ABSTRACT

The prolific Maracaibo basin contains the second largest hydrocarbon accumulation in South America; it has been one of the principal oil producers of the world since the beginning of this century. Exploratory efforts in this basin, carried out with new techniques and new ideas, continue Today, so it is of interest to determine the trends of hydrocarbon concentrations in terms of resources per unit volume of sediments and to correlate them to stratigraphic, sedimentary-tectonic and geochemical variables.

Regional scale maps representing the 24 principal geologic and geochemical variables that are thought to be a function of hydrocarbon generation, migration and accumulation were discretized on a 25 * 25 km grid. Variables used are isopach and Total Organic Carbon (TOC) of source rocks, isopach, sandstone content and grain size parameters of reservoir rocks, isopach of stratigraphic seal and overburden, maximum paleotemperatures (Ro and Tmax), tectonic energy (fault length and displacement) and hydrocarbon families. Multivariate analytical statistics was used to obtain the trends of hydrocarbon distributions.

The resulting hydrocarbon concentration trend map was cuantitatively correlated to known hydrocarbon accumulations and prospective areas, where additional new accumulations might be found, were obtained. It can be shown that the largest known hydrocarbon concentrations correspond to areas of greatest cumulative overburden. The southern Zulia Catatumbo region is the largest prospective area determined by this method.

EXPLORATION HISTORY

There are many surface evidences - oil seeps or menes - along the rim of the present-day Maracaibo basin, pointing to the many prolific reservoirs in the subsurface. The native indians used bitumen and tar for medicinal and other domestic purposes.

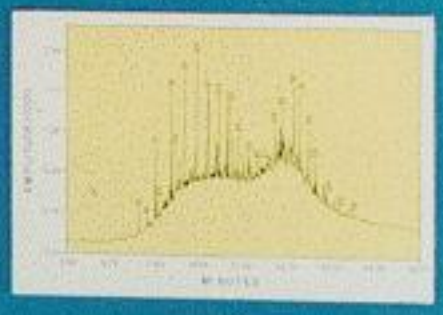
In 1883 the first producing well - EUREKA - was completed by the Compañia Minera del Táchira, yielding 200 litres of crude oil, that was refined locally into kerosine. In 1914, the ZUMAQUE-1 well discovered the giant Mene Grande field, initiating the commercial oil production in the basin. The blow-out of well LOS BARROSOS-2 in the La Rosa field in 1922 attracted world attention and definitely established the Maracaibo basin as a world class petroleum province with 13 discovered giant oil fields.

