PUTUMAYO BASIN

Colombia

2005

2006

Exploring an old place for new oil in subtle traps

Putumayo Basin

Hydrocarbon Evidence: Significant production, one major Oil field (Orito), 18 minor oil fields and the presence of giant oil fields in the Oriente basin in Ecuador are the evidence of the exploration potential of this basin.

Reservoirs: Cretaceous sandstone of the Caballos Formation, is the main reservoir in the basin, with an average gross thickness of 300 Ft. or more depending on paleorelief. Porosities range 10% - 16% and permeabilities average 50 md.

Traps: Structural traps associated to thrusts and sub-thrusts, and reverse faulting in the foreland basin are the main targets. Additional traps are: pinch-outs, incised valleys, and carbonates build-ups.

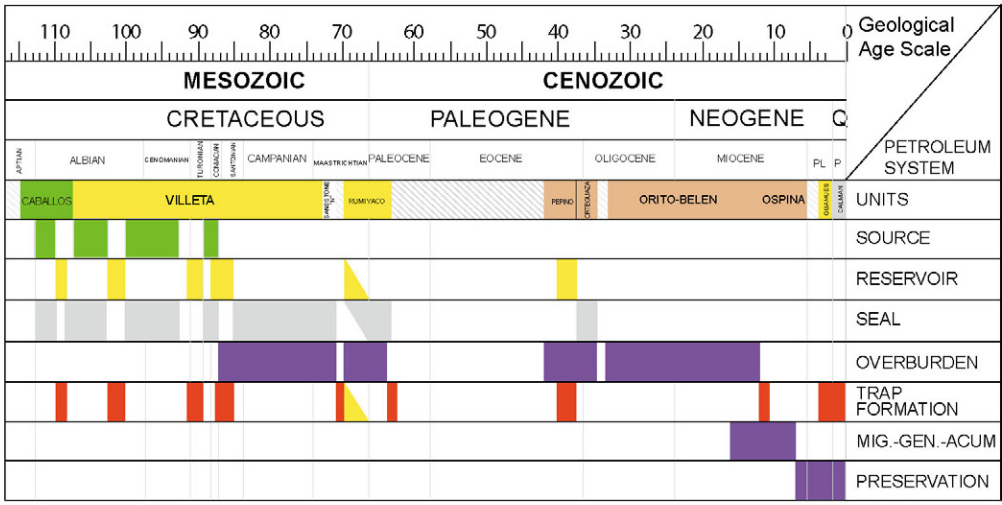
Sources: Cretaceous Limestones and Shales from the Villeta Formation, with marine organic matter type II, high petroliferous potential and average TOC of 0.5-1.0 percent represent the best source rocks in the basin.

Cretaceous organic shales from the Caballos Formation, with average TOC. of more than 0.5% and organic matter type III is a secondary source of hydrocarbons

Seals: Cretaceous plastic shales of the Villeta Formation are excellent top and lateral seal units.

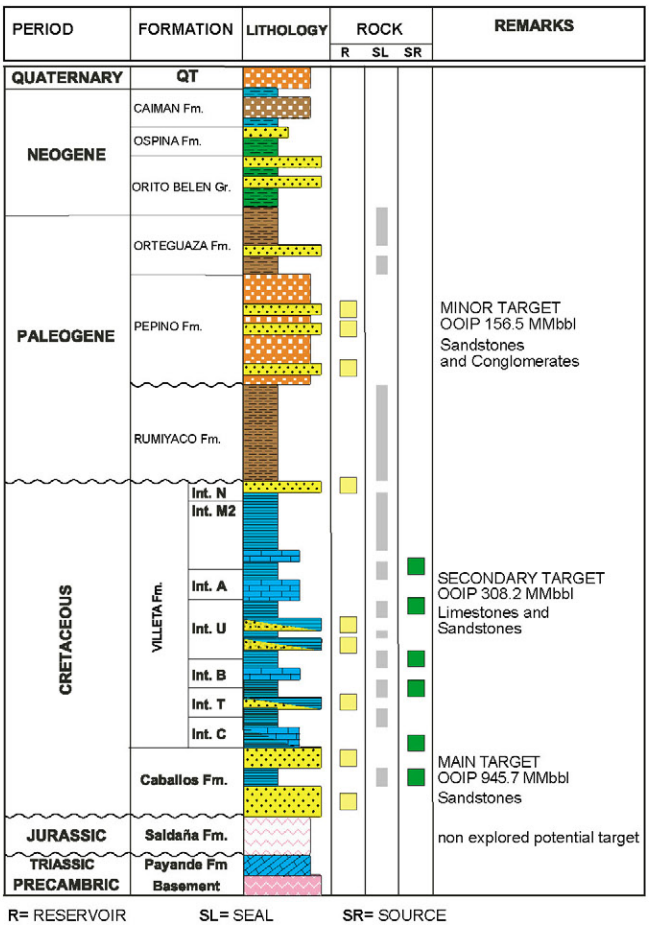
Migration and Timing: Two pods of active source rocks, within the Cretaceous sequence, located in the western flank of the basin contributed to hydrocarbon storage in the Putumayo basin. Migration pathways show several options. The most likely migration route seems to be west to east along sandstones of the Caballos and Villeta formations. Vertical migration along fractures and fault zones has also been documented. Expulsion of hydrocarbon started by late Miocene soon after the formation of the major structures.

