Lower Magdalena Valley Basin

LMV BASIN

Colombia

2005

2006

Lots of exploration opportunities for new concepts

Petroleum System

Hydrocarbon Evidence: abundant oil and gas seeps are evidence of the existence of a prolific Petroleum System at work.

Reservoirs: Oligocene sandstones and limestones (Cienaga de Oro Formation) are the main reservoirs in the basin. The gross thickness is 300 ft, with an average porosity of 15%.

Traps: Diverse structural play types highlight the basin´s potential among others: structural traps associated with high-side closures in contractional faults, anticlinal closures in the footwall of normal faults, up structures related to flower structures generated by transpression, rollovers in the hanging wall of listric normal faults, are the main structural exploration targets in the basin. Stratigraphic traps are also of great economic impact, since production from carbonates has long been established and submarine fans turbidites are also prospective.

Sources: Early Miocene shales (Lower Porquero Fm.) has been recognized as the main zone of hydrocarbons in the basin. These shales are of great thickness, rich in organic matter and Kerogene type II.

The Cienaga de Oro Formation has an upper interval with fair–to-rich content of organic matter, type – III, in the oil window at the deepest areas of the basin. This interval could be considered as deposited during a maximum flooding event.

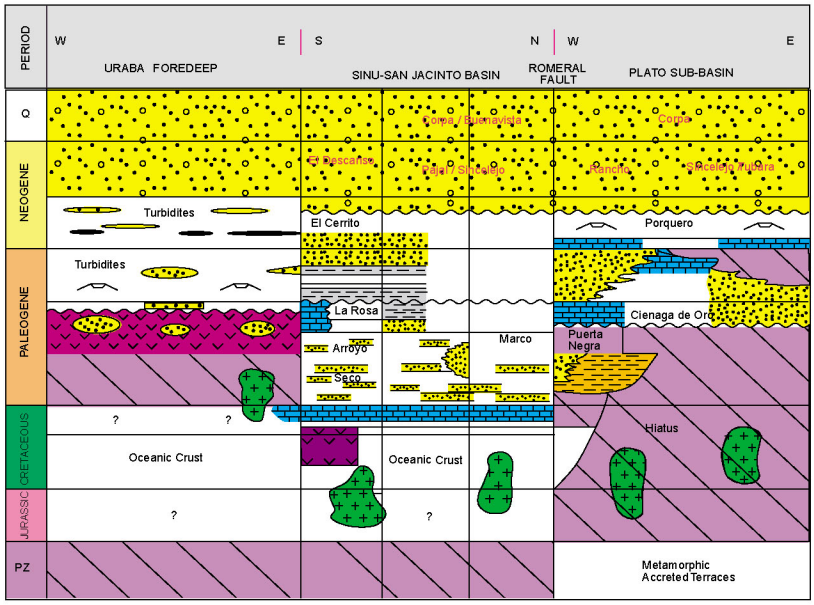
Seals: Shales of the upper Porquero Formation deposited during a period of rapid subsidence, have excellent physical characteristics as a sealing unit. The deep-water shales are the regional top seal for the underlaying reservoir rocks. The younger Tubara formation (Middle Miocene to Lower Pliocene) is also a sealing unit.

Generation and Migration: Effective-source rock pods in generation/expulsion phase are present in an extensive area in the so called Plato sub-basin, between the wells Guamito-1 to the Northeast and Pijiño-1 to the South. The available source rock data suggests an active source rock pod, coinciding with the area of greater sediment depth. API gravity for oil generated within the basin varies between 30º to 52º. The sulfur content is very low, while the paraffin concentration is relatively high, exceeding 70%. Various geochemical parameters indicate that the majority of oil originated in a relatively dioxic proximal siliciclastic environment. Four different migration pathways have been proposed (Rangel, A. et al., 2004) : 1) The Cicuco-Boquete area. 2) Momposina area. 3) Guepaje area; and 4) Apure-region. Migration most likely happens along network of fracture and fault planes.

Prospectivity

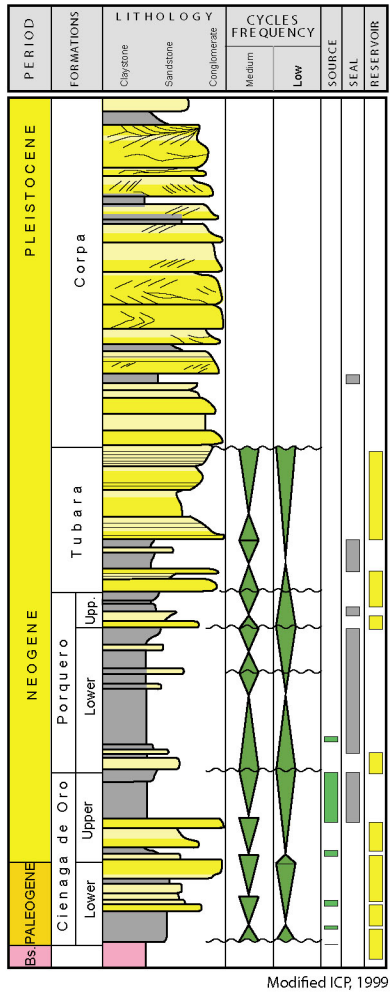
Presence of oil fields and abundant oil seeps, together with a great variety of structural traps and recent generation from pods of active source rock in deep synclinal structures indicate very good potential for discovery of new reserves.