SURFACE INDICATIONS - MENES

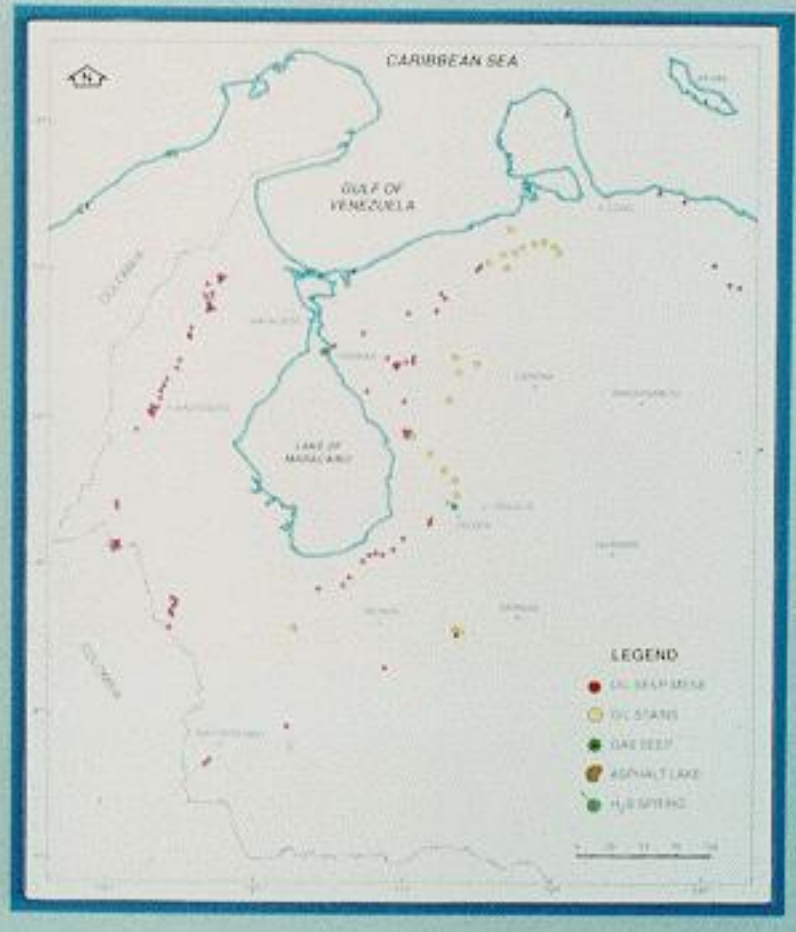
CARAÑO SEEP

MENE GRANDE SEEP

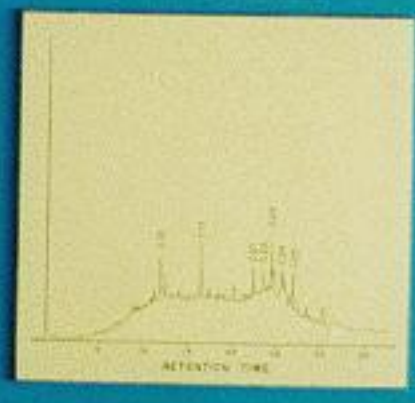
QUEBRADA LA LUNA
SATURATE FRACTION



CARAÑO SEEP



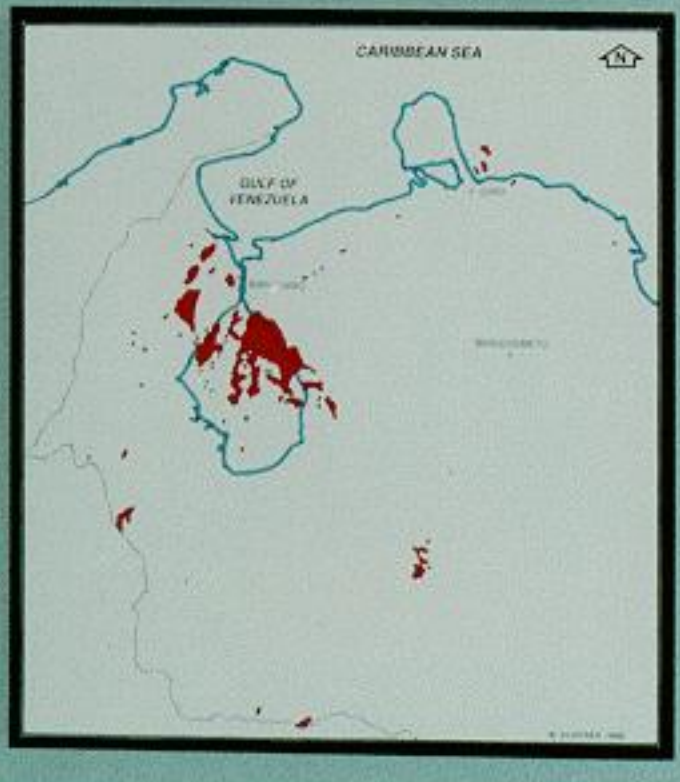
RIO QUI
SATURATE FRACTION

