



Overview of the Oil and Gas Basins of Colombia

Contents



1. Introduction
2. Colombian General Geological Framework and Basins Technical Aspects
3. Database (EPIS)
4. Summary and Conclusions

Contents



1. Introduction

2. Colombian General Geological Framework and Basins
Technical Aspects

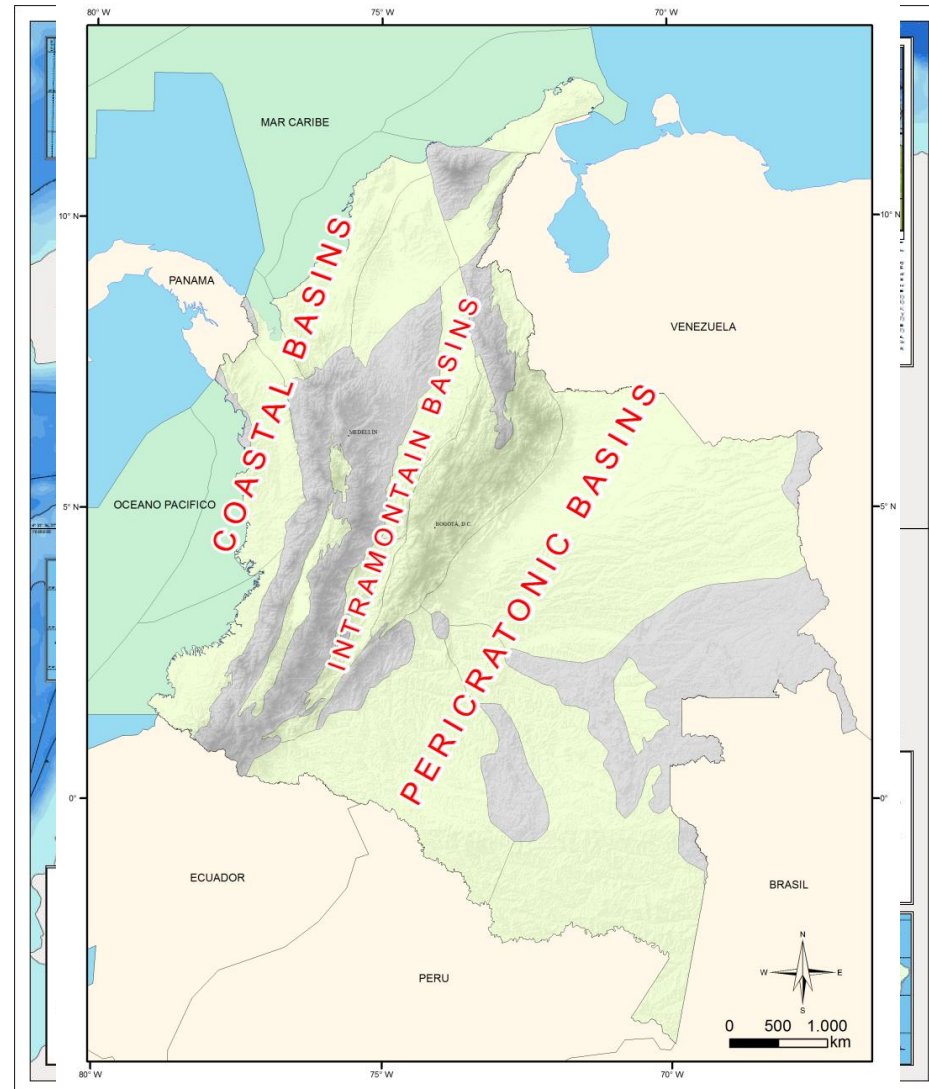
3. Database (EPIS)

4. Summary and Conclusions

Colombia

= *Diverse Geology*

= *Something For All Explorers!*



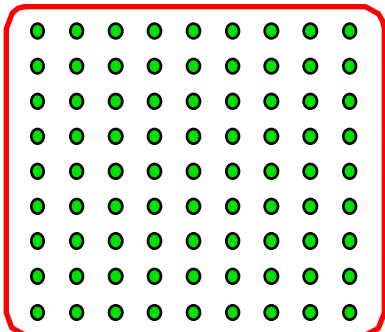
Colombia – An Underexplored Country



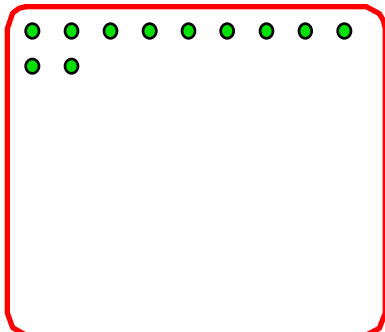
Number of Wells per 1,000 km²

UNITED STATES	—————>	83
CANADA	—————>	11
COLOMBIA	—————>	2

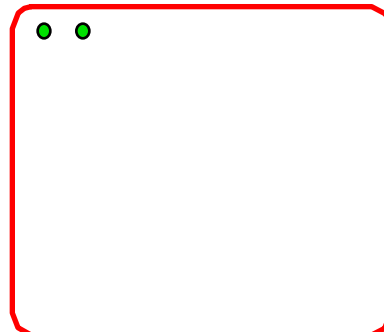
UNITED STATES



CANADA



COLOMBIA



Colombia – An Underexplored Country



Western Sedimentary Basin of Canada

Approx. 525,000 wells
1 well / 2.5 km²

Eastern Cordillera-Llanos-Putumayo
2,026 wells
1 well / 200 km²

Colombia has room to explore!

Contents



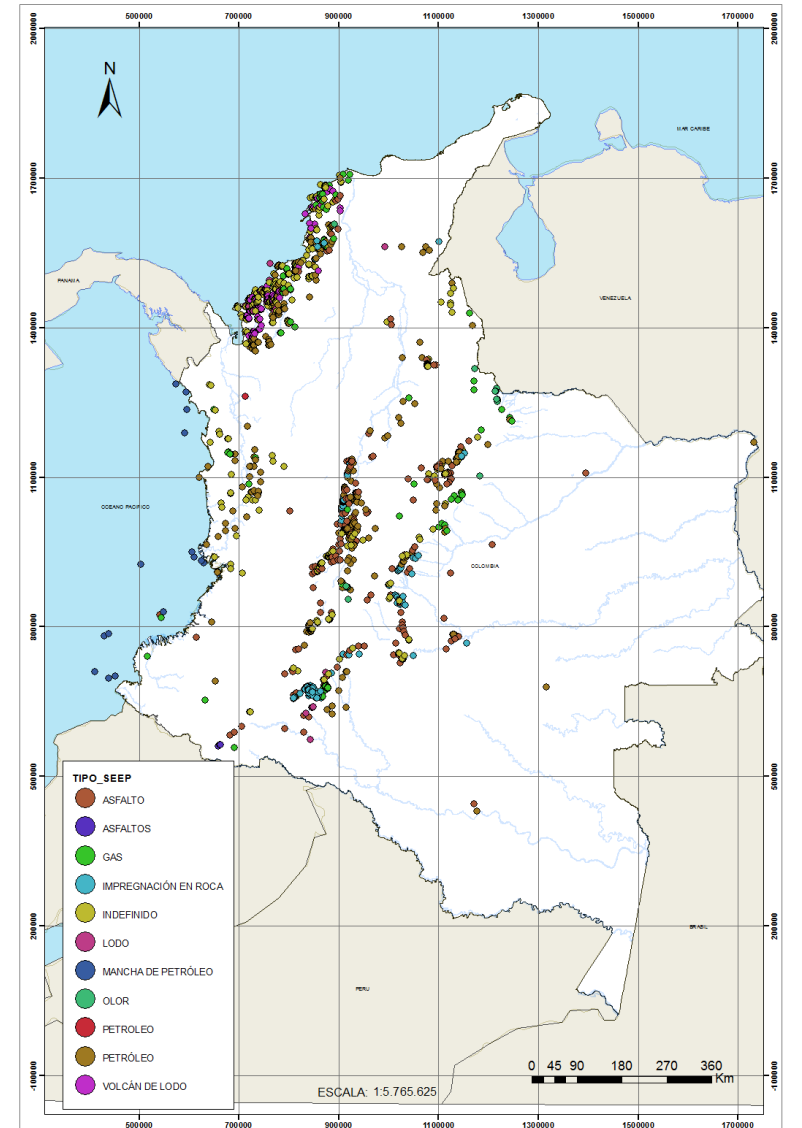
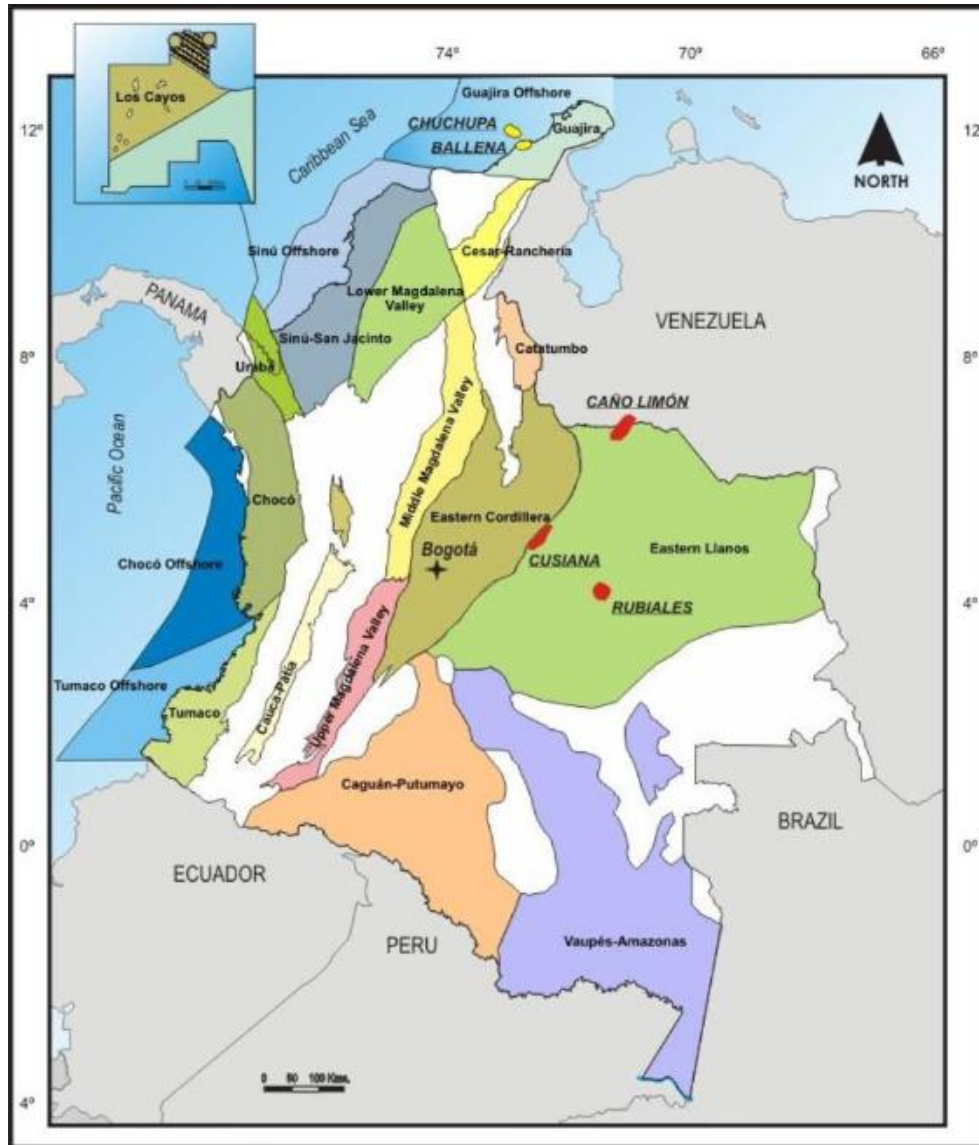
1. Introduction

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3. Database (EPIS)