Events Chart



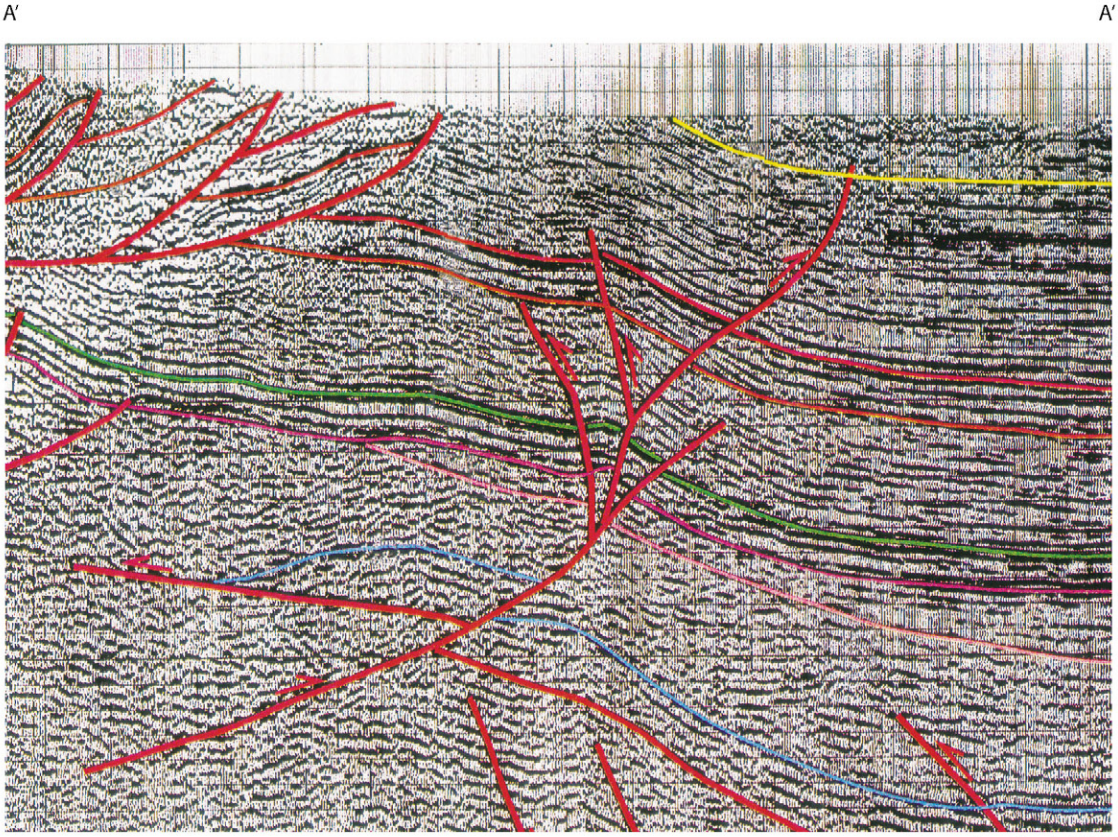
From Ecopetrol, 1999

Petroleum System Chart



Modified From Ecopetrol, 1999

Seismic Expression



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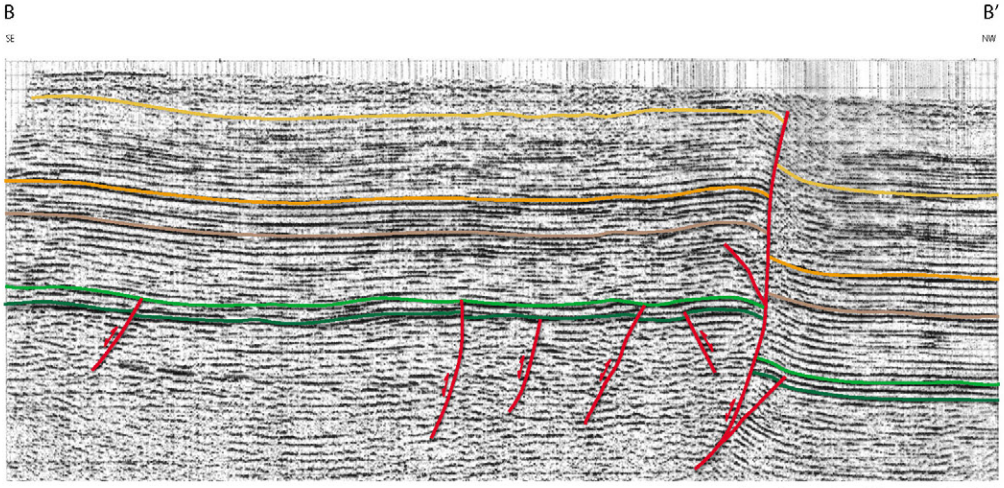
Prospectivity

Oil fields in the basin are related to structural traps, mainly folds associated to thrust, sub-thrust and reverse faulting. Additional oil reserves could be found in significant quantities trapped in sub-basement traps, wrench related anticlines, drape over basement highs and subtle stratigraphic traps at the eastern flank of the basin. Presence of these traps suggests that large part of the basin still has significant exploration potential.