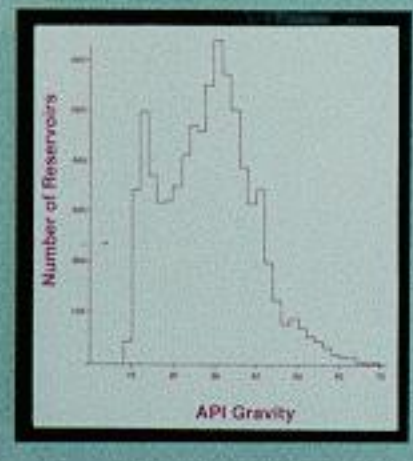


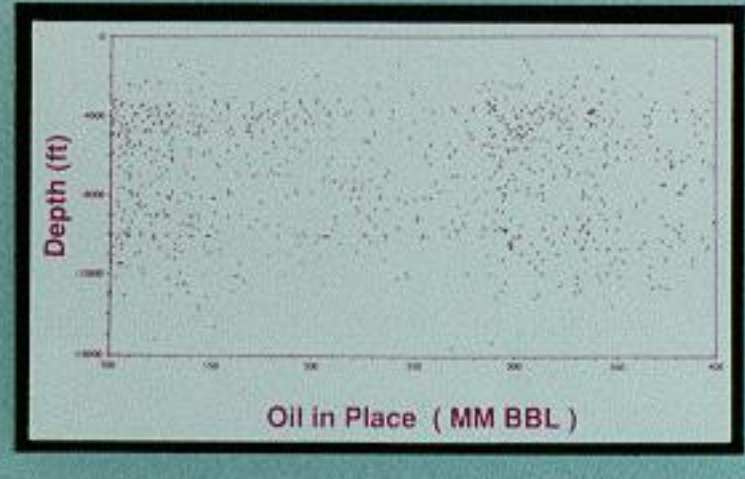
QUEBRADA LAS VIRTUDES

CONCESSIONES 1928

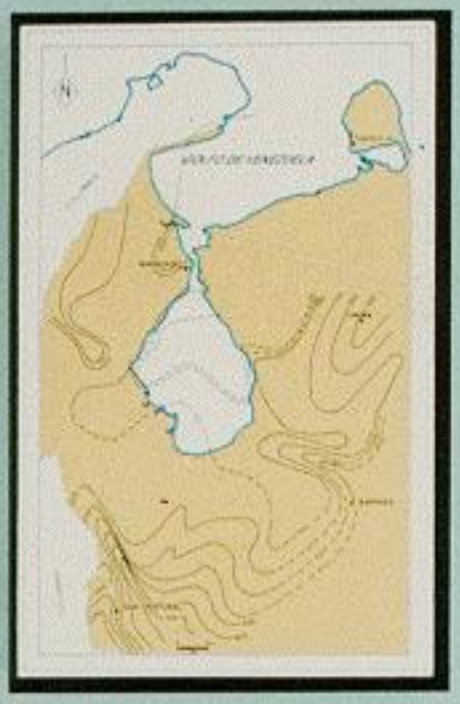
OIL FIELDS 1996







LA LUNA Fm ISOPACH



LA LUNA Fm TOC

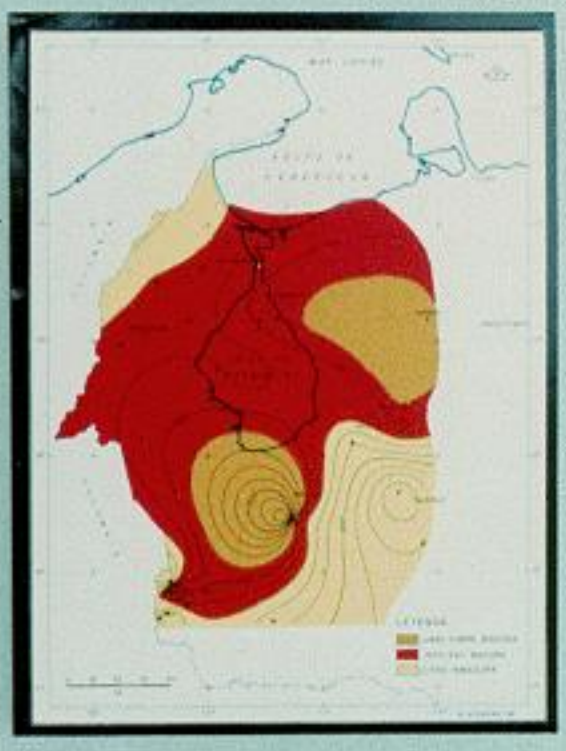
LA LUNA Fm FACIES