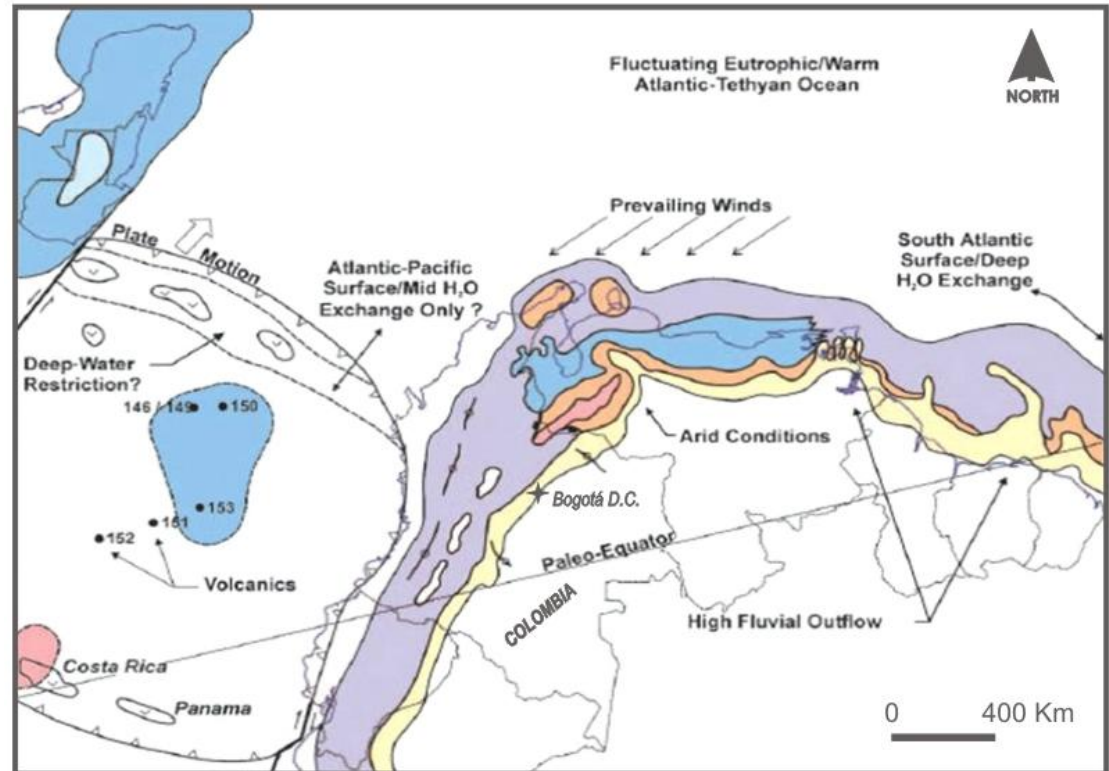
4. Summary and Conclusions

Colombian Basins & Oil and Gas Seeps



Colombia Has a World-Class Source Rock!

- ✓ Mid-Cretaceous La Luna / Gachetá, Villeta, Cansona – A rich, regional hydrocarbon source rock.
- ✓ Additionally, Tertiary carbonaceous shales and coals are also present.
- ✓ In the shallower basins, these rocks might have generated commercial quantities of biogenic methane.



From Villamil, 2003, AAPG

Late Cenomanian-Turonian paleogeography of NW South America. La Luna / Cansona deposition in purple and blue.

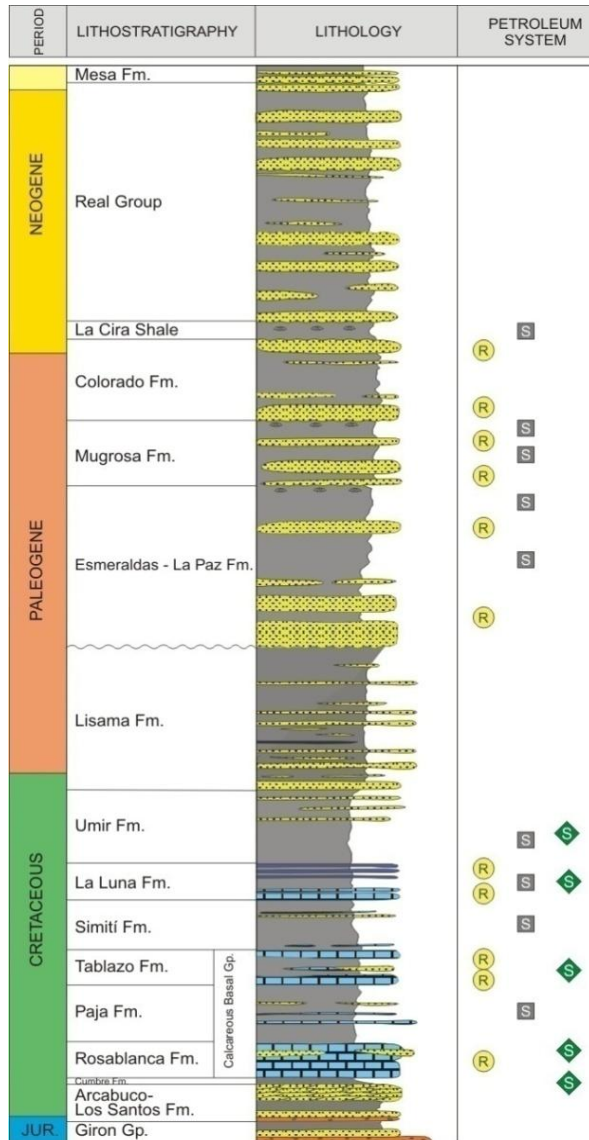
Colombia Has Reservoirs!



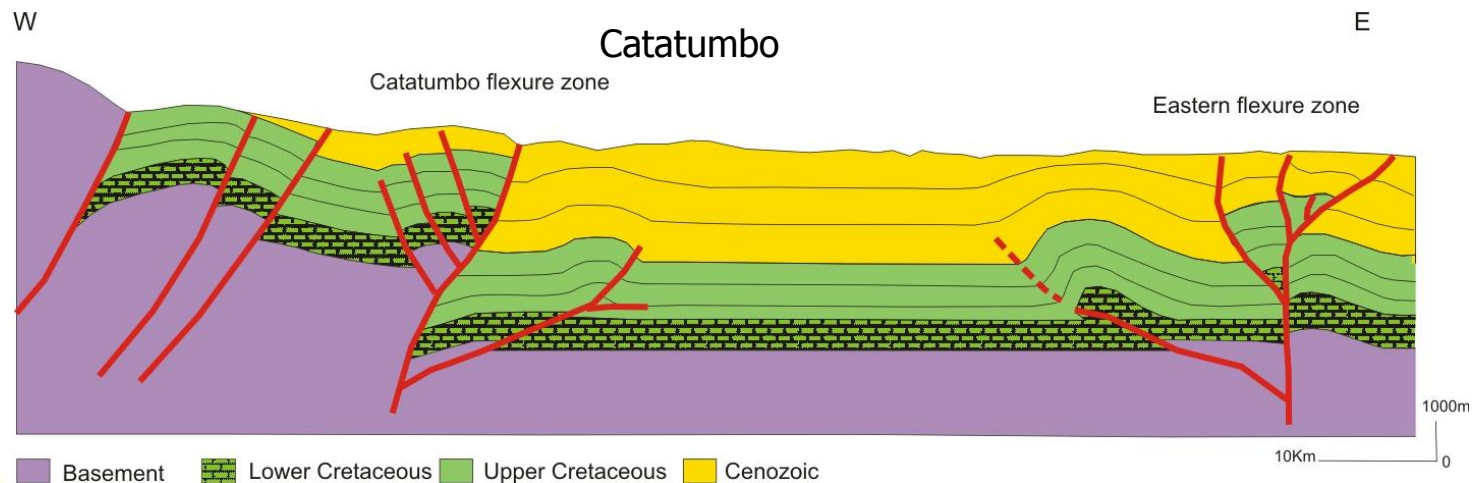
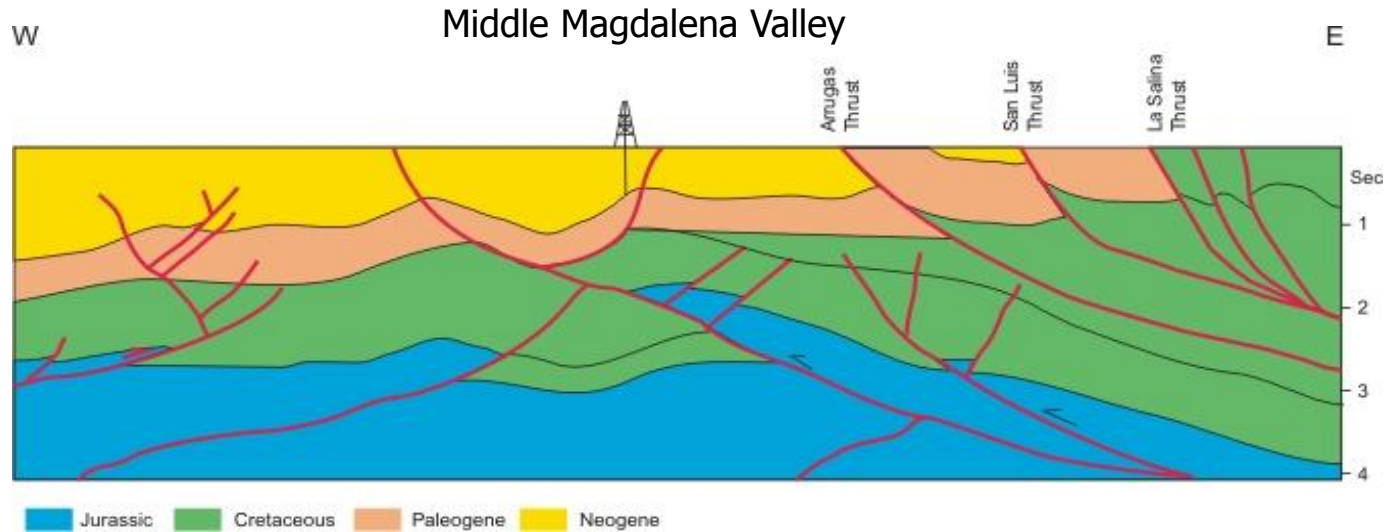
FOR CONVENTIONAL HC