Chronostratigraphic Chart



From Ecopetrol, 1999

Petroleum System

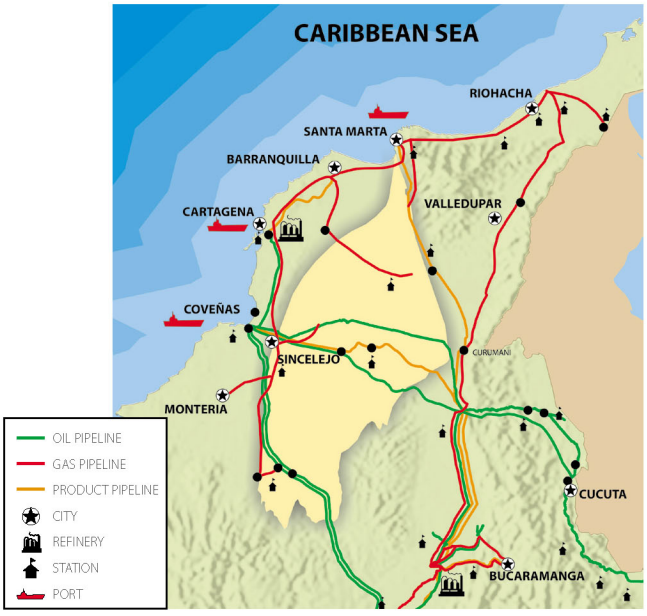


Modified ICP, 1999

Oil and Gas Fields

From Ecopetrol, 1999

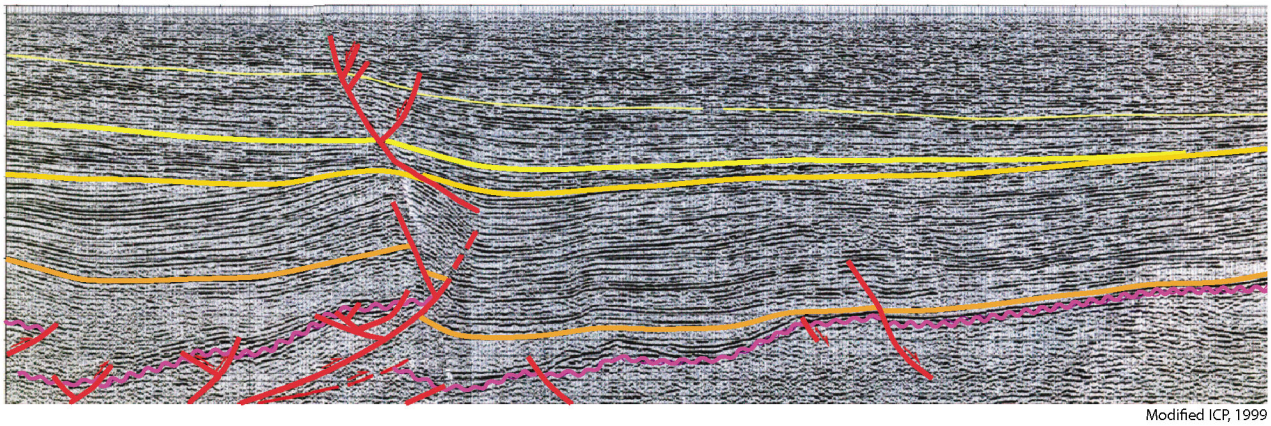
Infrastructure



Seismic Expression

Line 1

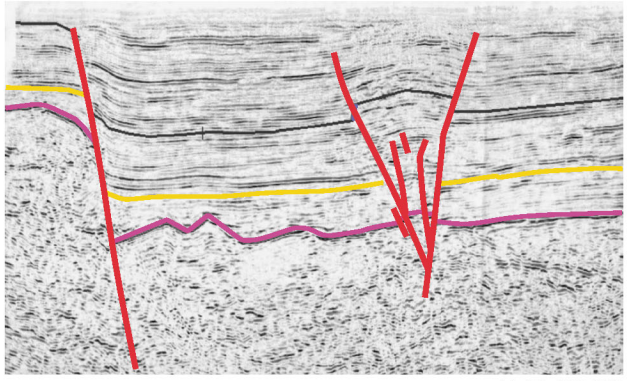
NW SE



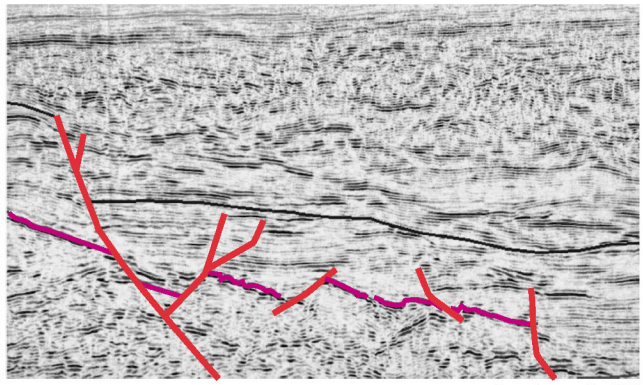
Modified ICP, 1999

Line 2

NW SE

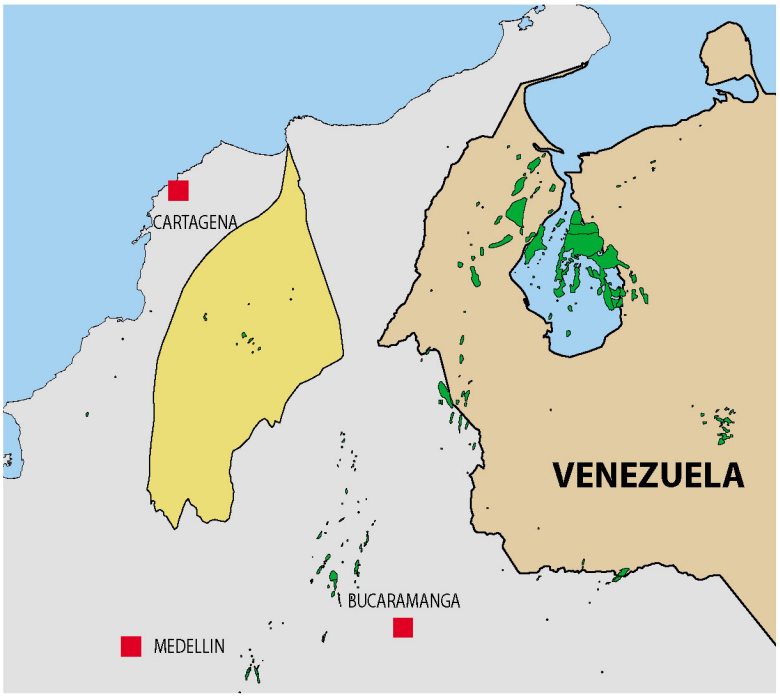


Modified ICP, 1999



From Barrero, D., 2001

Basin Location



Basin Location

The Lower Magdalena basin is located in the North West of Colombia where the Caribbean, Cocos and South American plates have interacted to produce Transpressure and Transtensional movements since the Cretaceous period to the present day. The Lower Magdalena basin is limited to the north east by the Bucaramanga - Santa Marta fault system, to the east with the San Lucas ridge (Palestina faults), to the south by the Central Cordillera and to the west by San Jacinto fold Belt (Romeral System). This basin is subdivided by three structural elements that have controled sedimentation since Eocene age to the late Miocene age. These structural elements can be grouped as: The Plato sub-basin to the north, the Cicuco arch and the San Jorge sub-basin to the south.

HIGHLIGHTS

Basin Type	Transtensional basin
Area	41,600 km^2
	10,280,000 acres
Tested Oil Reserves (Dec/04)	72 MMbbl.
Exploratory Wells	117
Oil Field Discoveries	12
Seismic	20,300 km
Exploratory Density	355 km^2 / well