MARACAIBO BASIN - RESOURCE ANALYSIS

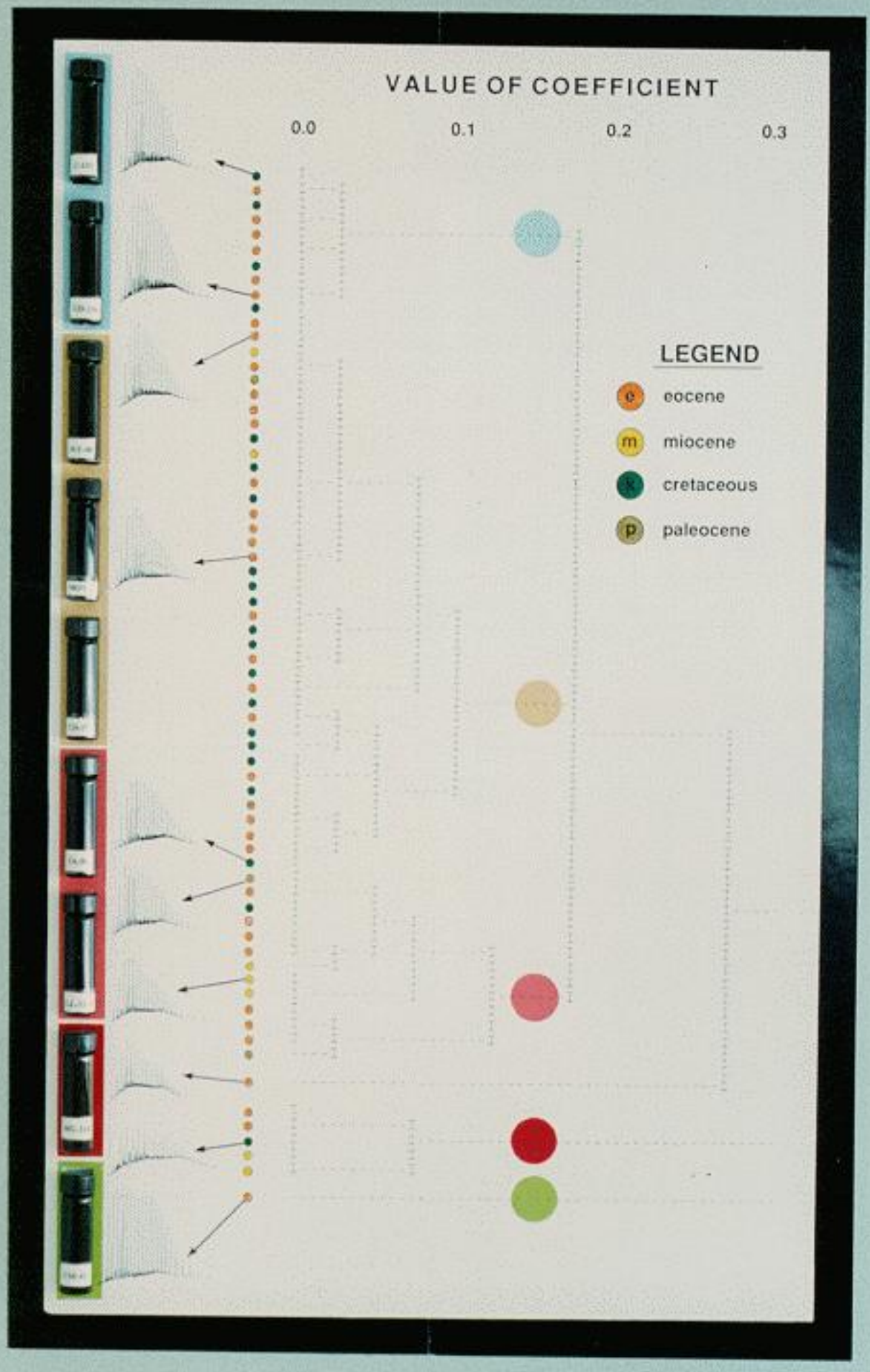
	Volume of Sediments km³
CRETACEOUS	
Rio Negro Fm	4.688
Cogollo Grp	21.250
La Luna Fm	7.812
Colon Fm	39.625
Total Cretaceous	73.575
PALEO-EOCENE	70.538
OLIGO-MIO-PLIOCENE	118.655
Total Basin	262.768