Middle Magdalena Basin Reservoirs

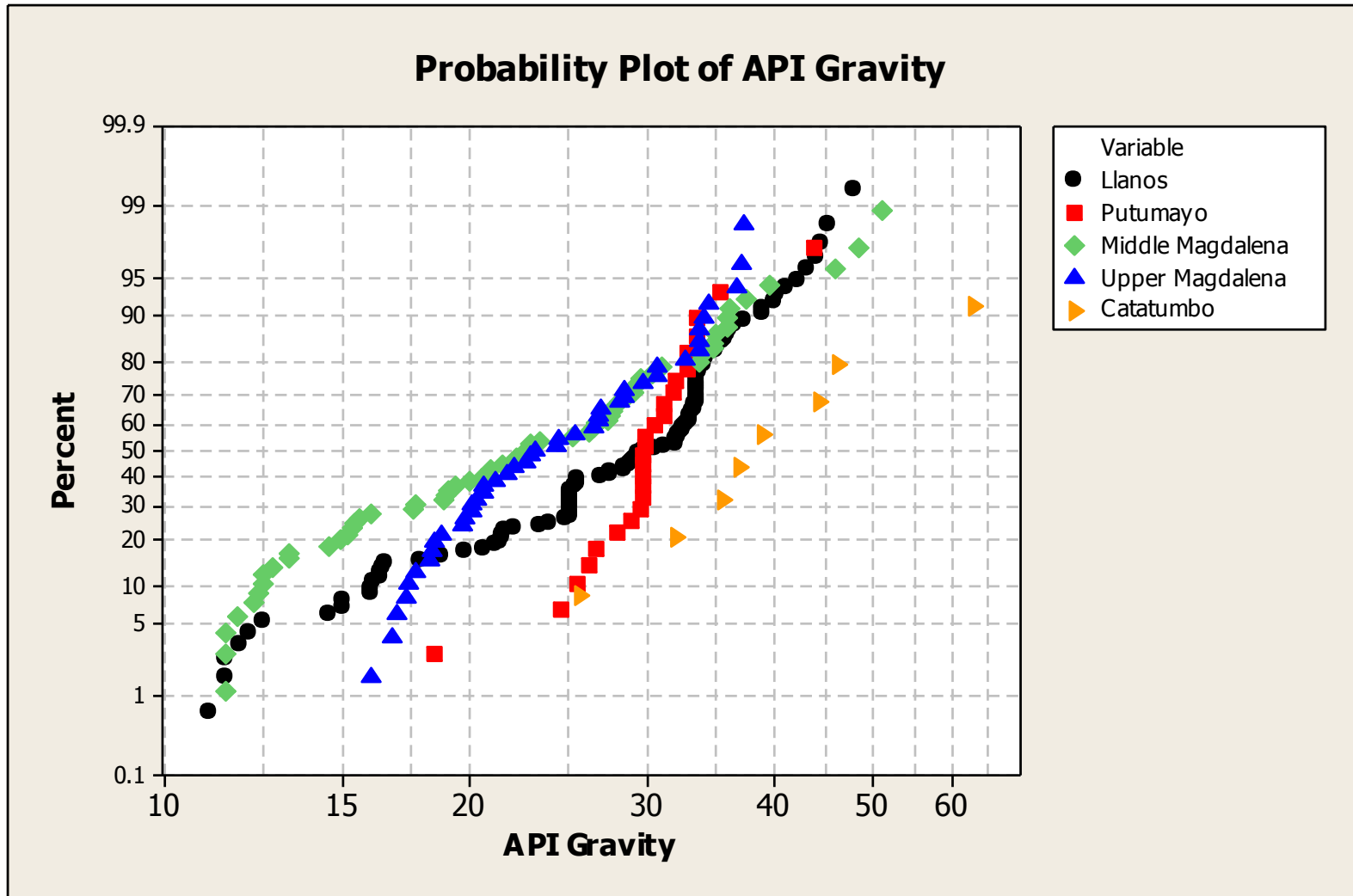
Colorado Fm. Mugrosa Fm. Esmeralda Fm. La Paz Fm. Lisama Fm.	Sandstones Porosity: 15 – 20% Permeability: 20 – 600 md
La Luna Fm. Tablazo Fm. Rosablanca Fm.	Fractured Limestone



Colombia Has a Wide Variety of Structural Styles



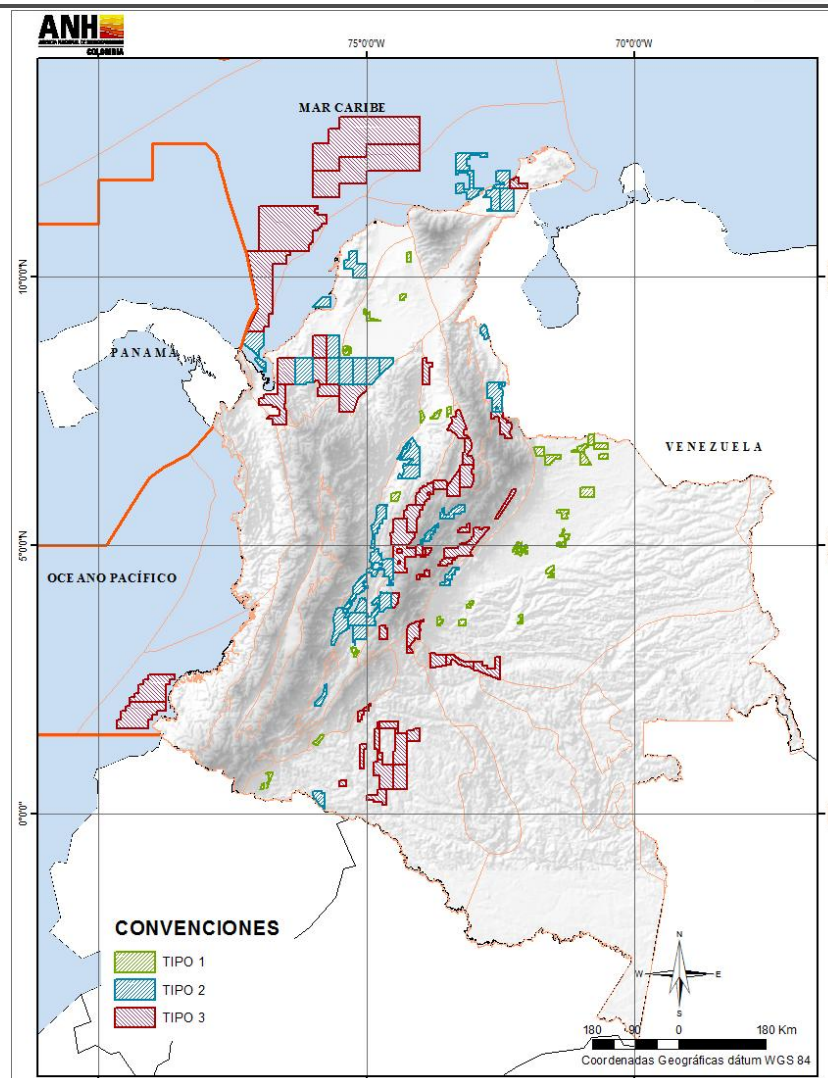
Crude Oil Quality



Colombia Round 2012

	Onshore	Offshore
Type 1 (Mature)	29	
Type 2 (Emerging)	29	5
Type 3 (Frontier)	40	6
TOTAL	98	11

Type	2D Seismic (km)	Number of wells	Total (km ²)
Type 1	914	76	6,565
Type 2	1,644	186	35,913
Type 3	438	23	92,297
TOTAL	2,996	285	134,775



Why is Colombia an attractive place to explore ?



Let's consider the following points:

- **Underexplored basins with proven petroleum systems**
- **Exploration tools used in the past**
- **Geologic concepts applied in the past**
- **When were the major discoveries made?**

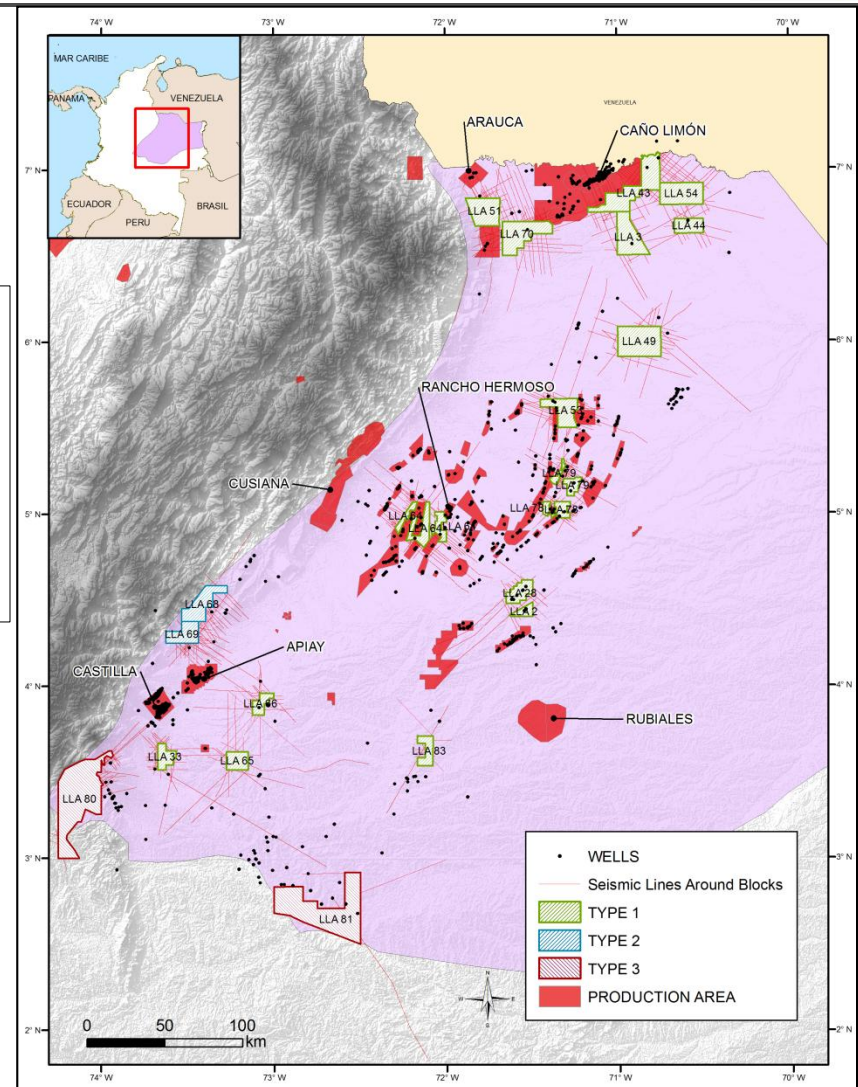
Therefore, let's take into account that:

1. **There are large areas which remain unexplored/underexplored, in both producing and frontier basins**
2. **Let's generate new ideas**
3. **Let's apply the new concepts**
4. **Let's use the new technologies**

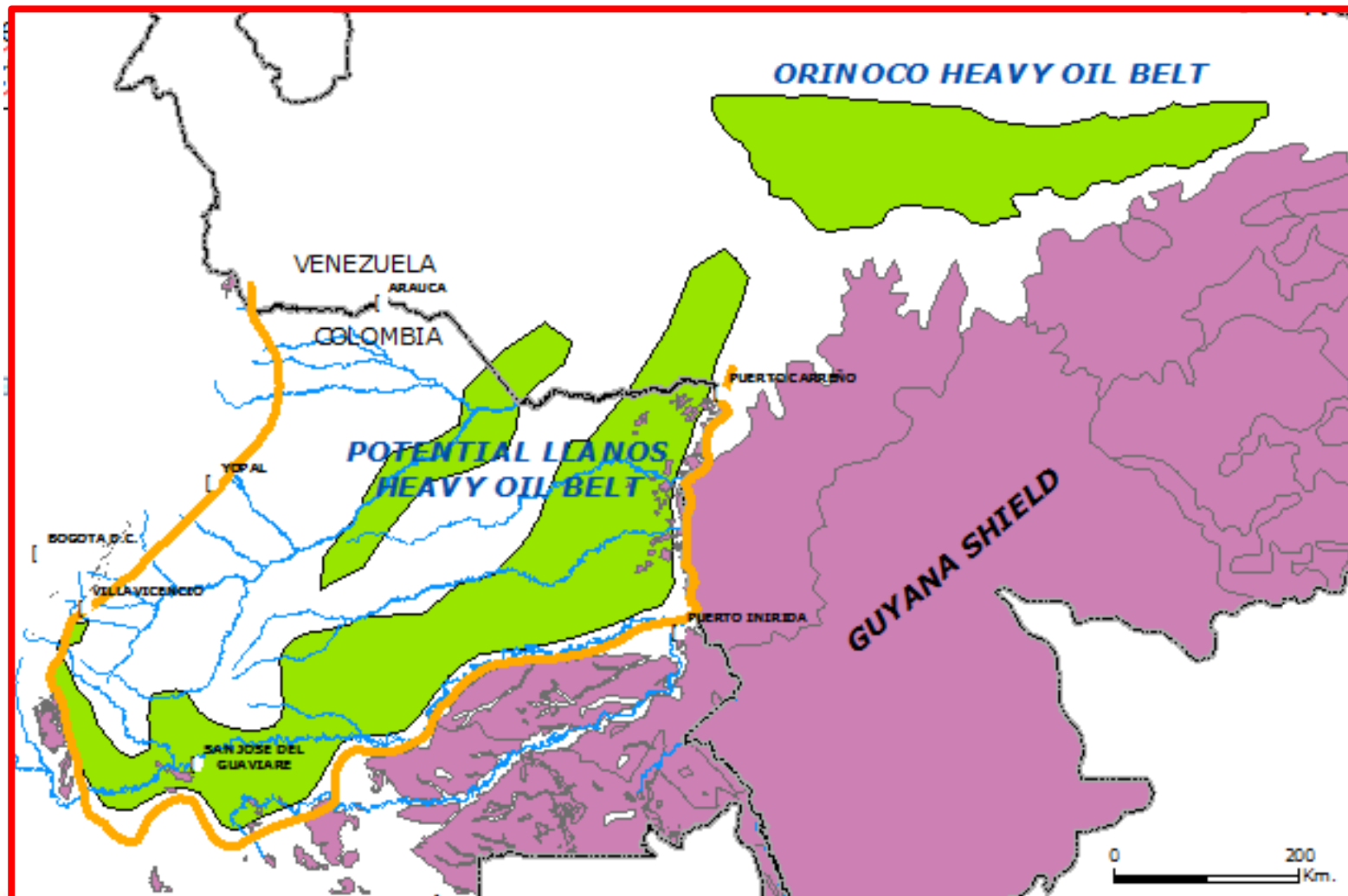
It's time for conducting 3D seismic exploration