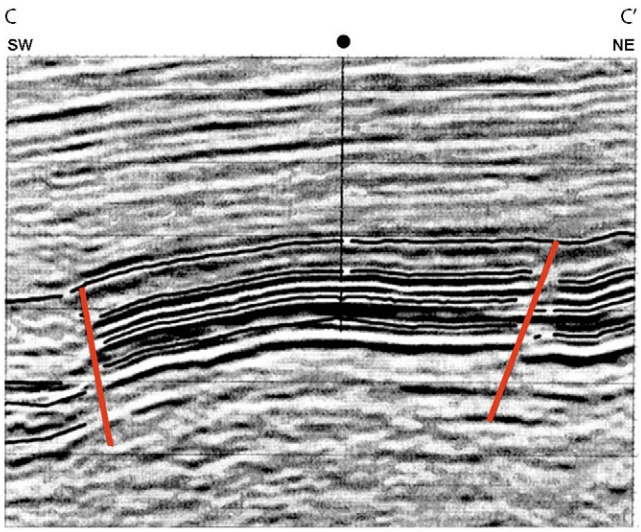
Stratigraphic Potential Areas



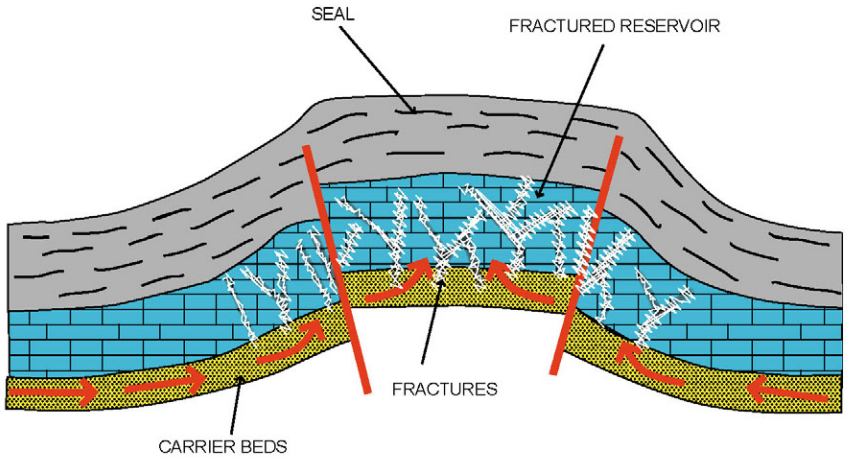
From Ecopetrol and Tecnoanalysis, 1998

Seismic Expression of Structural and Stratigraphic Traps

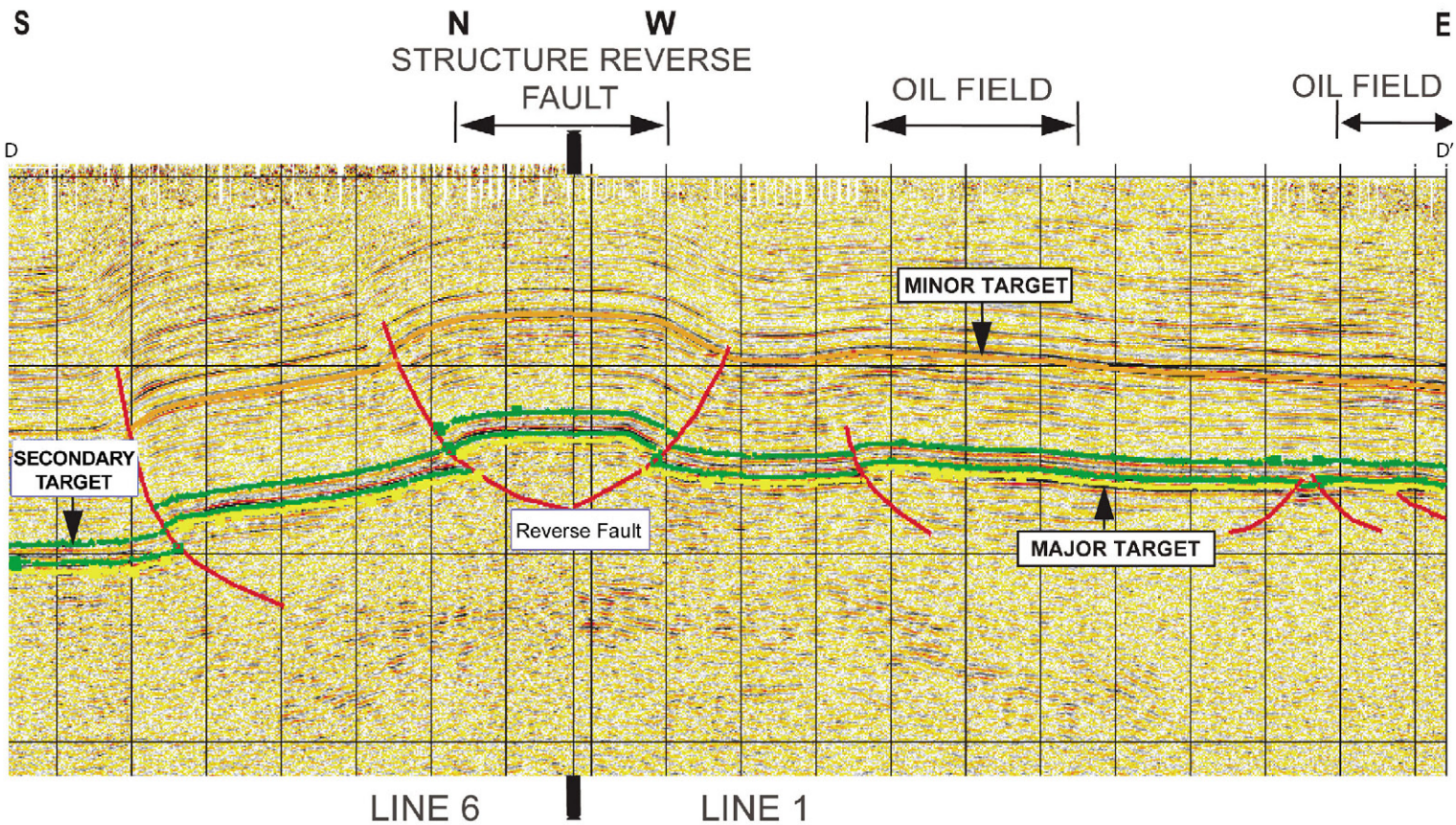
FRACTURED CARBONATES



From Western, 1996



Structural Trap



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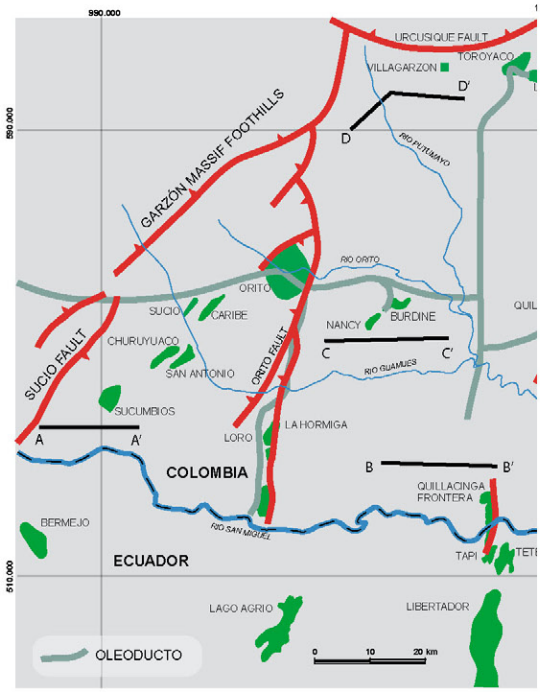
Putumayo and Oriente Basins Oil Fields