PALEO-EOCENE ISOPACH

LA LUNA Fm Tmax



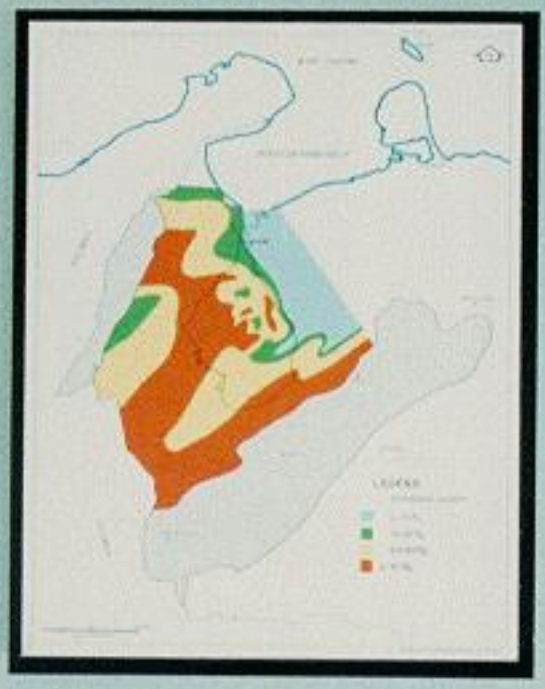
CLASSIFICATION



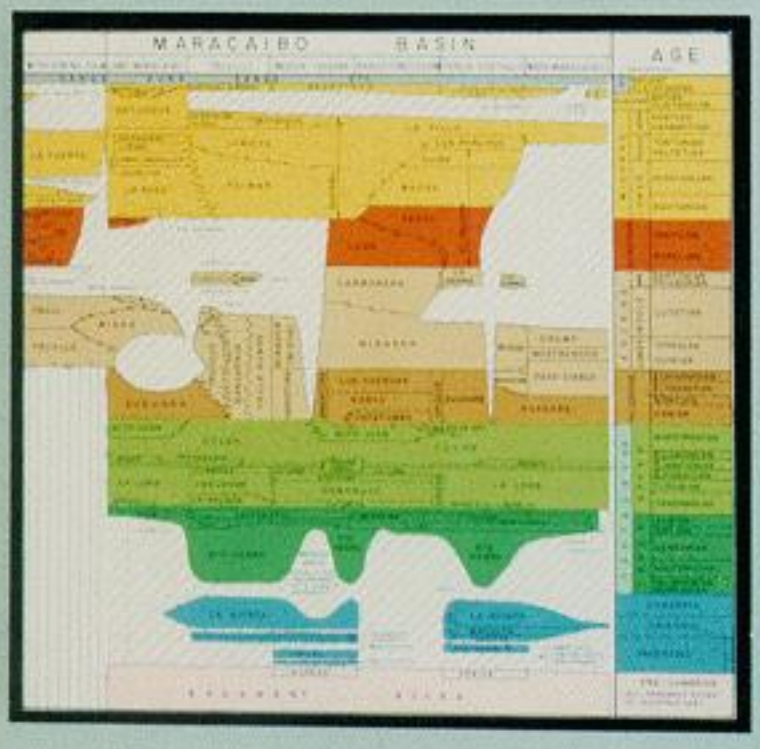
Q-mode cluster analysis of C14-C33 data established six natural groups. Representative chromatograms and samples are shown for each family of crude.