Llanos Basin

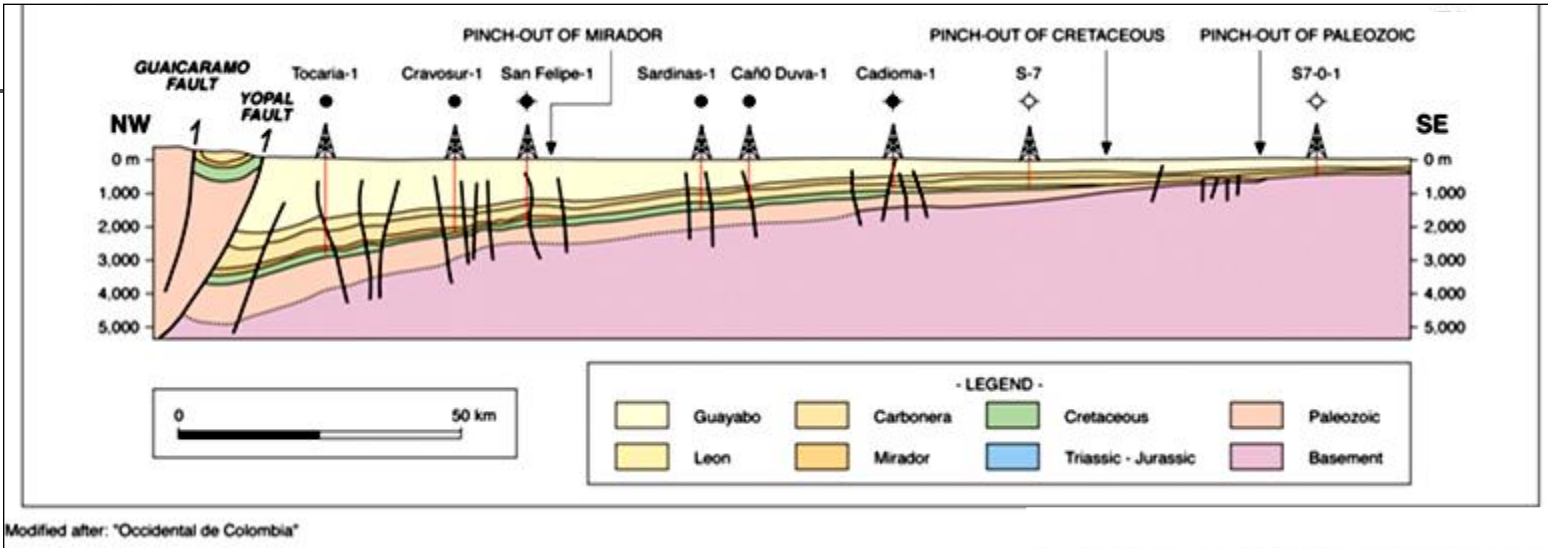
- Mature in terms of exploration
- It is the country's most prolific basin.
- A preliminary assessment of hydrocarbon resources suggests that the basin is also prospective for *Shale Oil* and *Shale Gas*.



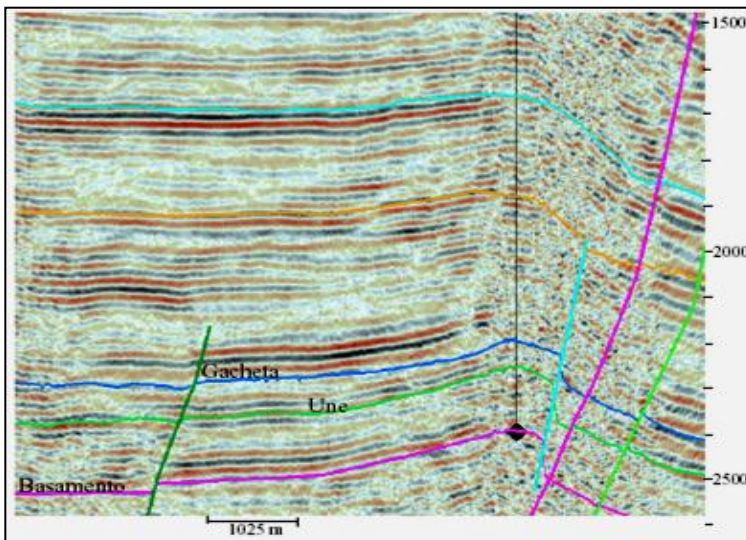
Llanos Basin



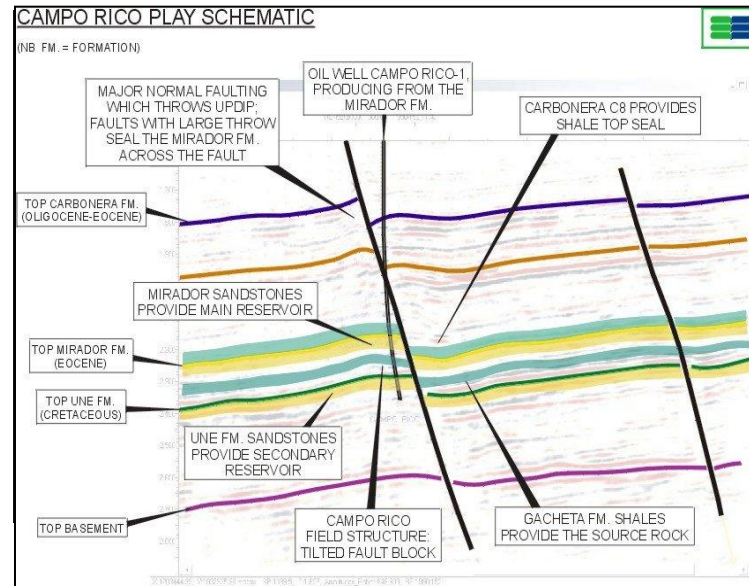
Structural Styles



Inversion structure

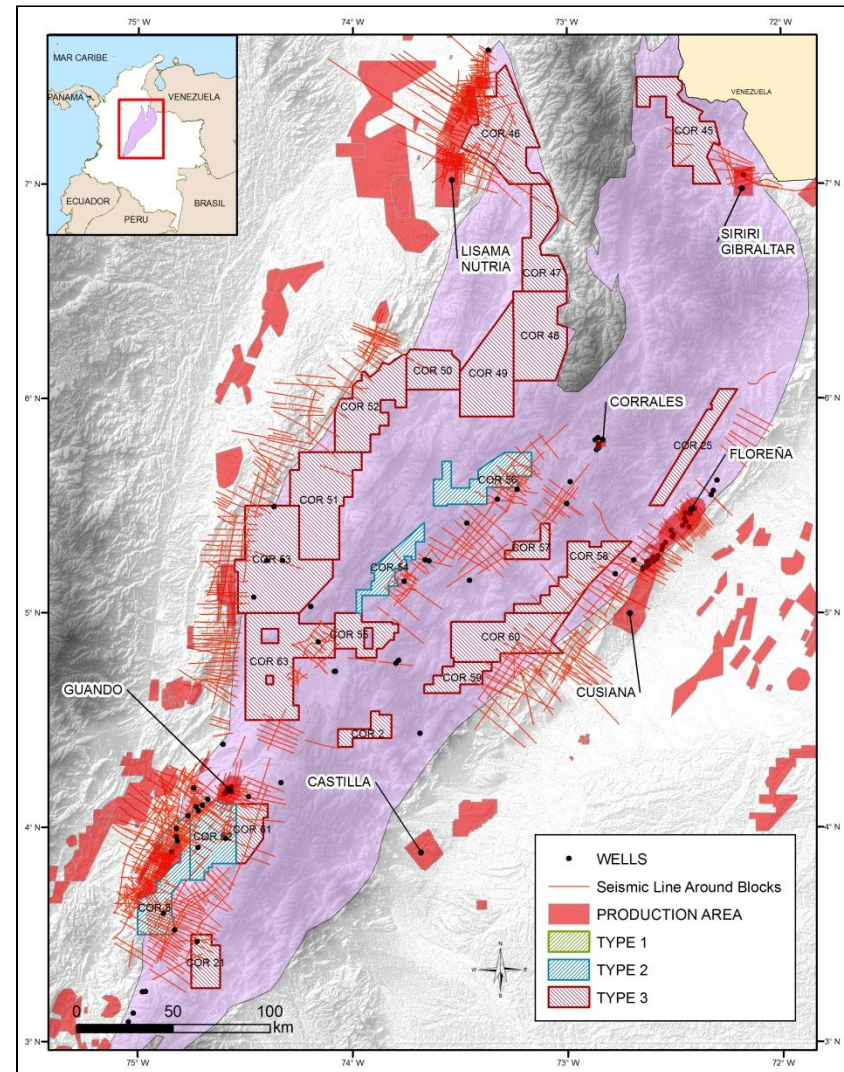


Antithetic normal fault



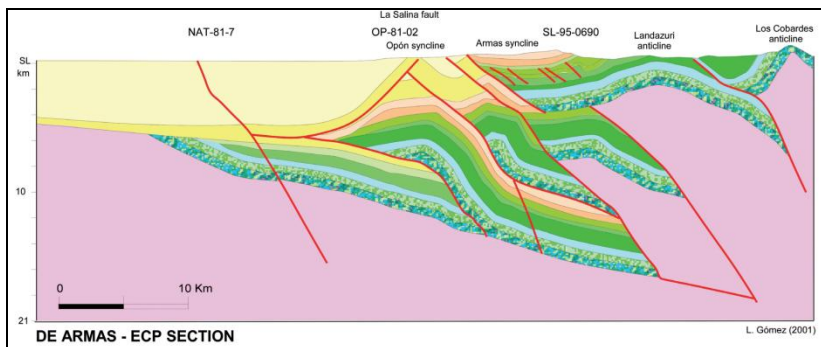
Eastern Cordillera Basin

- Active petroleum system (Multiple seepage of liquid hydrocarbons)
- Excellent quality source rocks (Chipaque Fm= La Luna Fm)
- A preliminary assessment of the hydrocarbon resources suggests that the basin is also prospective for *Oil Shale* and *Shale Gas*.