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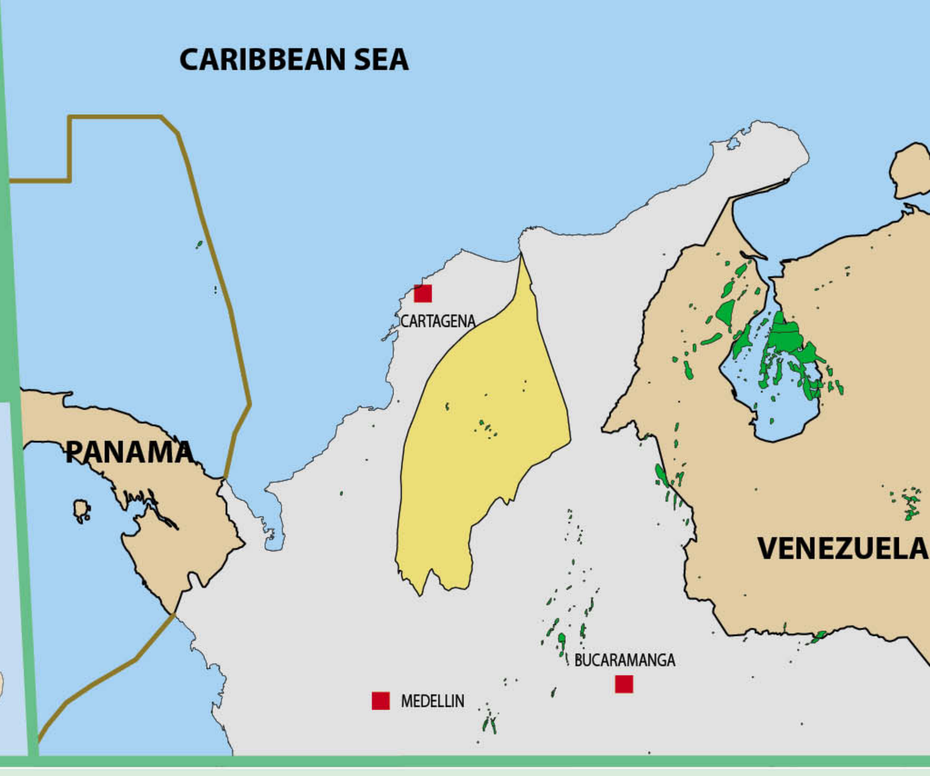
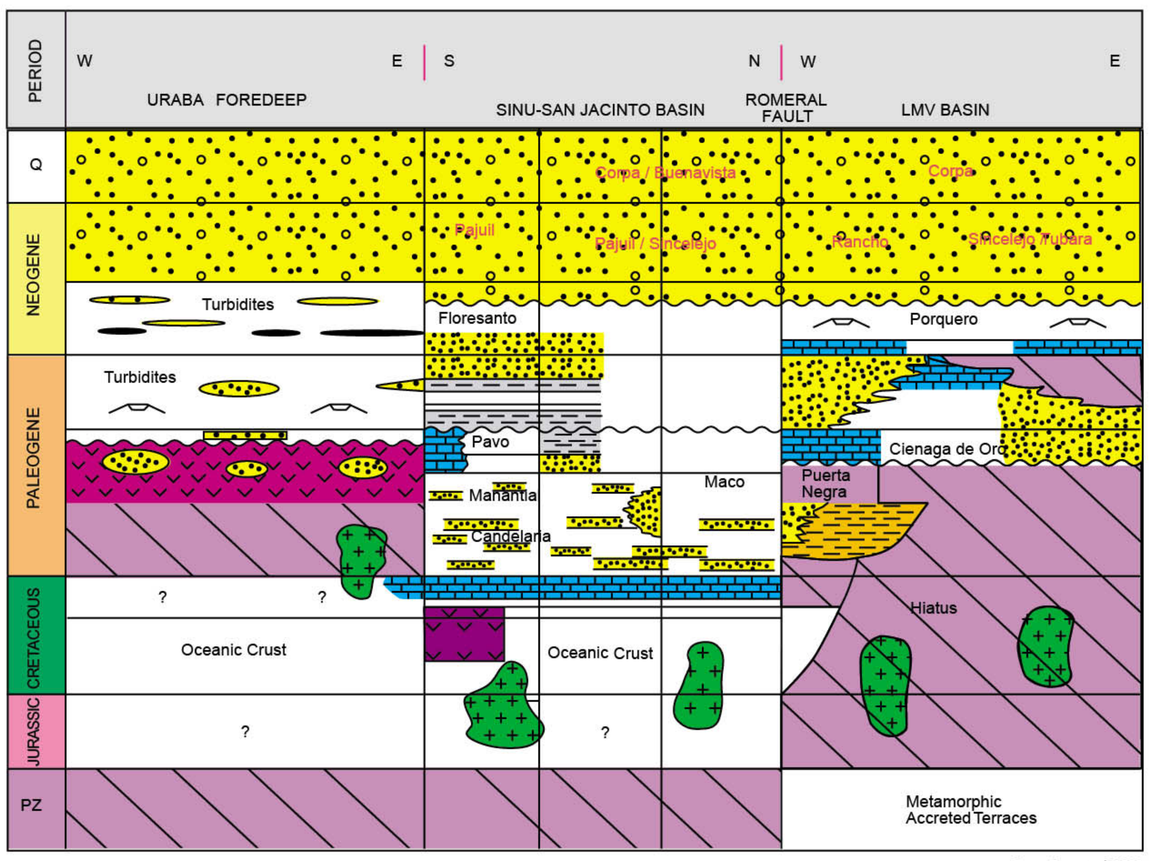
Lower Magdalena Valley Basin