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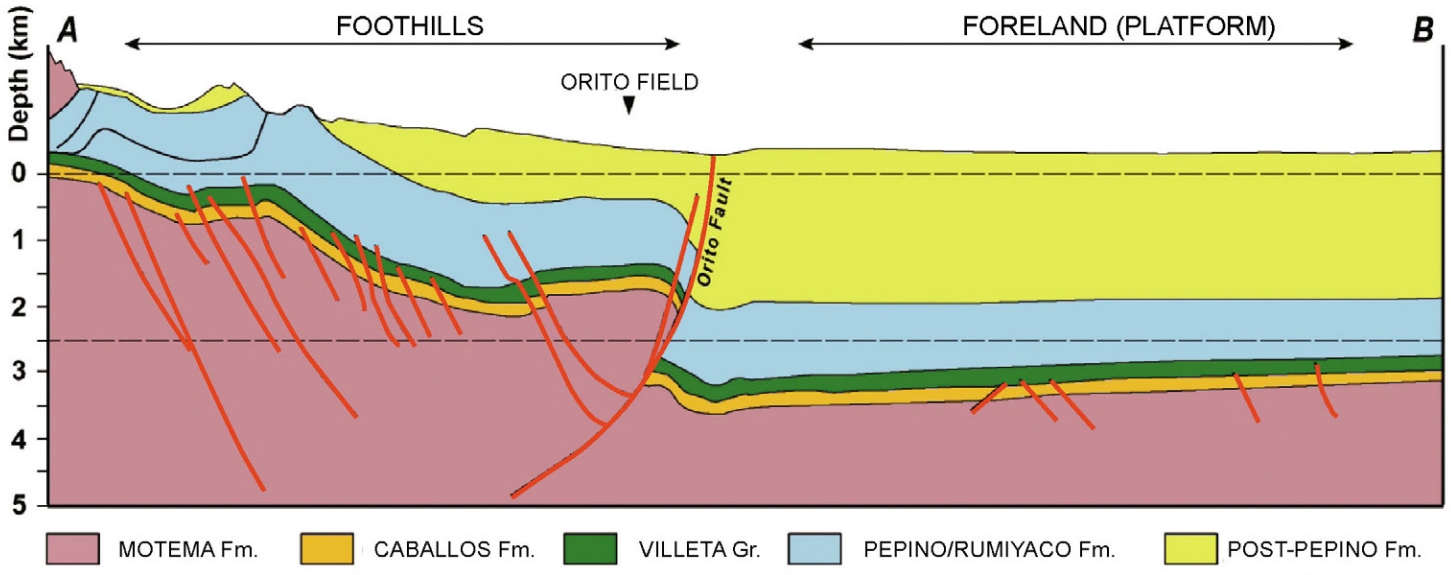
Infrastructure

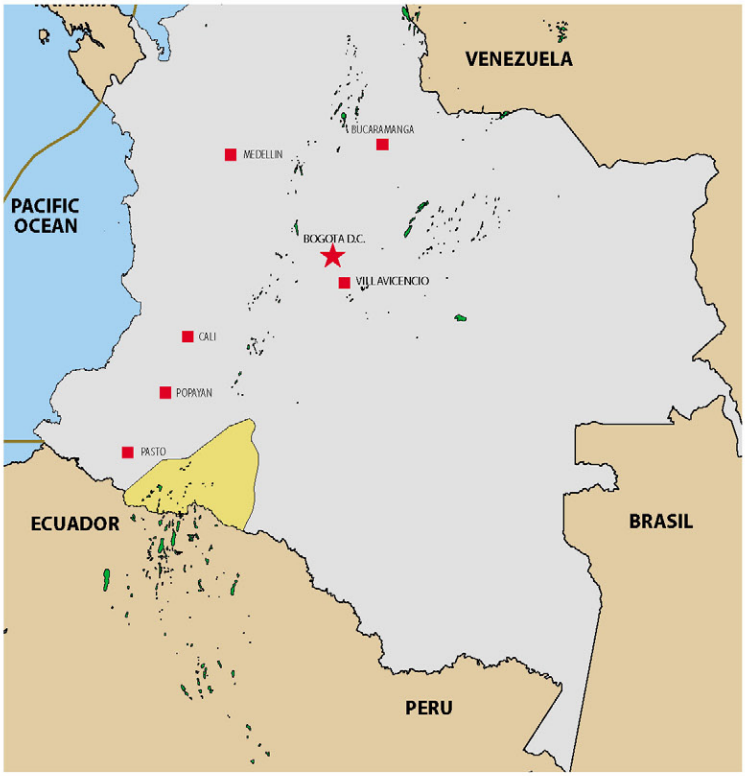
From Ecopetrol, 1994

Generalized Cross Section



Modified Cordoba, F., 1997

Basin Location



HIGHLIGHTS

Area	29,900 km²
	7,400,000 acres
Oil field discoveries	19
Exploratory Wells	103
2D Seismic	17,800 km
Discovered Oil Reserves	365 MMBO
Discovered Gas Reserves	305 Gcf
Fields / A-3 Wells Ratio	0.28
Coverage	290 km² / well

Location

The Colombian Putumayo basin is the northern extension of the Oriente Basin of Ecuador. This basin has an extension of about 29,900 Km² (7'400,000 acres). Reserves of more than 365 MMBO have been found to date in 19 oil fields.

Exploration in the basin was started by Texaco in 1948. In 1963 this company discovered the major Orito oil field with reserves of about 250 MMBO.

Produced by
Geoconsult Ltda

Manager: Nelson Álvarez

Technical Director: Darío Barrero

Geologists: Yolanda Aguiar, Alfonso Robledo, Camilo Hernández, Juan Fernando Martínez, Oliverio Rojas, Edwin Valencia and Mercedes Álvarez

Petroleum Engineer: Yolanda Ojeda

Design
Manttis Estudio

Cover Picture
Ecopetrol S.A.

Libertad y Orden

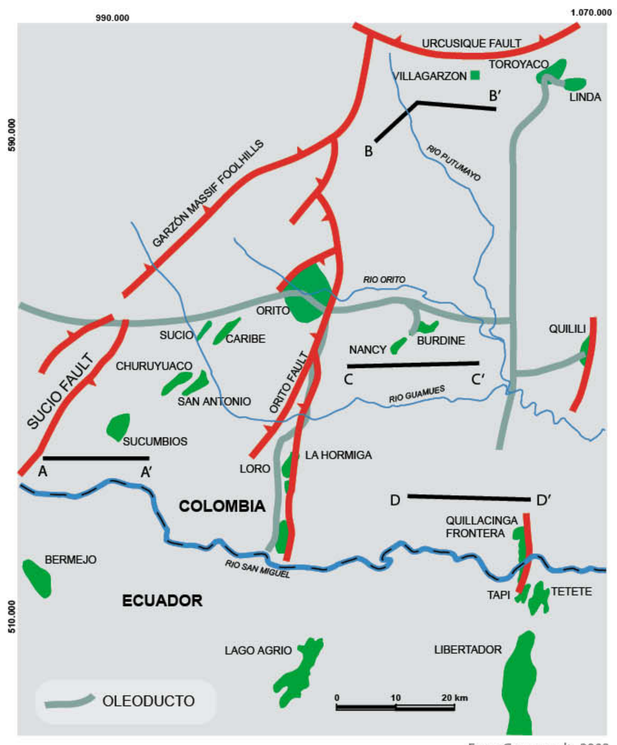
Agencia Nacional de Hidrocarburos
República de Colombia

Contact Information
www.anh.gov.co ¦ info@anh.gov.co ¦ PBX: (571) 593 1717 ¦ Fax: (571) 234 5712 ¦ Calle 37 No. 7-43 piso 5 ¦ Bogotá, Colombia, South América