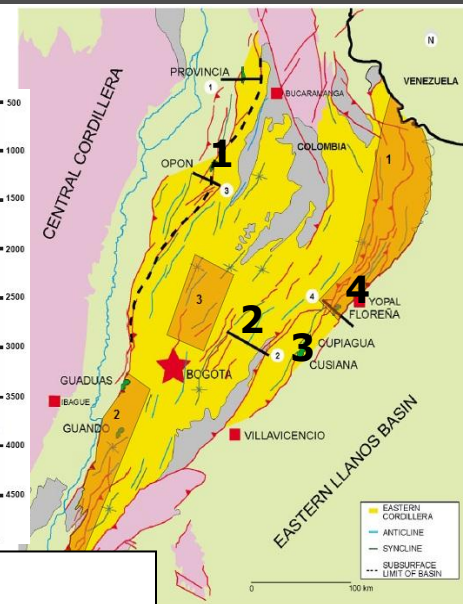
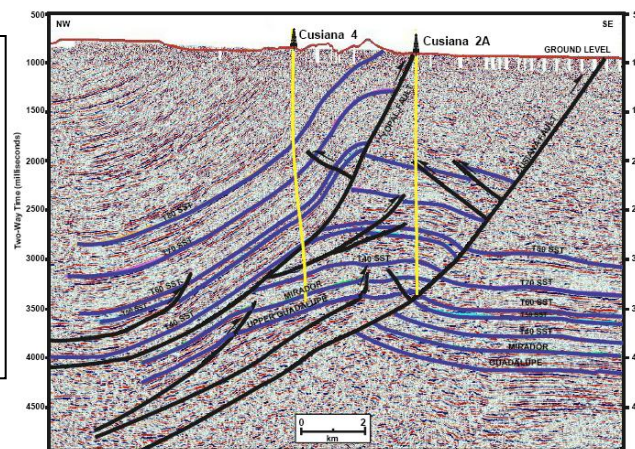


Structural Styles

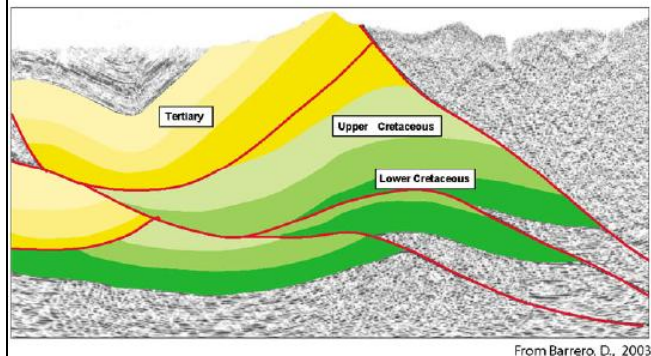
1. Sub thrust anticline



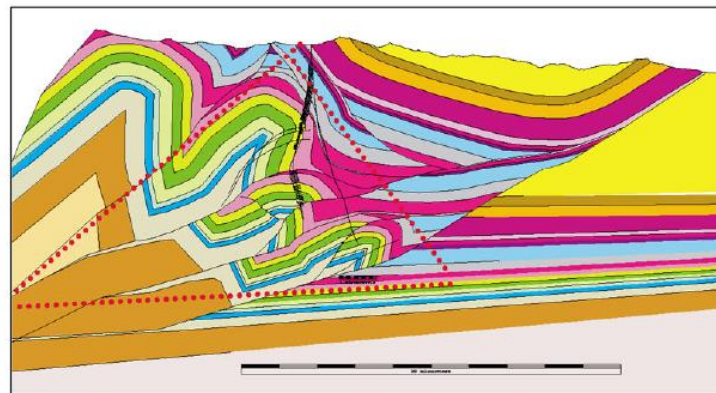
3. Cusiana field



2. Triangle zone – Río Horta

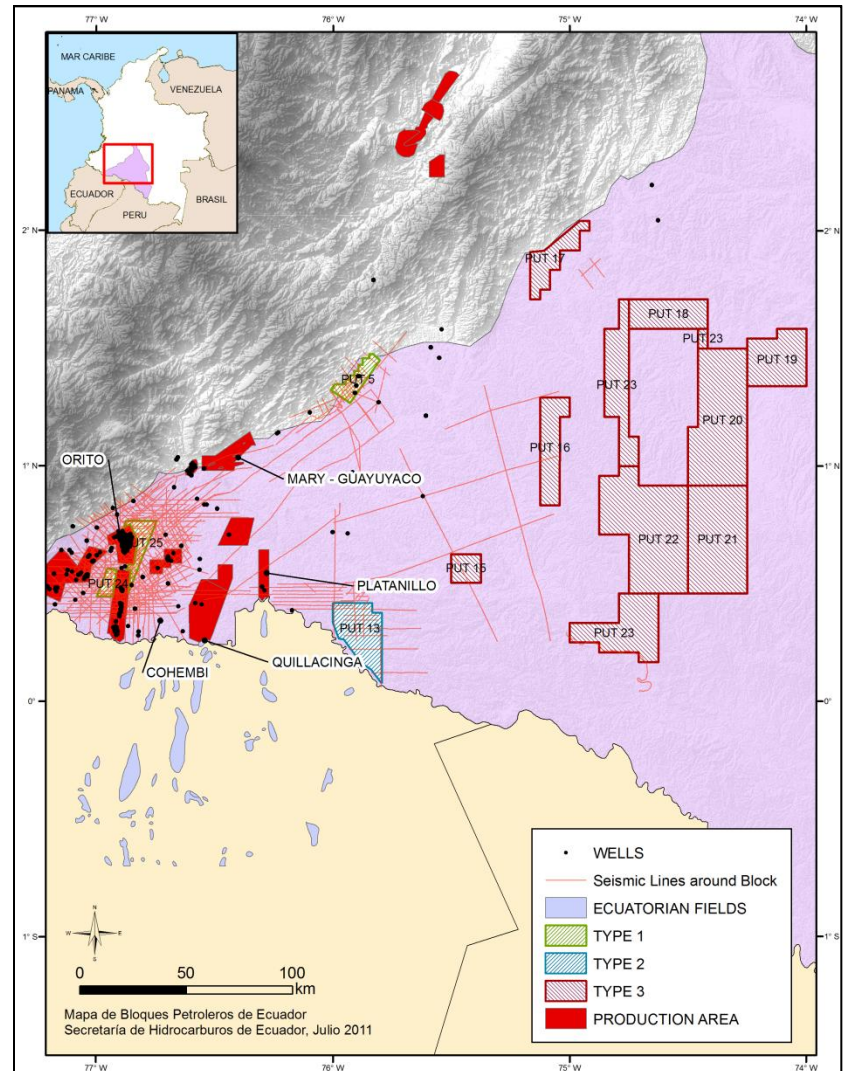


4. Duplex structure – Floreña area

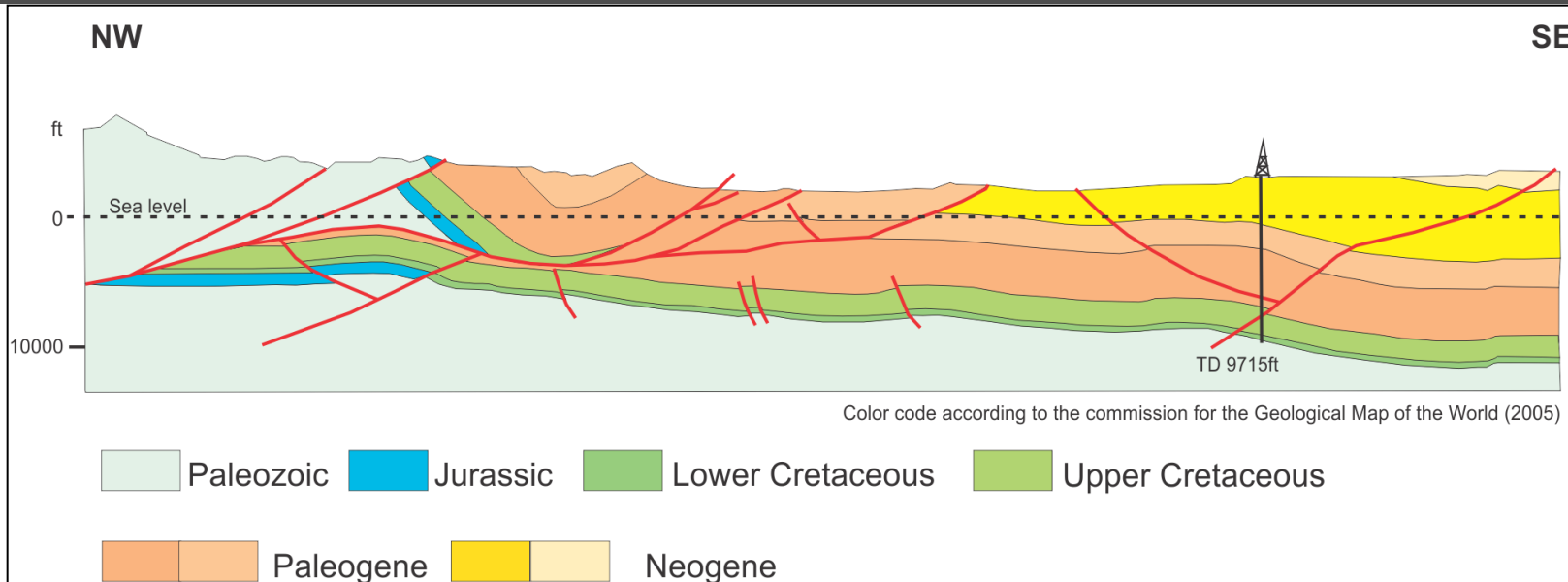


Caguán–Putumayo Basin

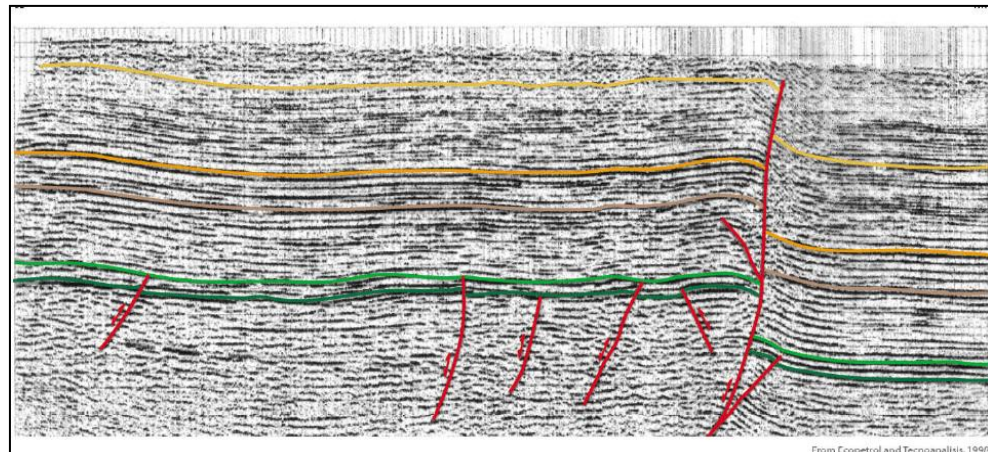
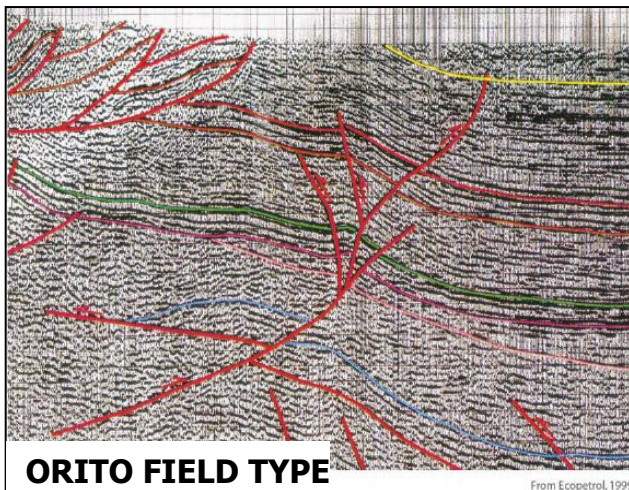
- Possible extension of the Llanos basin heavy oil belt.
- Possible petroleum system associated with Paleozoic rocks (Caguán Sub-basin)
- Stratigraphic potential remains unexplored
- Excellent quality source rocks (Villeta Fm. and Caballos Fm.).