LMV Basin

Accretionary prism basin



Chronostratigraphic Chart



From Ecopetrol, 1999

Highlights

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Area	41,600 km²
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Tested Oil Reserves	72 MMbbl.
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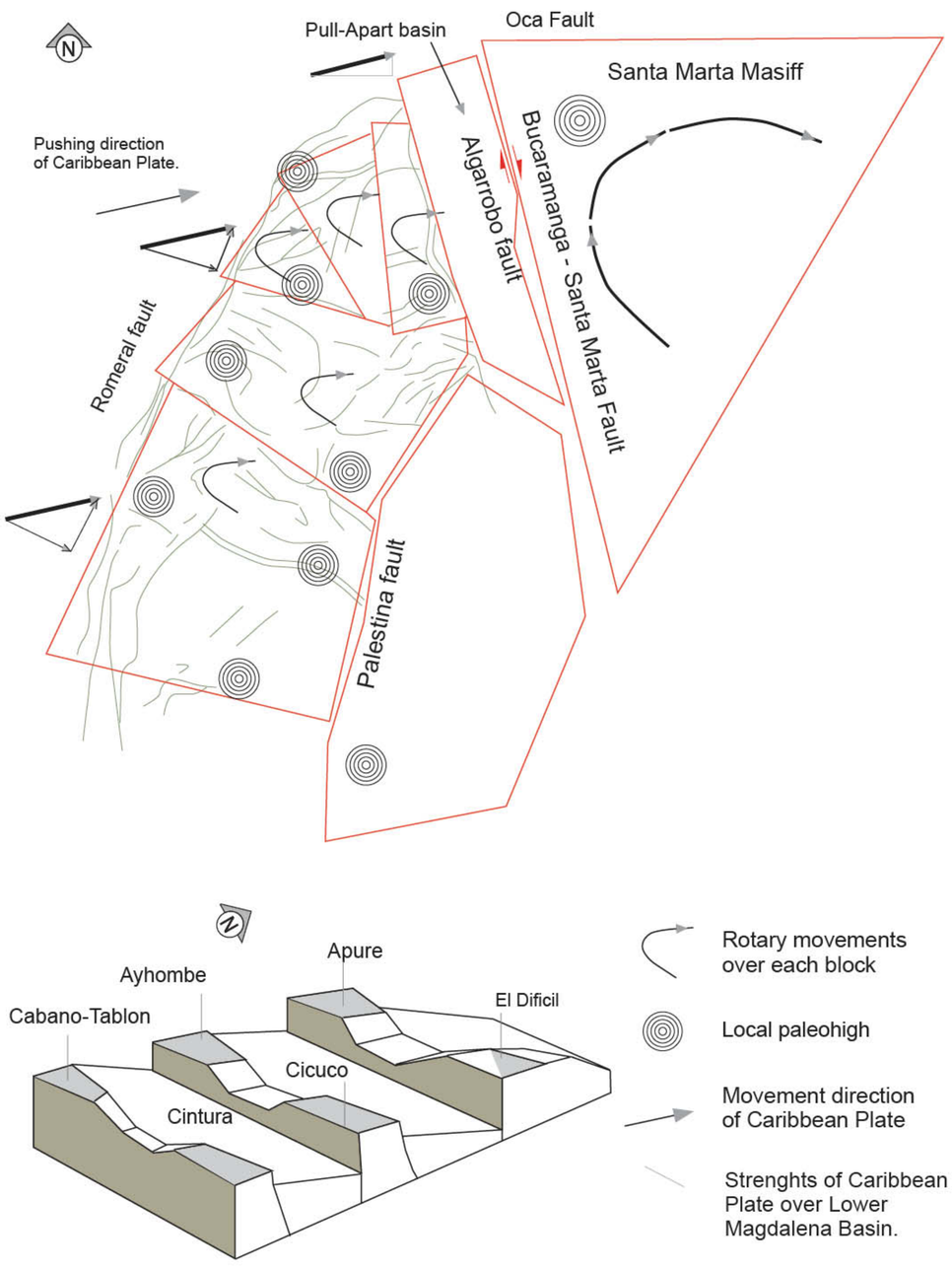
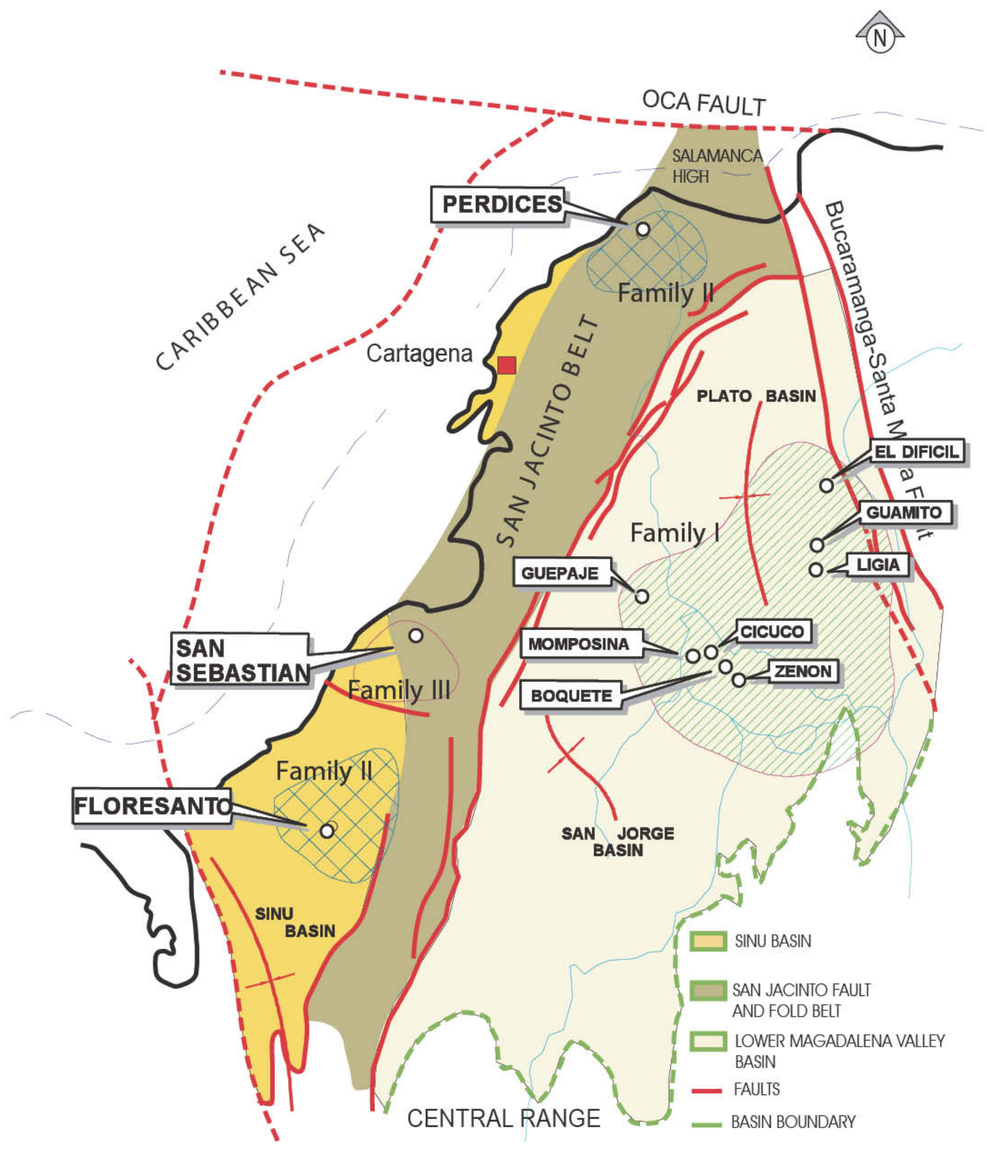
Oil Field Discoveries	12
Seismic	20,300 km
Coverage	One exploratory well / 355 km2
	One exploratory well / 87,700 acres