MIOCENE FACIES

EOCENE FACIES



FAULT DISTRIBUTION

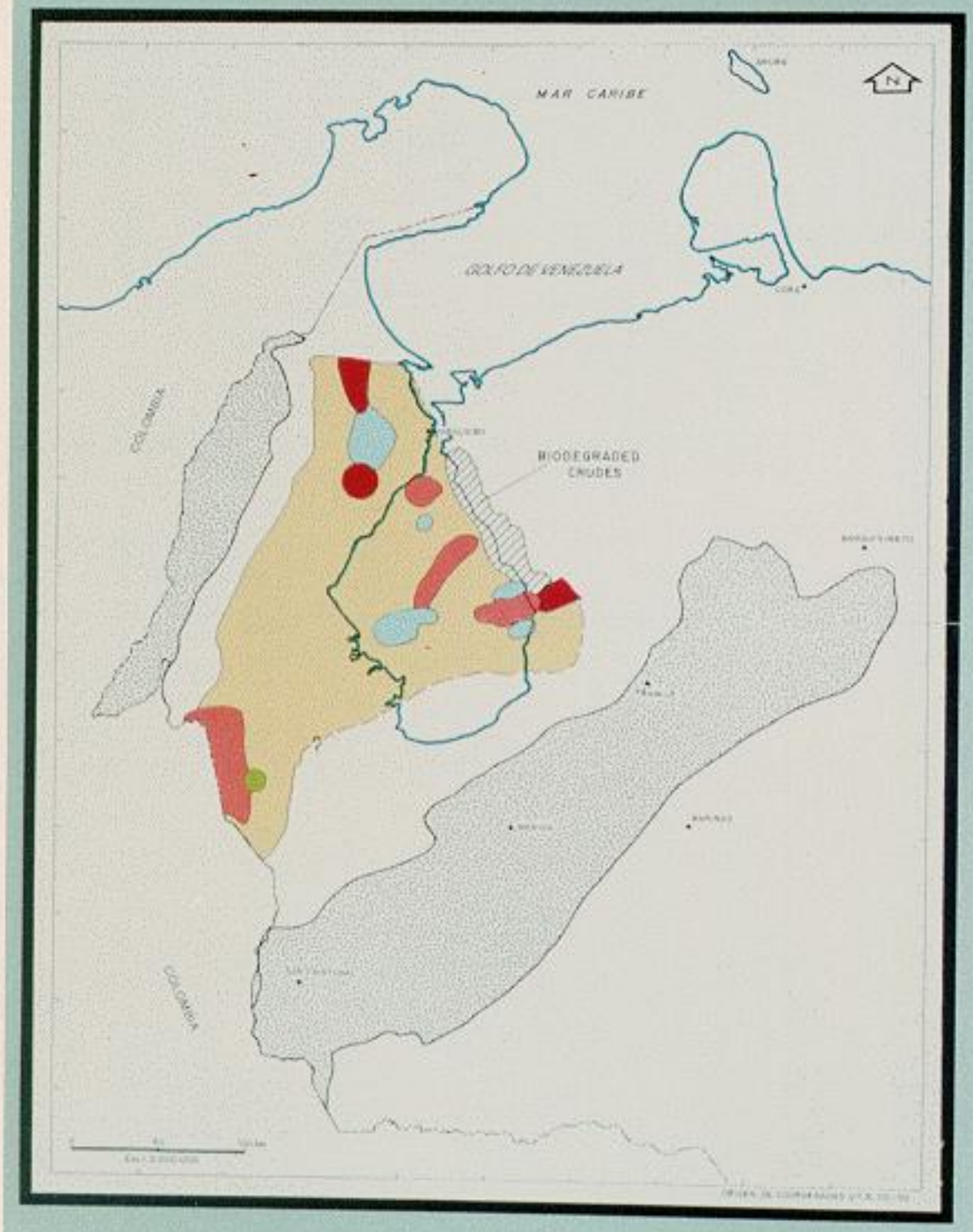


MARACAIBO BASIN - SOURCE ROCKS

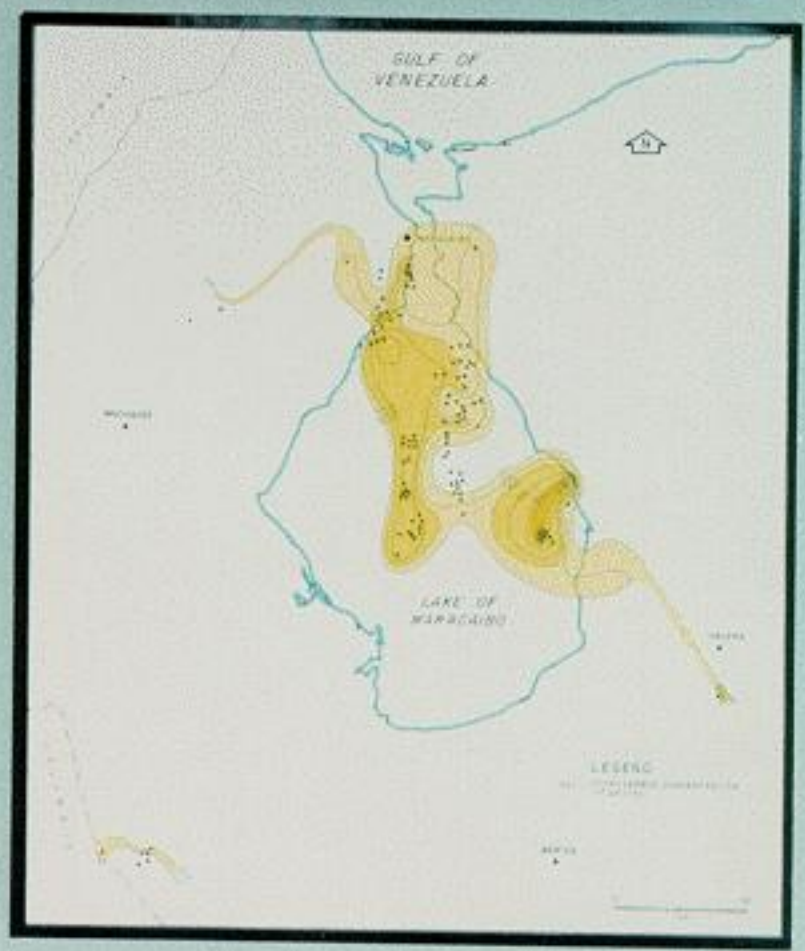
La Luna Fm.
Volume - COT > 2%, in oil window 7.012 km³

OIL POSSIBLY GENERATED	MM bbls
a- Nederloff	2.456.000
b- Fisher assay	651.000
c- Cabrera, 1985	791.000
d-COTconversion	572.000
1994 Cumulative Production	41.400
1994 Reserves	28.550