Structural Styles

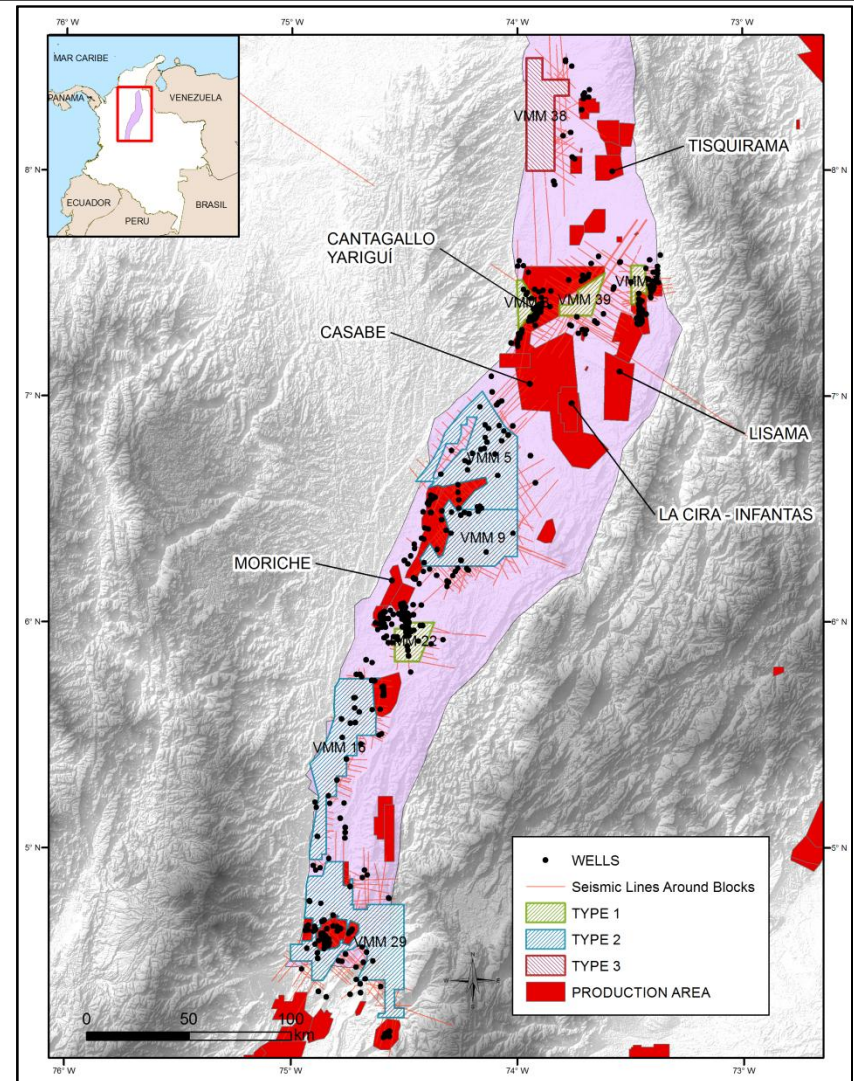


Inversion structure



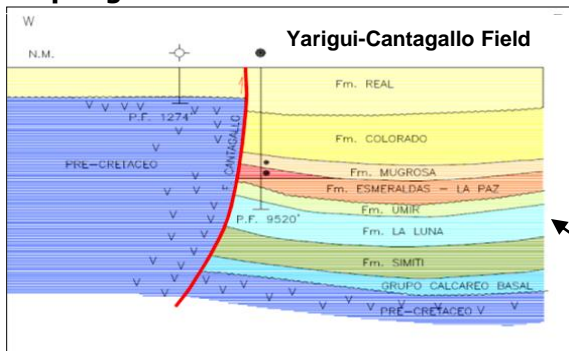
Middle Magdalena Basin (VMM)

- It has additional exploration potential and is one of the most prolific basins in the country.
- Unexplored Cretaceous carbonates.
- A preliminary assessment of the hydrocarbon resources suggests that the basin is also prospective for *Oil Shale* and *Shale Gas*.

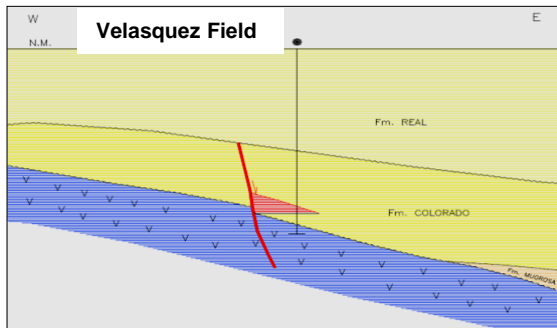
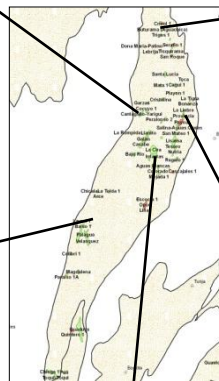
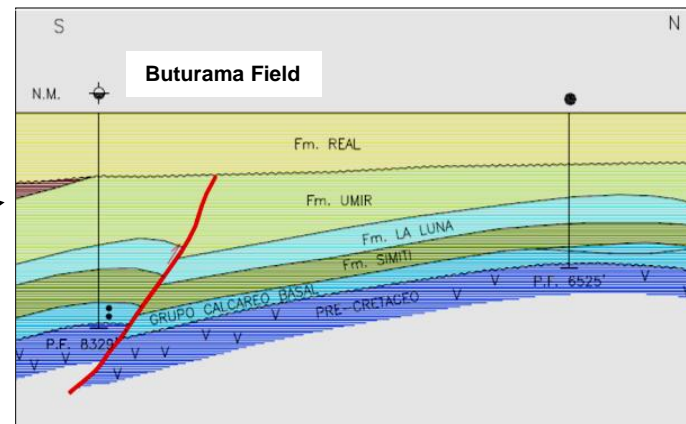


Structural Styles

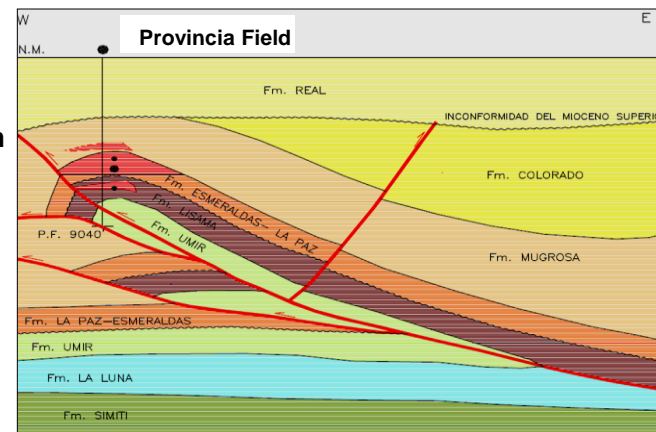
Faulted traps against basement of the Central Cordillera



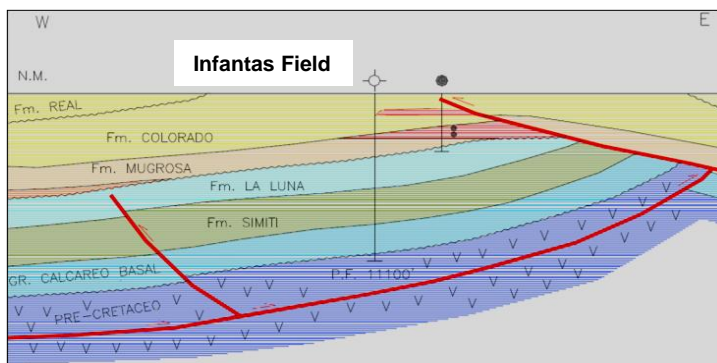
Lower Cretaceous fractured limestones



Fold Propagation Fault



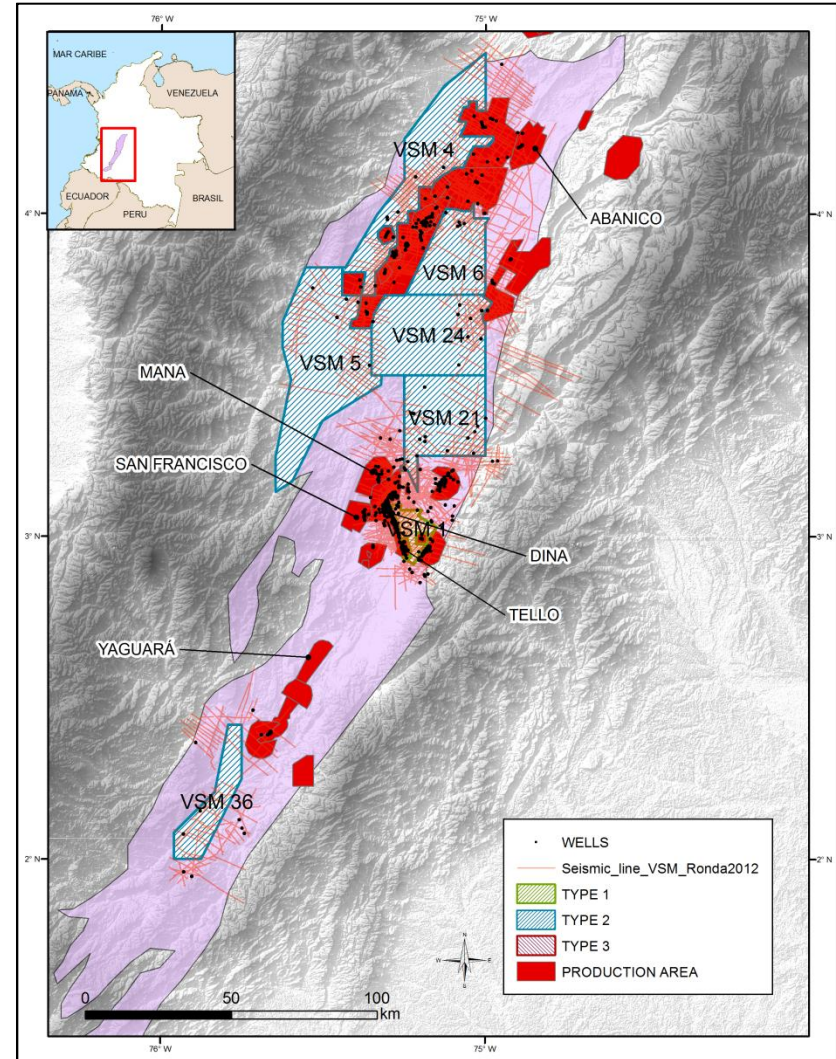
Subthrusts structures associated to Andean deformation



Normal fault traps - eastward dipping monocline

Upper Magdalena Basin (VSM)

➤ A preliminary assessment on the hydrocarbon resources of the country suggests that the basin is also prospective for *Oil Shale* and *Shale Gas*.

