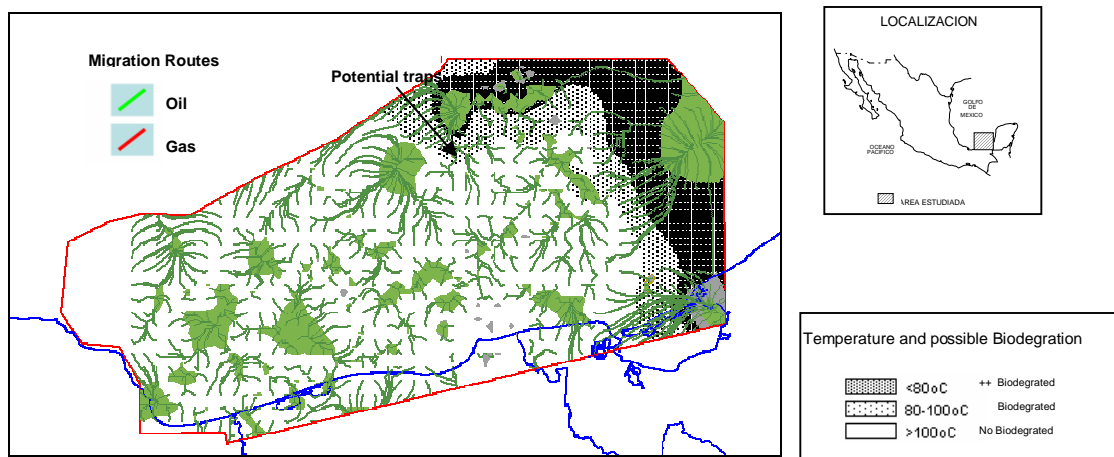


Figure 1. Hydrocarbon migration and areas with possible biodegradation for the Upper Cretaceous of the studied area.