Putumayo Basin

Foreland Basin

Putumayo and Oriente Basin's Oil Fields



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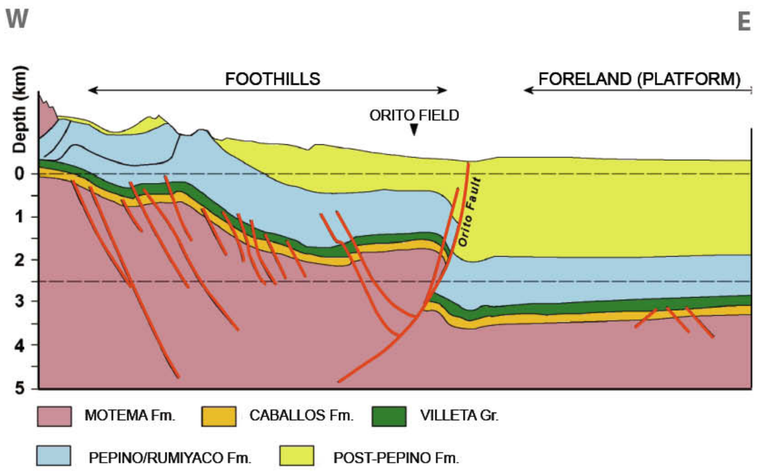
Generalized Cross Section

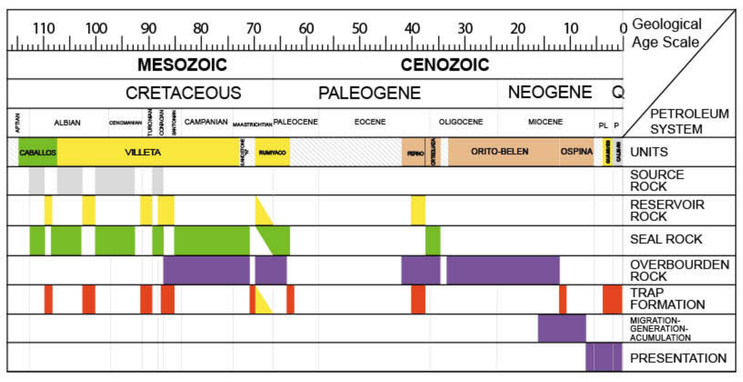


Modified Cordoba, F., 1997

Highlights

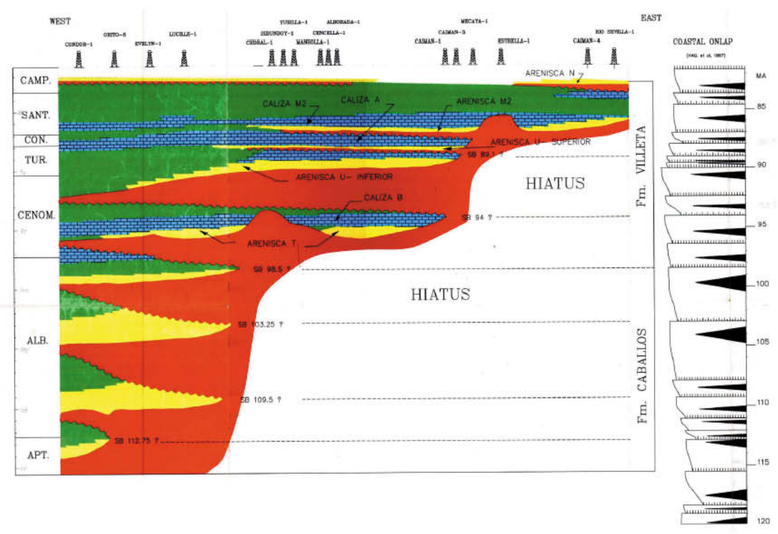
Area	28,090 km²
	7,400,000 acres
Oil field discovered	28
Exploratory wells	103
2D Seismic	17,800 km
Discovered Oil Reserves	385 Mbo
Discovered Gas Reserves	305 Gcf
Fields / A-3 Wells Ratio	28%

Events Chart



From Ecopetrol, 1999

Stratigraphic Cross Section



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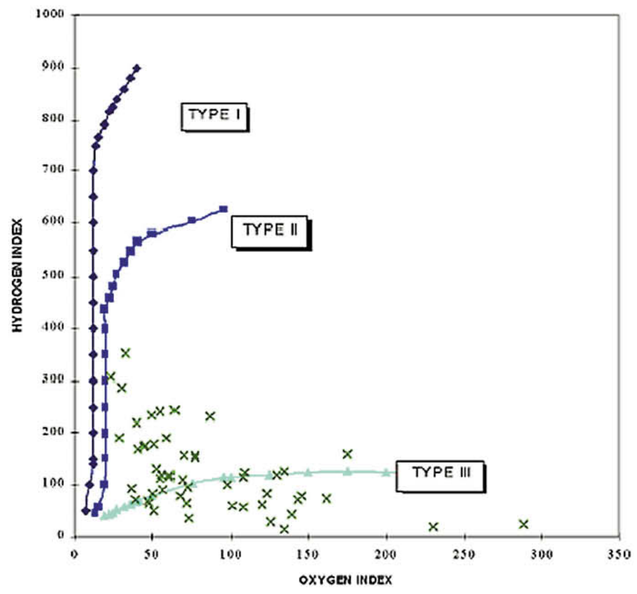
Geochemical Data

KEROGEN TYPE - VILLETA FORMATION



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Petroleum System Chart

PERIOD	FORMATION	LITHOLOGY	ROCK R	ROCK SL	ROCK SR	REMARKS
QUATERNARY	QT					
NEOGENE	CAIMAN Fm.					
	OSPINA Fm.					
	ORITO BELEN Gr.					
PALEOGENE	ORTEGUAZA Fm.					
	PEPINO Fm.					Sandstones and Conglomerates
	RUMIYACO Fm.					
CRETACEOUS	VILLETA Fm. Int. N					
	Int. M2					
	Int. A					
	Int. U					Limestones and Sandstones
	Int. B					
	Int. T					
	Int. C					
	Caballos Fm.					Sandstones
JURASSIC	Saldaña Fm.					non explored potential target
TRIASSIC PRECAMBRIC	Payande Fm Basement					