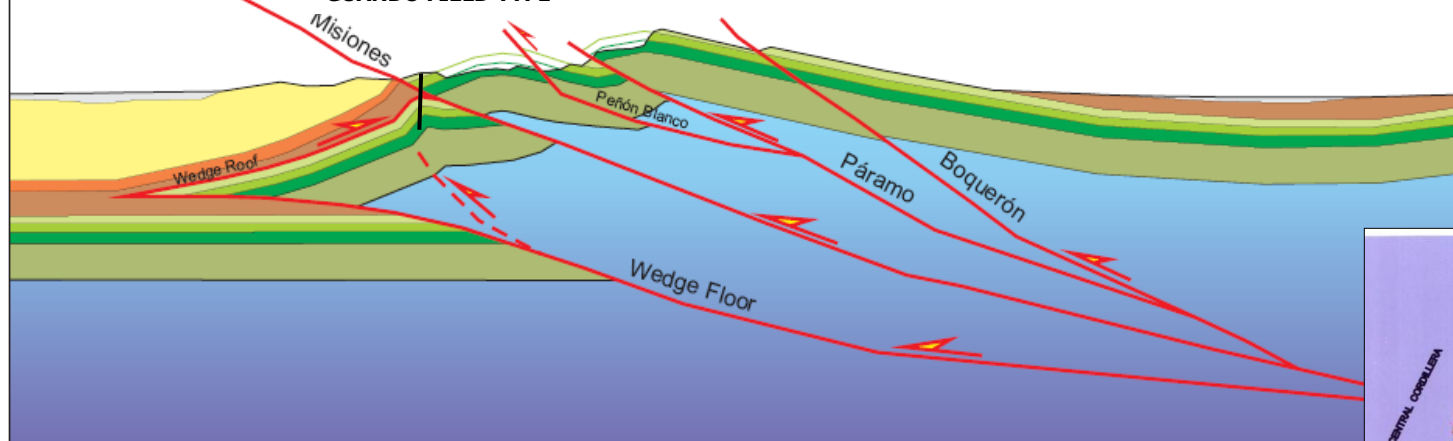


Structural Styles

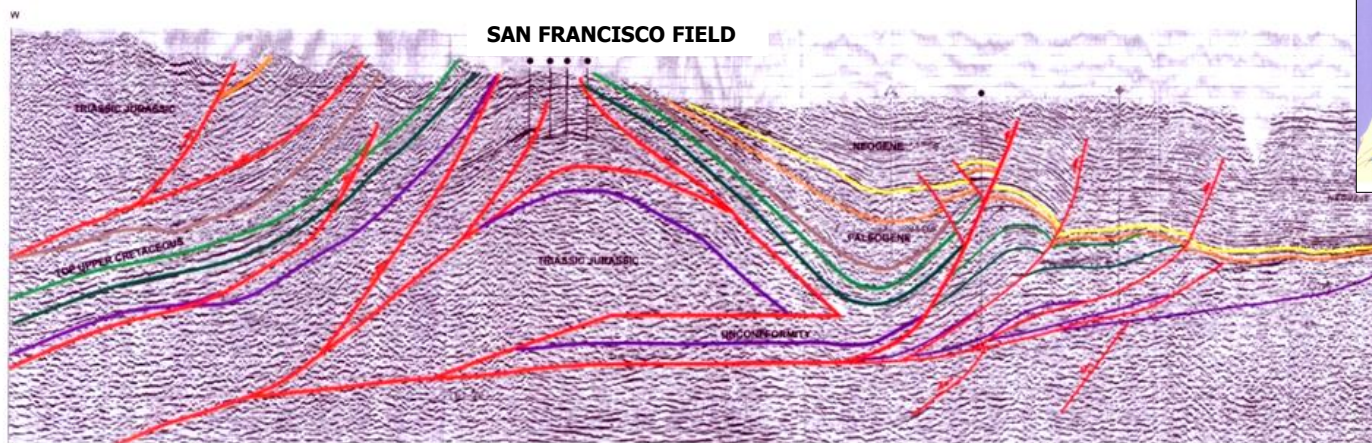
WNW

GUANDO FIELD TYPE

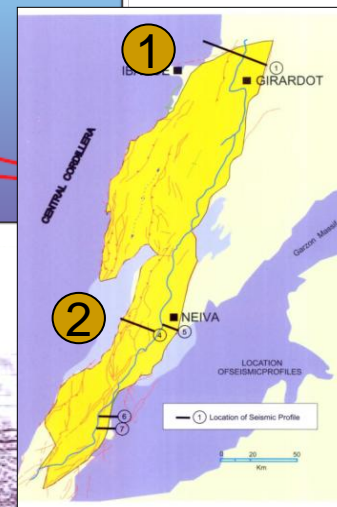
1- Sub-thrust and thrust anticlines



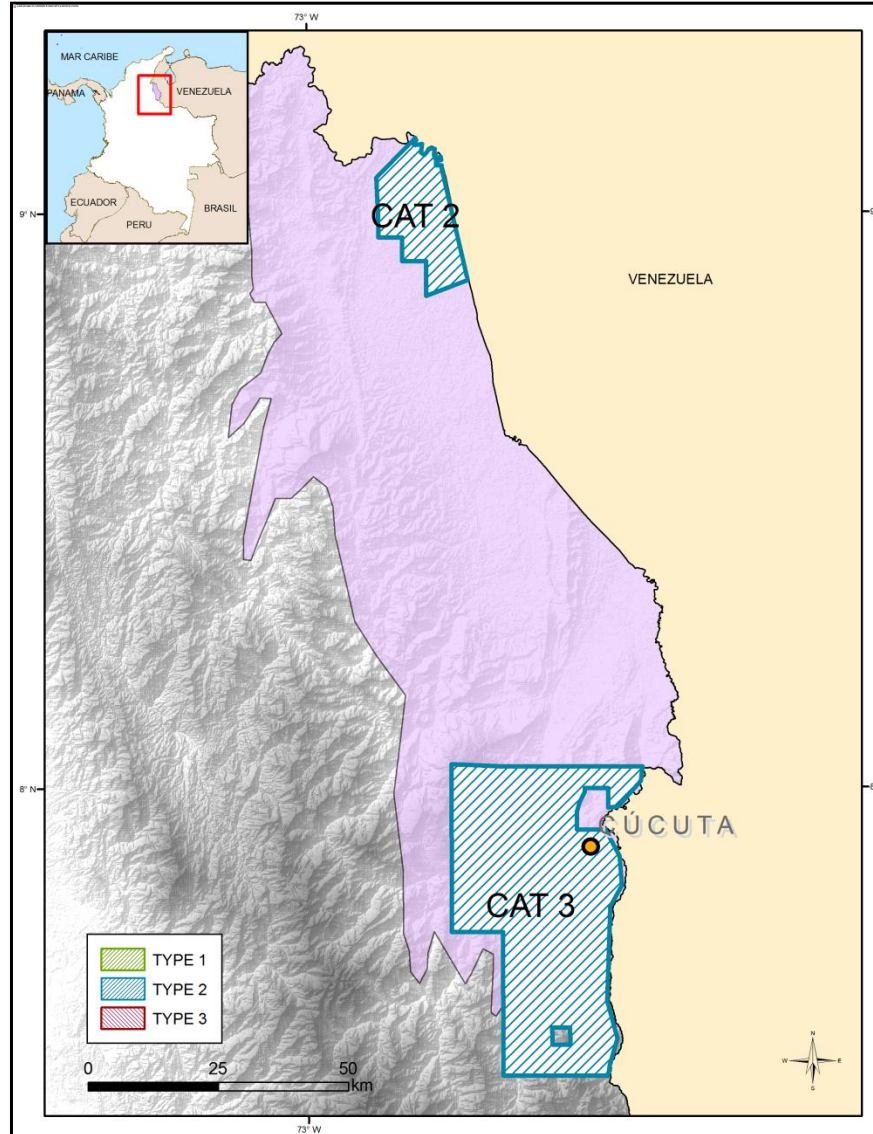
2- Fault Bend Fold and imbricate thrust fans



From Seismic Atlas, 1998

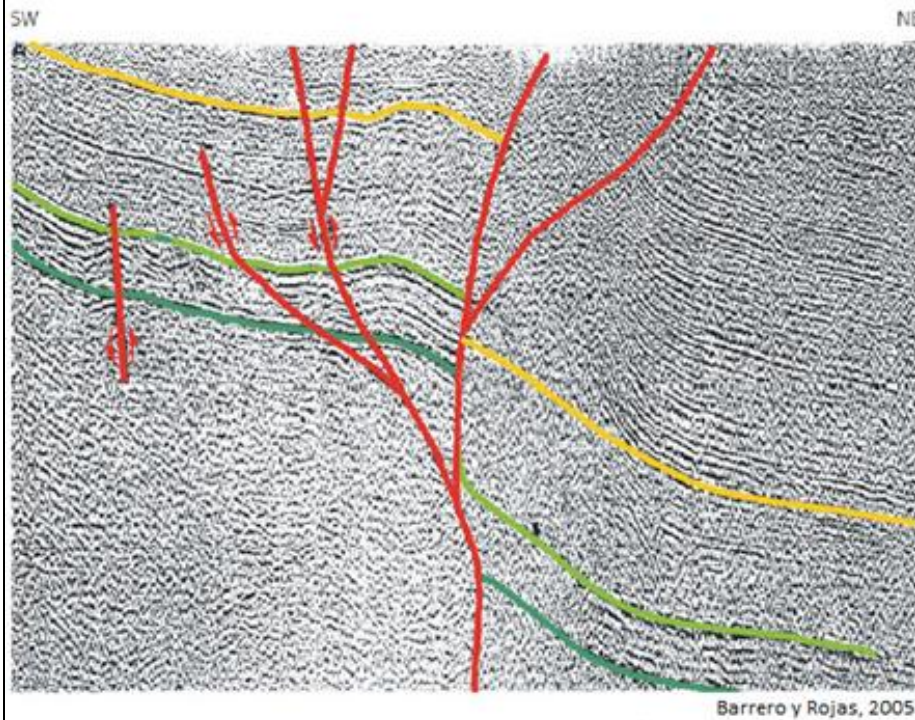


Catatumbo Basin (CAT)

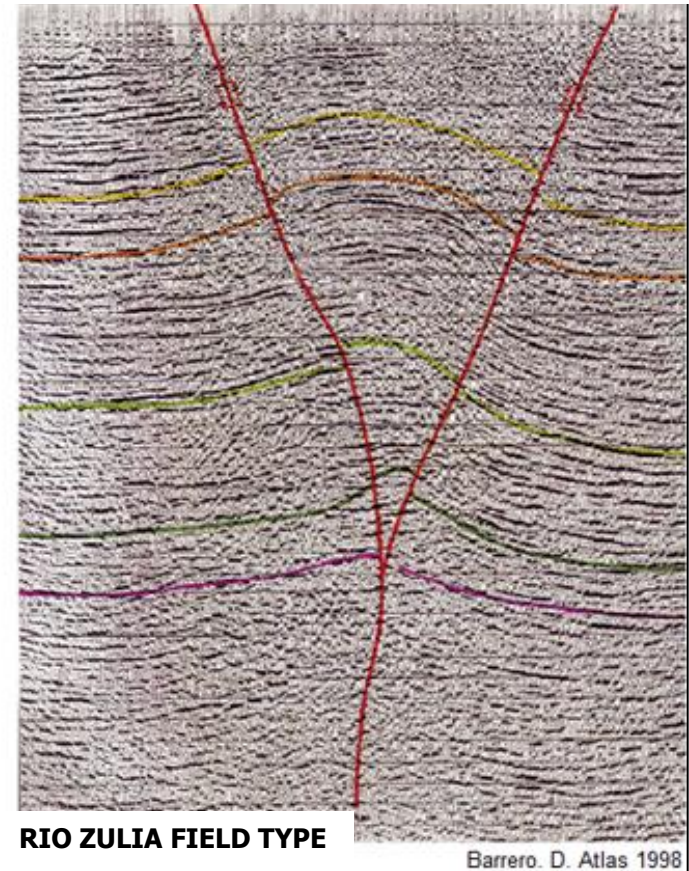


Structural Styles

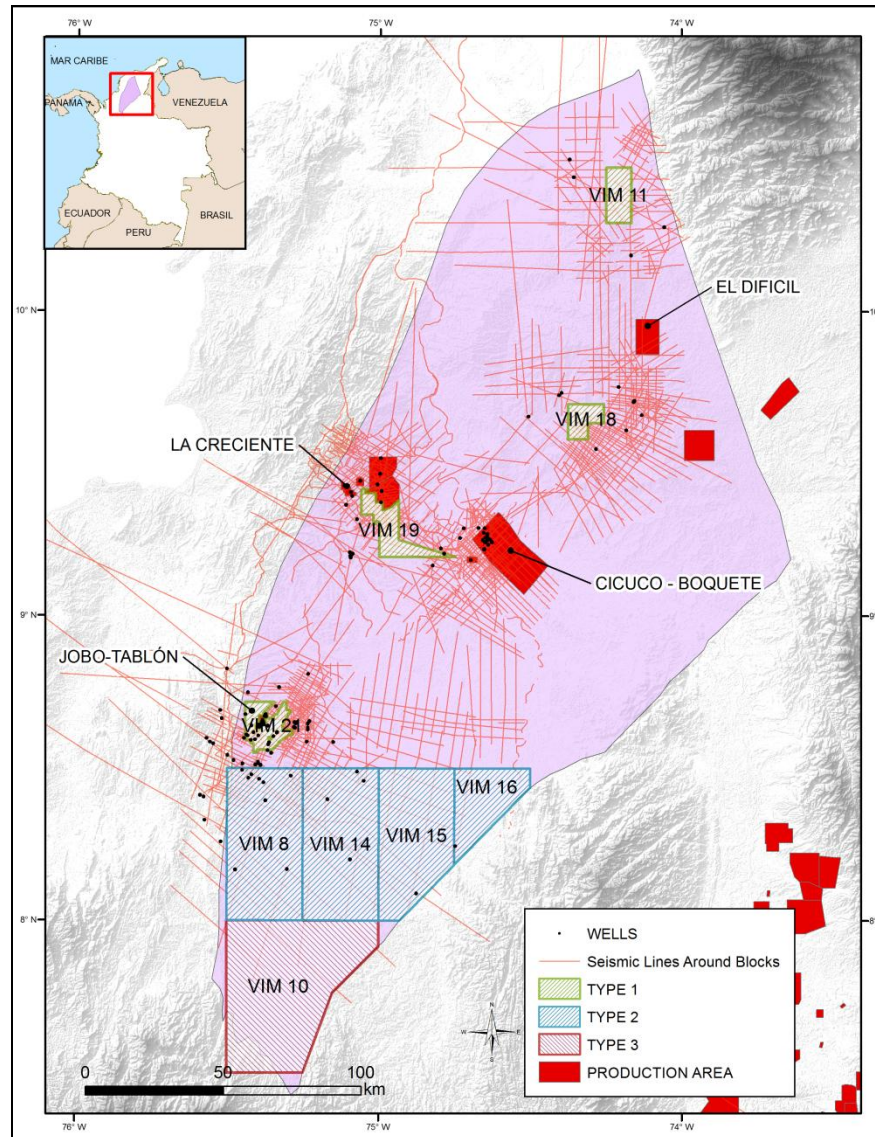
1- Closures on both hanging-wall and foot-wall of faults developed under transpression