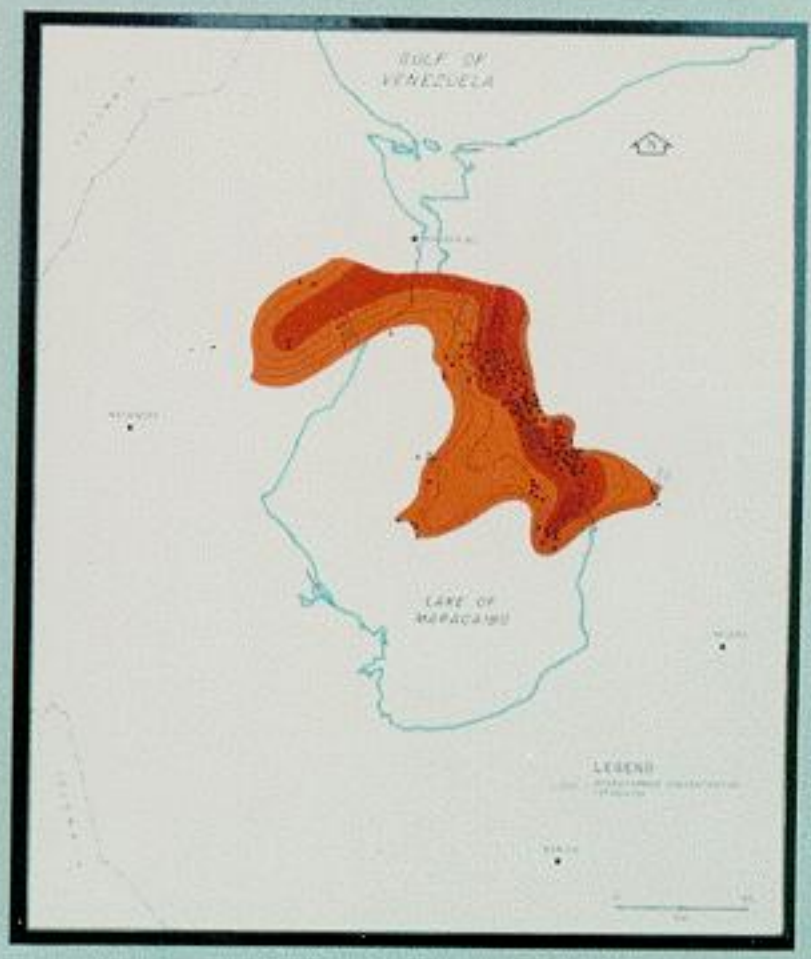
HYDROCARBON FACIES



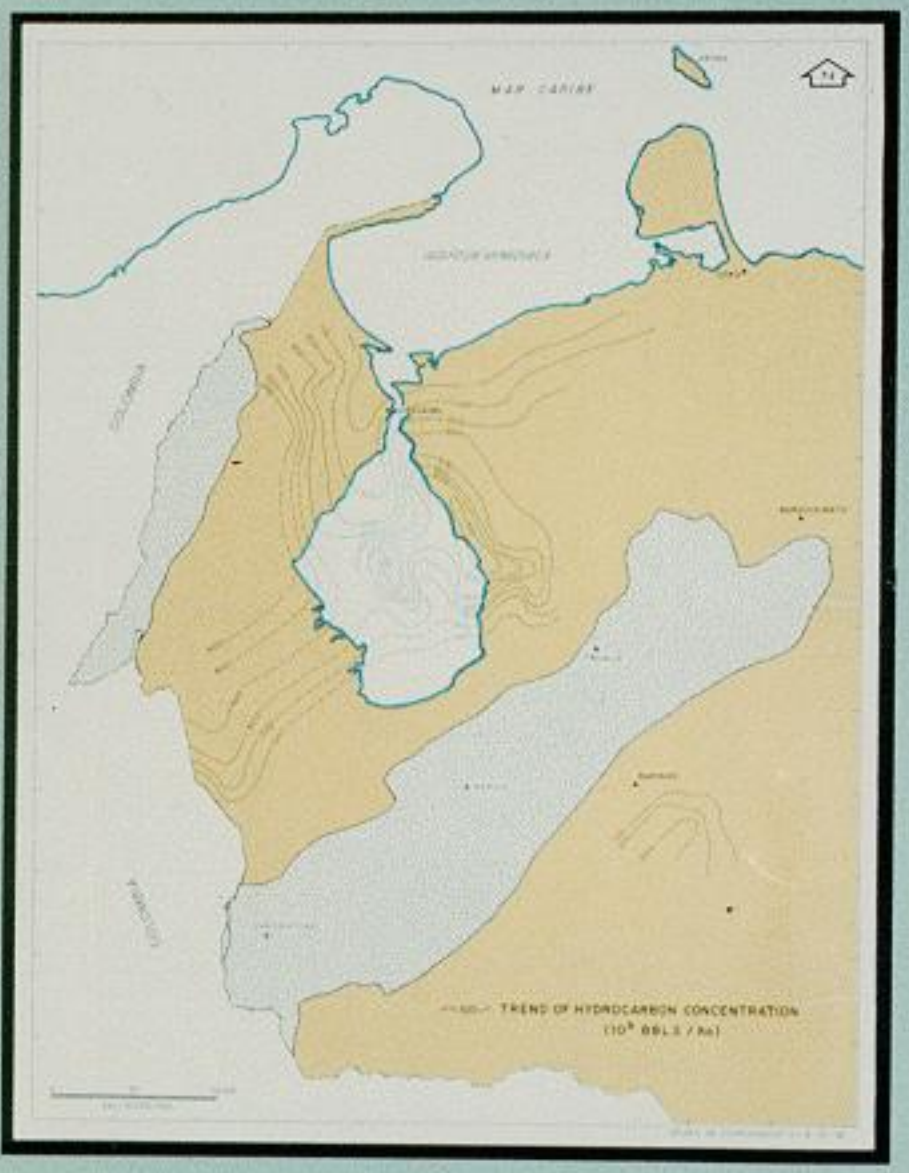
EOCENE-TREND OF HYDROCARBON CONCENTRATION