R= RESERVOIR **SL=** SEAL **SR=** SOURCE

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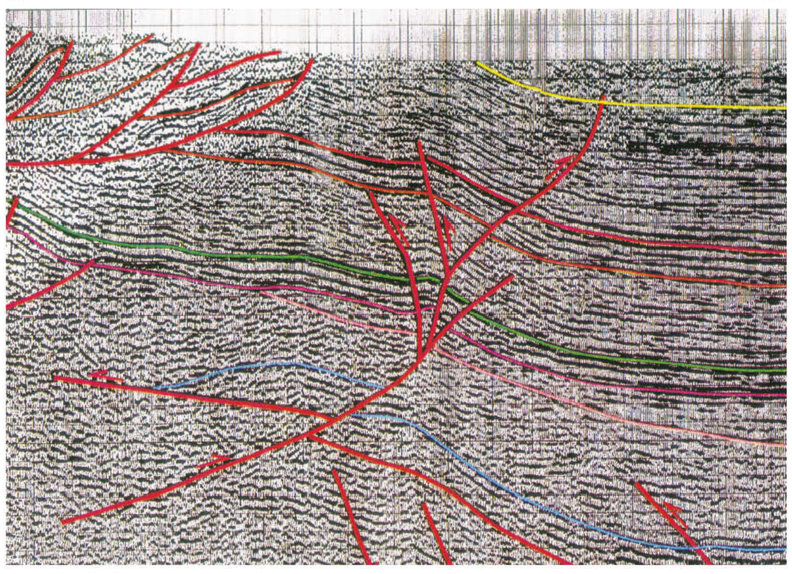
Seismic Expression

STRUCTURAL SECTION

A A´



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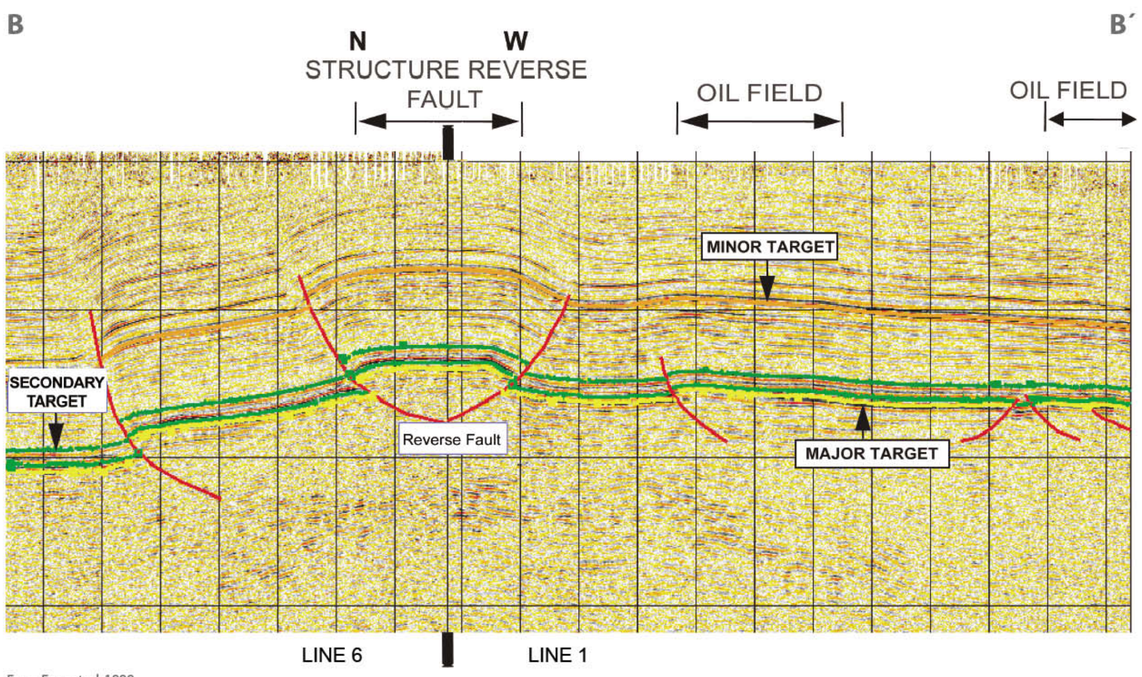
B B´



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Agencia Nacional de Hidrocarburos
República de Colombia
Libertad y Orden