Structural Model



From Reyes, A., et al, 2001

Oil Families



From ECOPETROL, 1999

Schematic Cross Sections

From ECOPETROL, 2000

From http://www.geo.uni-jena.de/geophysik/caribbean/home.html

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Agencia Nacional de Hidrocarburos
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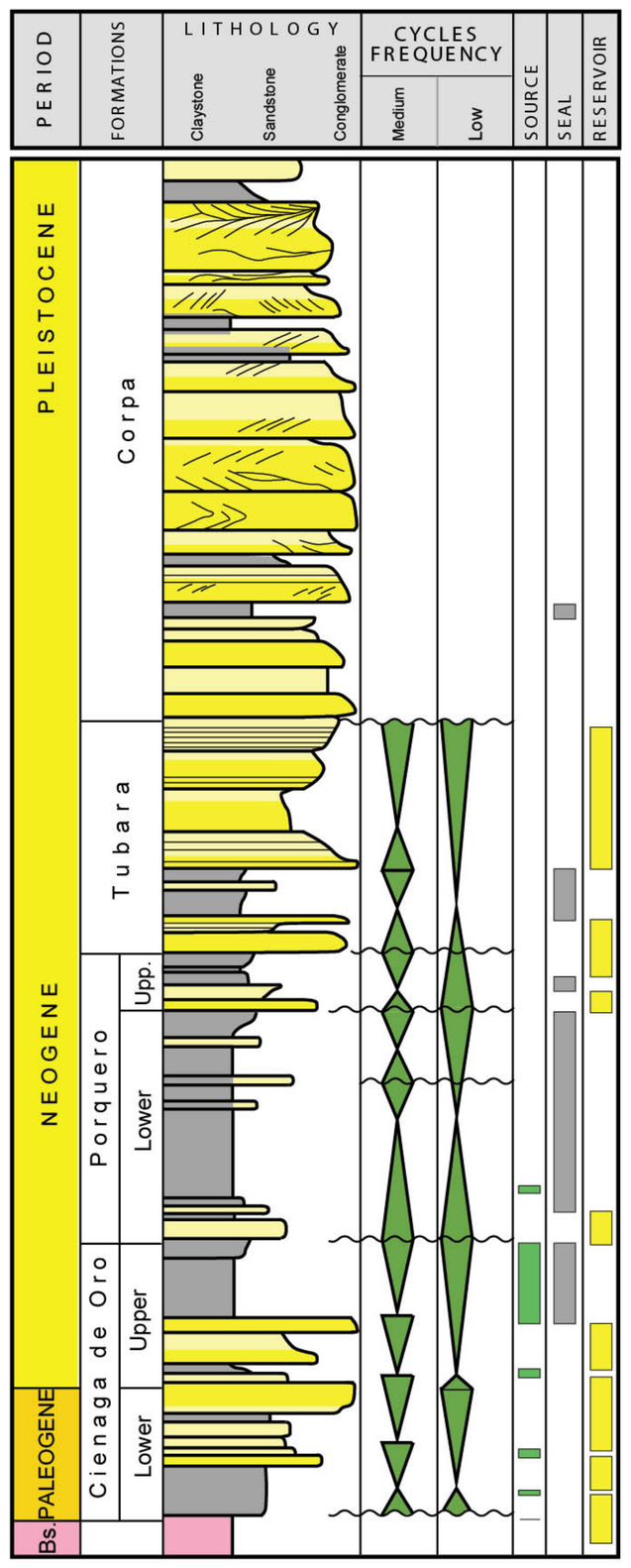
LMV Basin