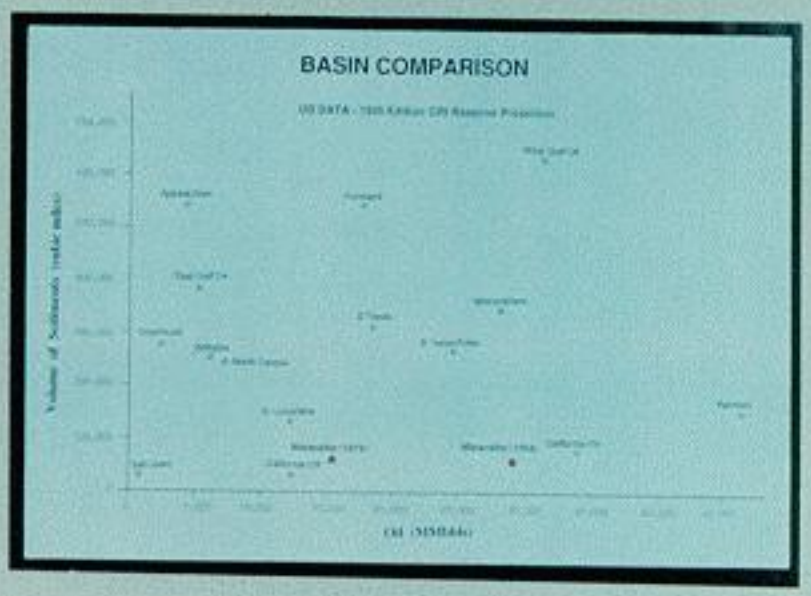


MIOCENE-TREND OF HYDROCARBON CONCENTRATION



TREND OF HYDROCARBON CONCENTRATION





CONCLUSIONS

The Maracaibo basin is a very prolific petroleum province, concentrating large reserves in a relatively small volume of sediments.

Many oil seeps and other surface indications limit the basin on all flanks.

The first giant oil field, the Mene Grande field was discovered in 1914 by drilling near the largest oil seep.

Other giant oil fields are closely associated to surface indications.

The upper Cretaceous La Luna Fm is the principal source rock; the Paleo-Eocene Paso Diablo Fm is an additional source in the southwestern portion of the basin.

The Eocene Misoa and Mirador formations and the Miocene Sta. Bárbara, Lagunillas and La Rosa formations are the main reservoir rocks.

Conservative estimates of oil generated in the La Luna Fm exceed by factors of 8 to 35 the amount of oil so far found, promising important additional discoveries mainly in the unexplored Catatumbo, South Lake, North Andean Flank and Motatan regions.

Even though the entire onshore portion of the basin was under concession, less than 25% of the basin has been completely explored to a depth of 20.000 ft.

Trends of hydrocarbon concentration are generally N-S in the Eocene to NNW-SSE in the Miocene.

The maximum concentrations are found in the central lake and Bachaquero areas for the Eocene, and along the Bolivar Coast shoreline for Miocene reservoirs.