Putumayo Basin

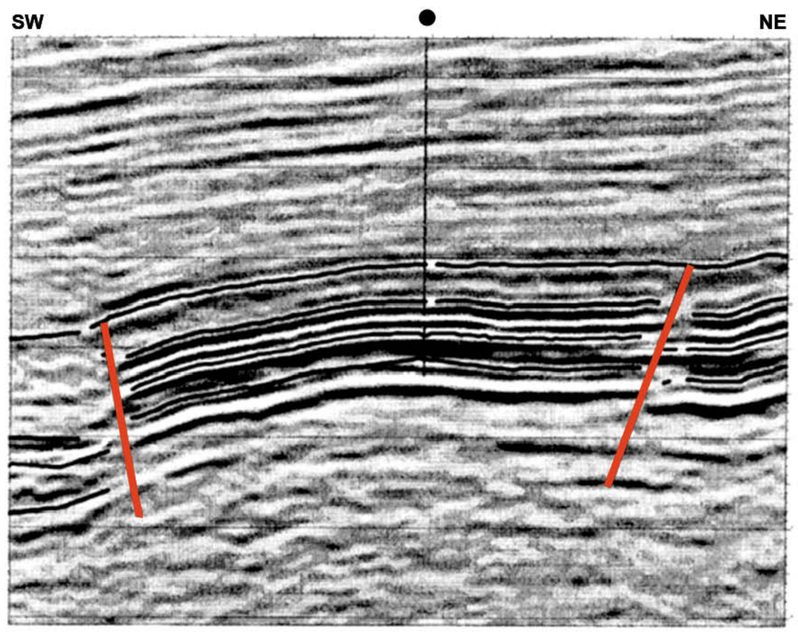
Subtle traps

New Exploration Frontiers

Postulated Plays

C

SW

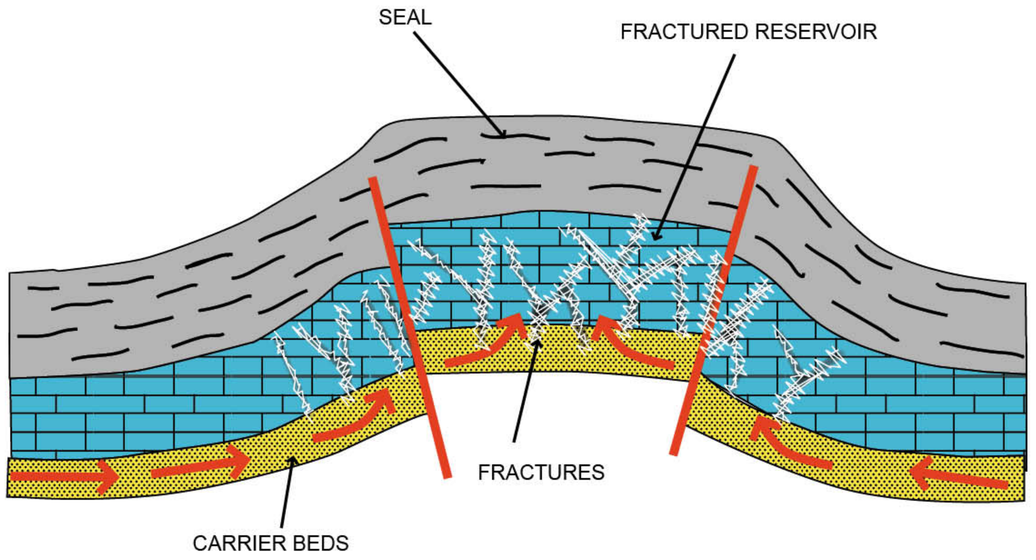


From Western, 1996

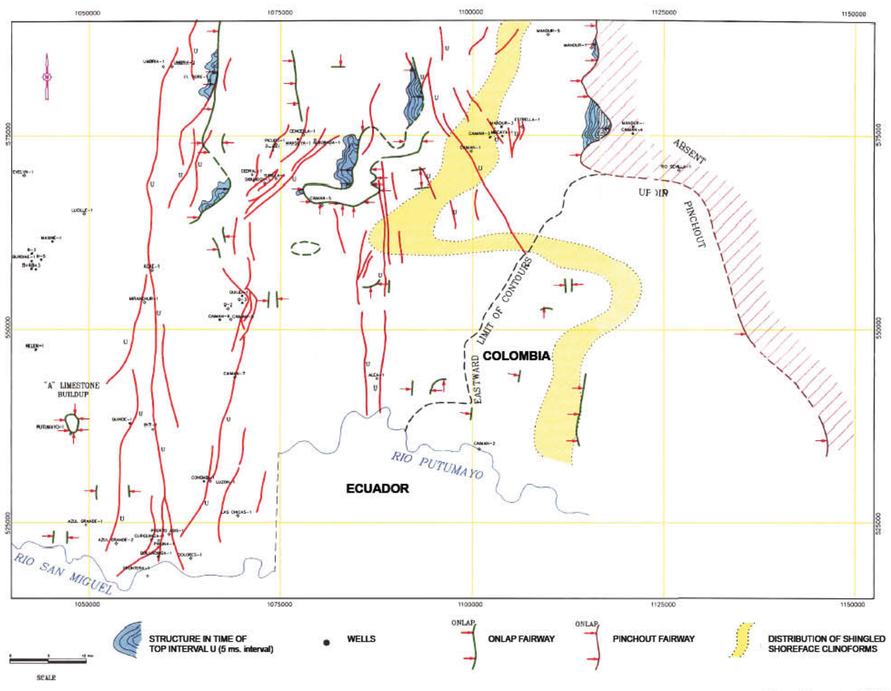
C´

NE

FRACTURED CARBONATES



From Western, 1996



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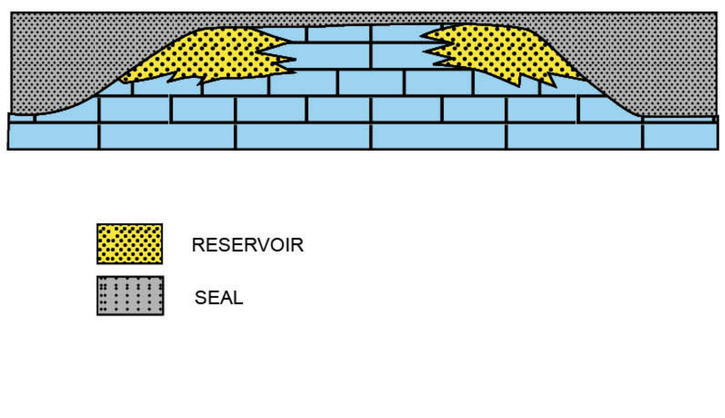
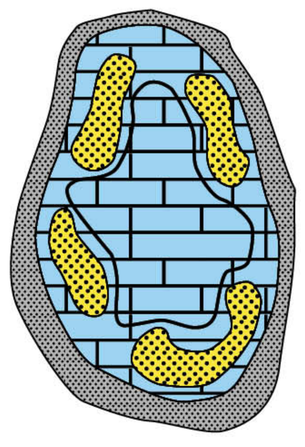
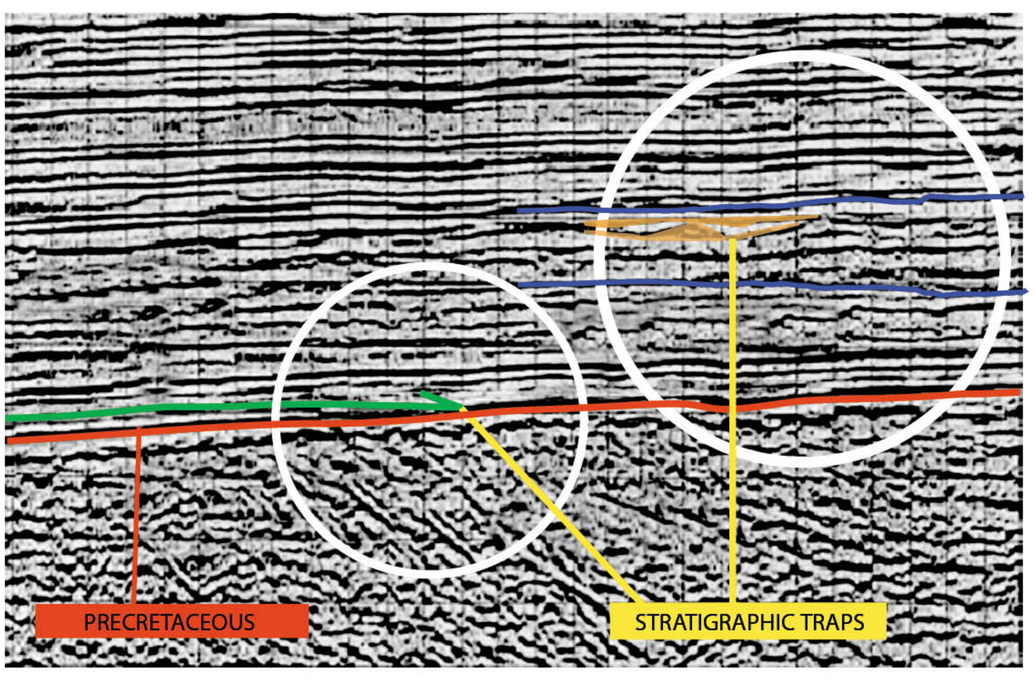
CARBONATE BUILDUP - GRAINSTONE MARGINS