Accretionary prism basin

Oil and Gas Fields

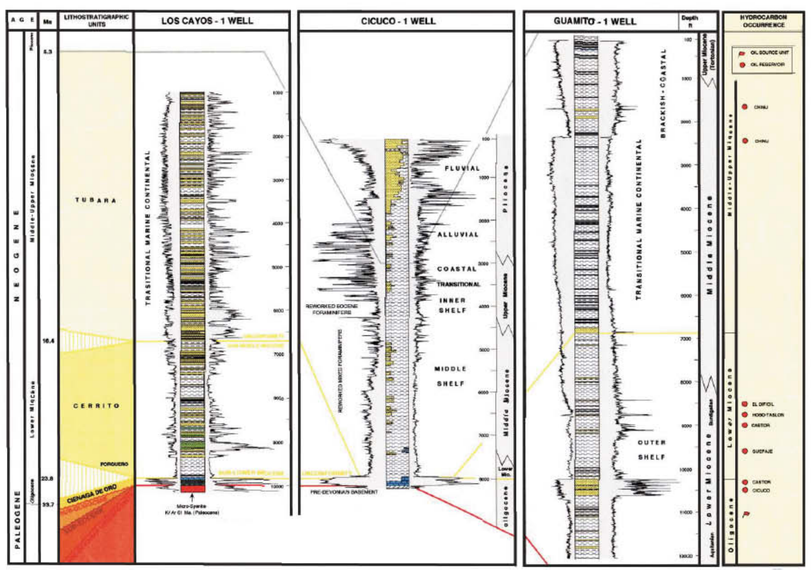
From ECOPETROL, 1999

Petroleum System Chart



Modified ICP, 1999

Hydrocarbon Occurence

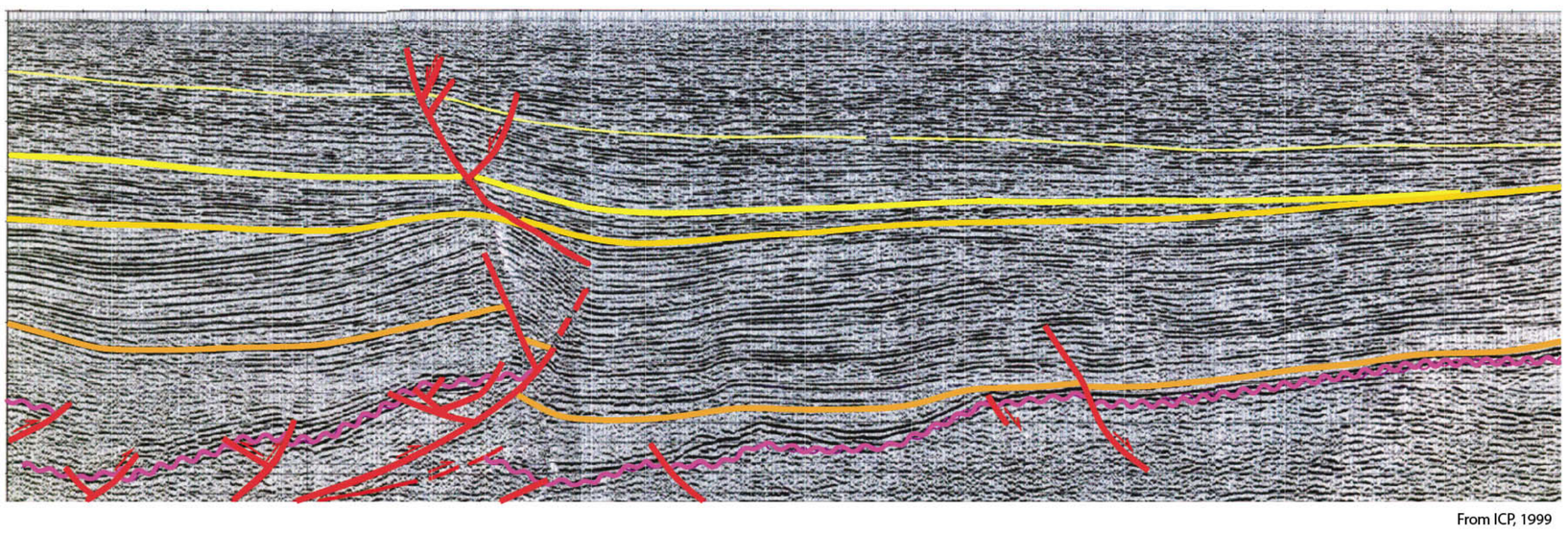


from Geotec, 1999

Seismic Expressions

Line 1. Foot-wall rollover in normal fault
Turbidite fans (SE side of line)