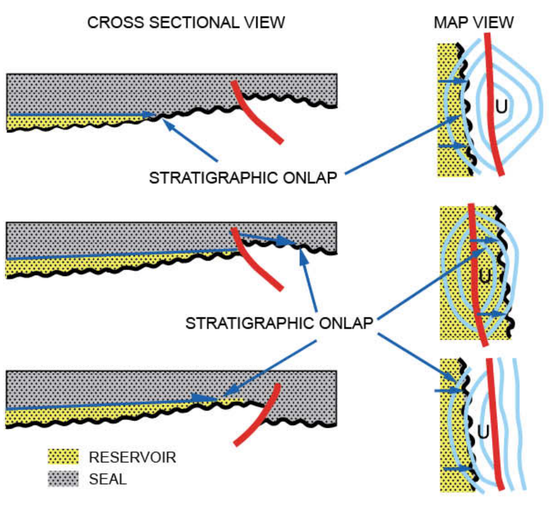


From Western, 1996

Sedimentary Model / Stratigraphic Plays



CROSS SECTIONAL VIEW



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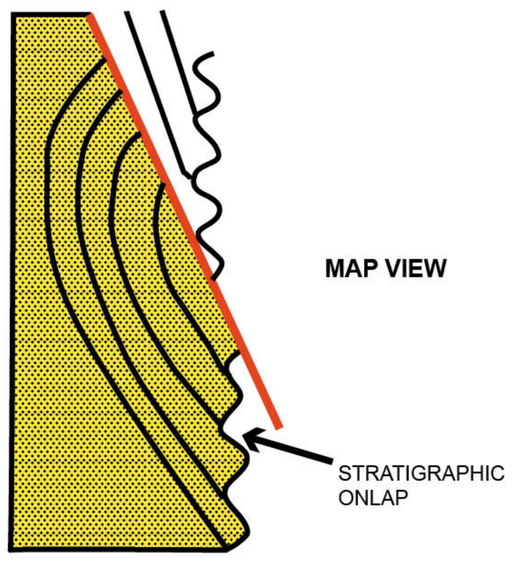
STRATIGRAPHIC PINCHOUT AND FAULT CLOSURE



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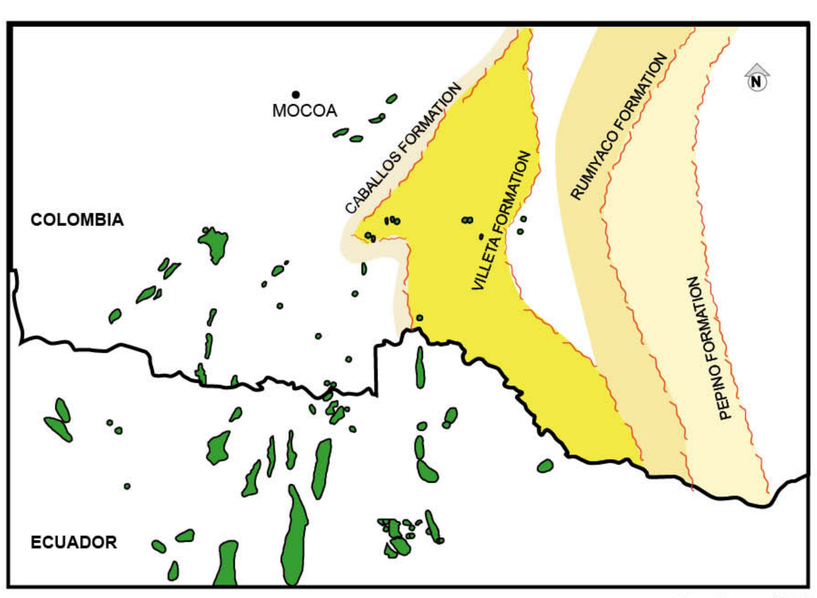
Stratigraphyc Potential Areas

CROSS SECTION



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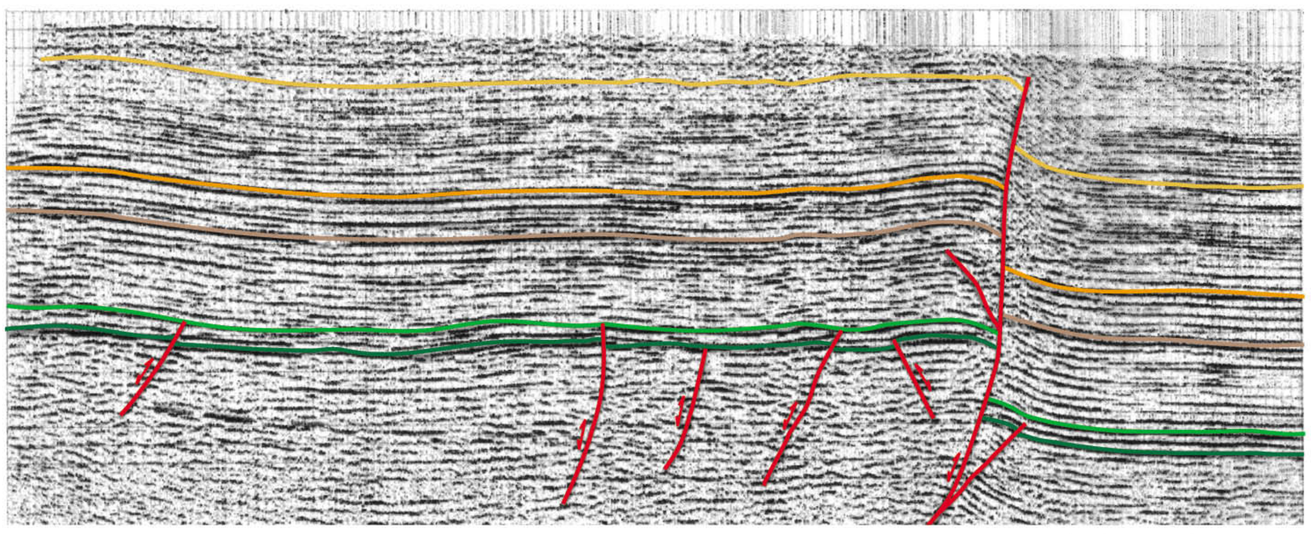
D

SE

D´

NW



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