NW SE

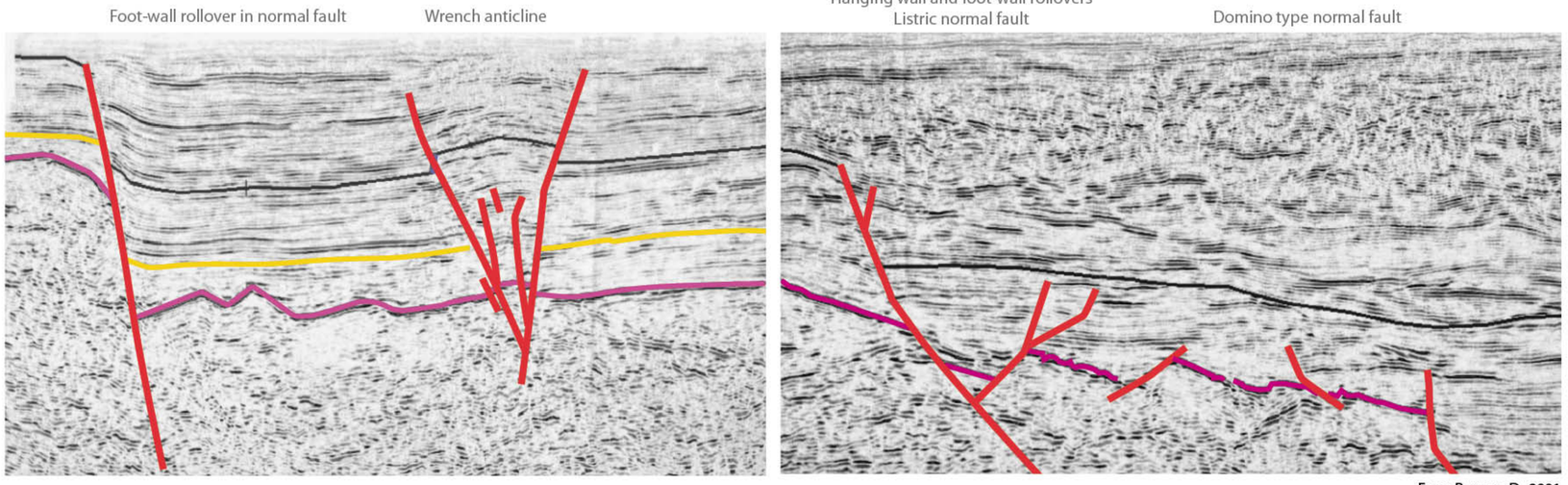


From ICP, 1999

Line 2

Foot-wall rollover in normal fault — Wrench anticline — Hanging wall and foot-wall rollovers Listric normal fault — Domino type normal fault

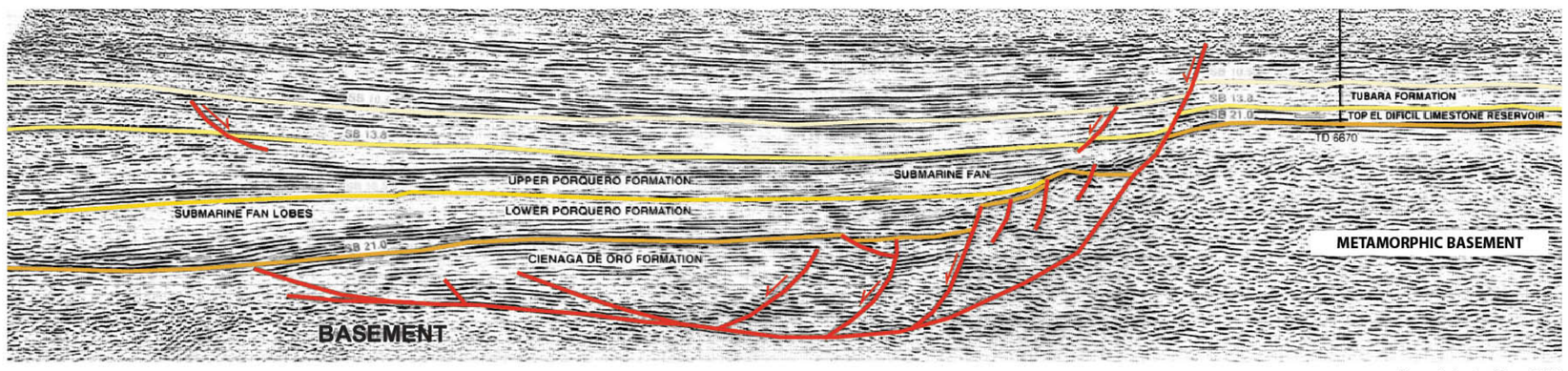
NW SE



From Barrero, D., 2001

Line 3

NW SE



From Seismic Atlas, 1998

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