2- Anticline traps (Flower Structures) developed under wrenching conditions

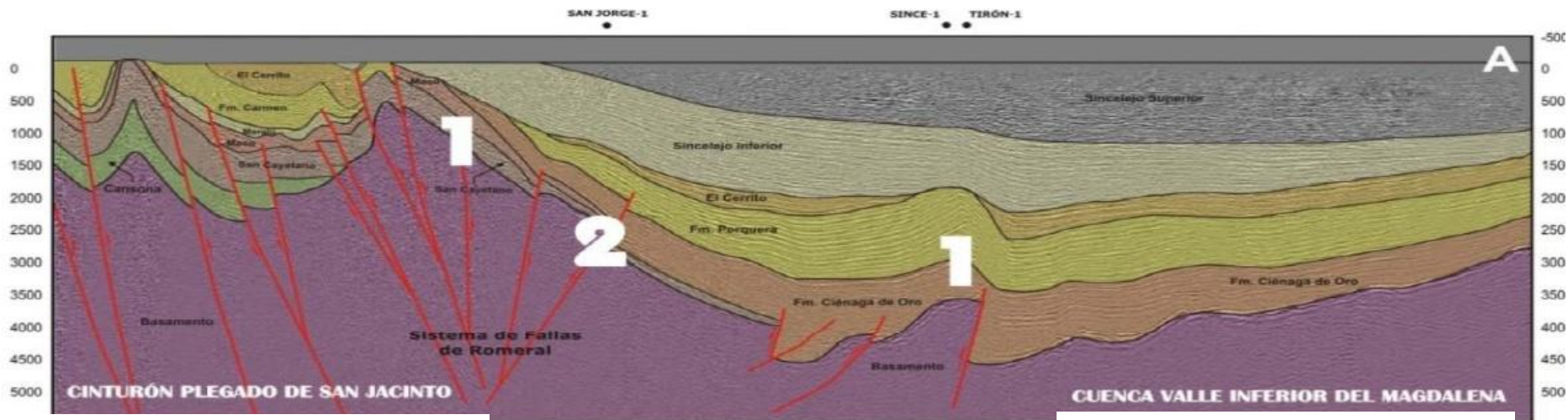


Lower Magdalena Basin (VIM)



Structural Styles

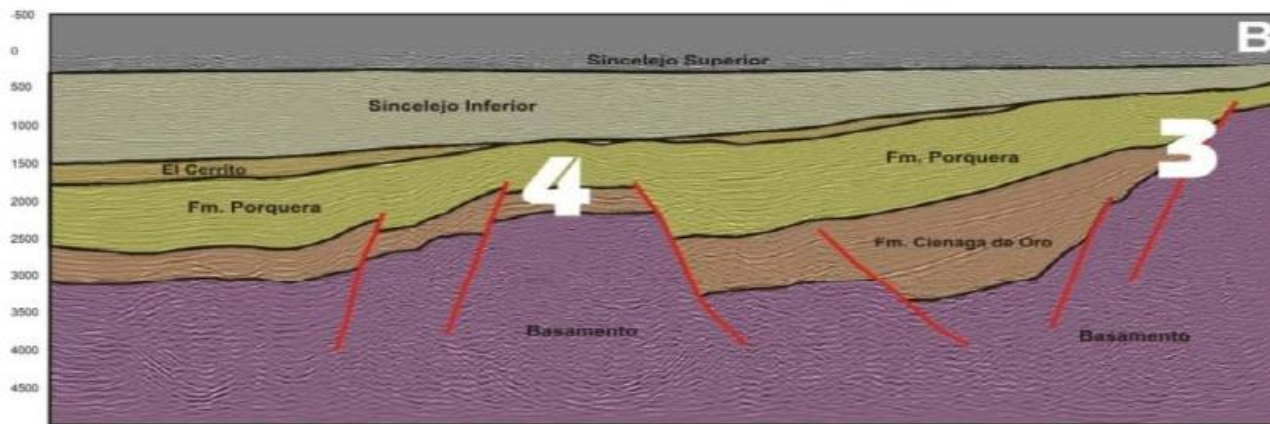
- 1- Inversion anticlines 2- Fault juxtaposition traps 3- Pinch-outs against basement 4- Basement High



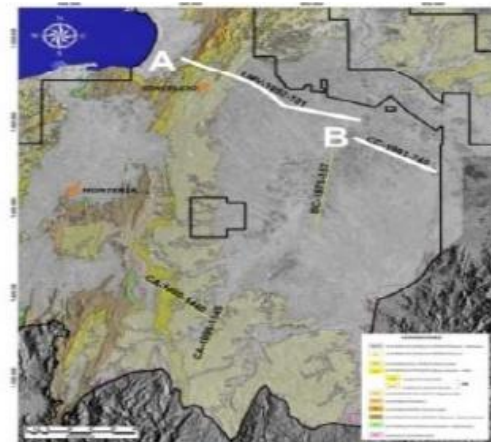
SAN JACINTO FOLD BELT

LMV-1992-101

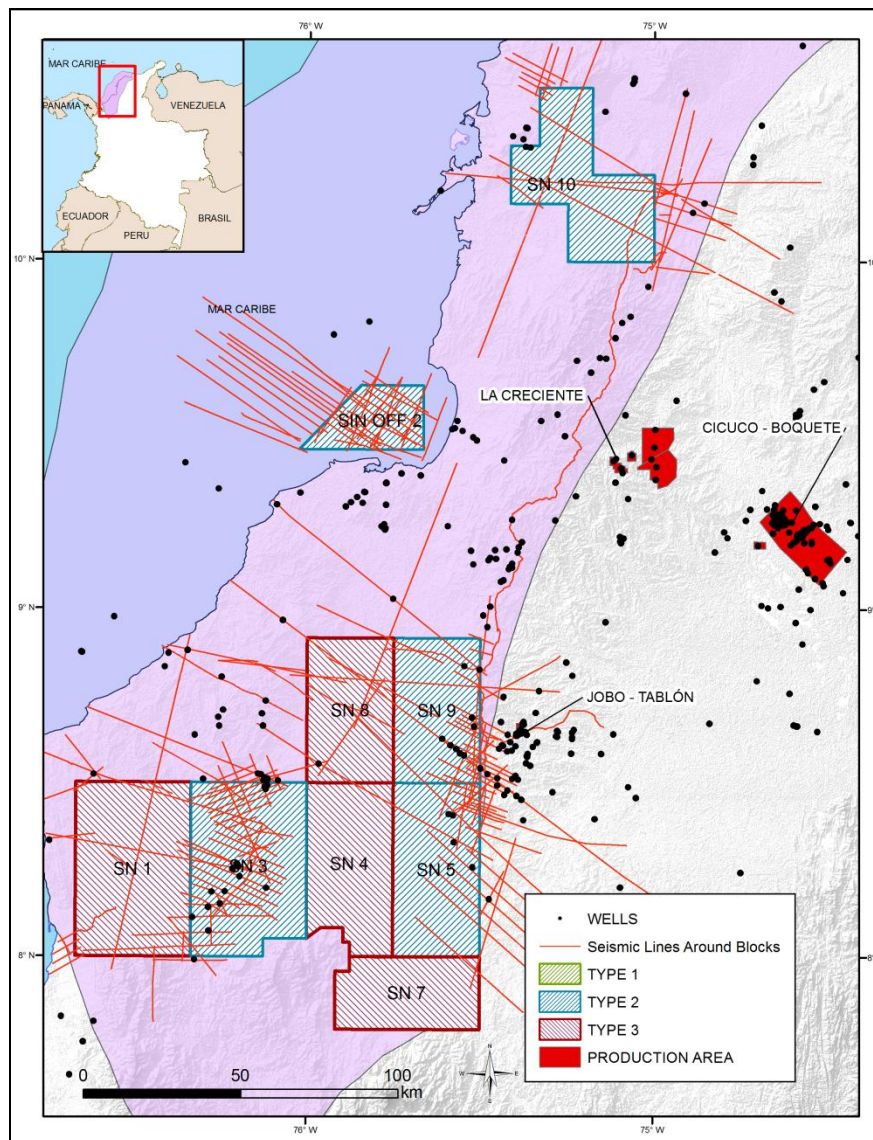
VIM BASIN



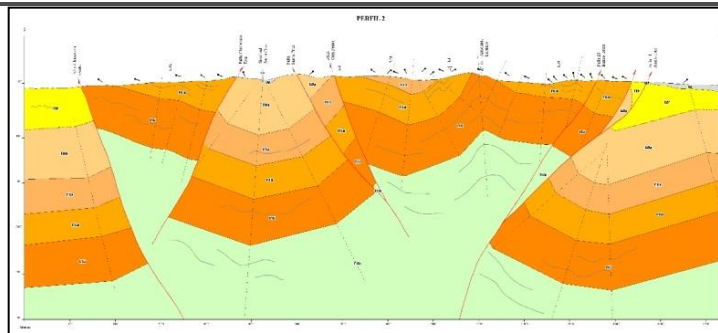
CC-1991-740



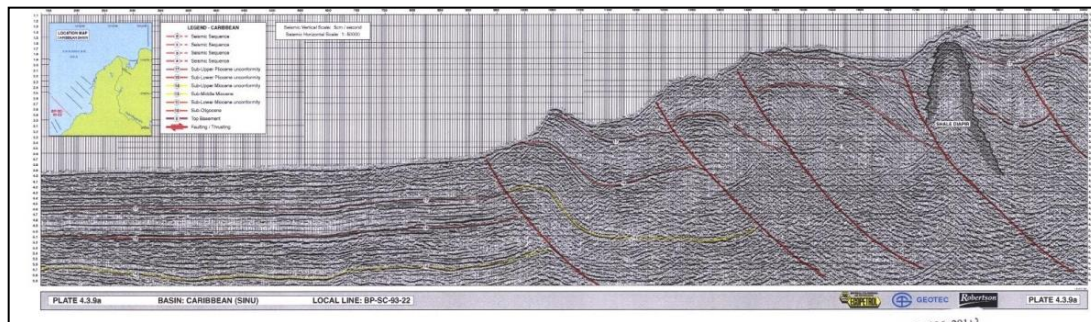
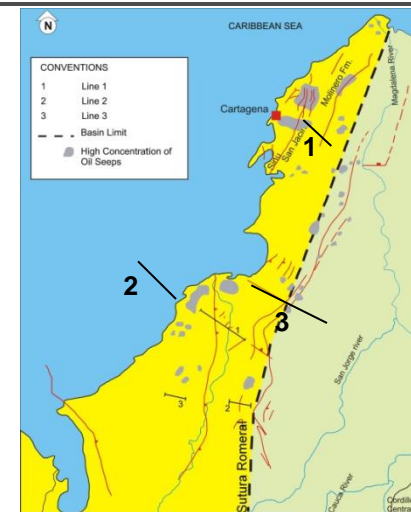
Sinú–San Jacinto Onshore and Offshore Basins



Structural Styles

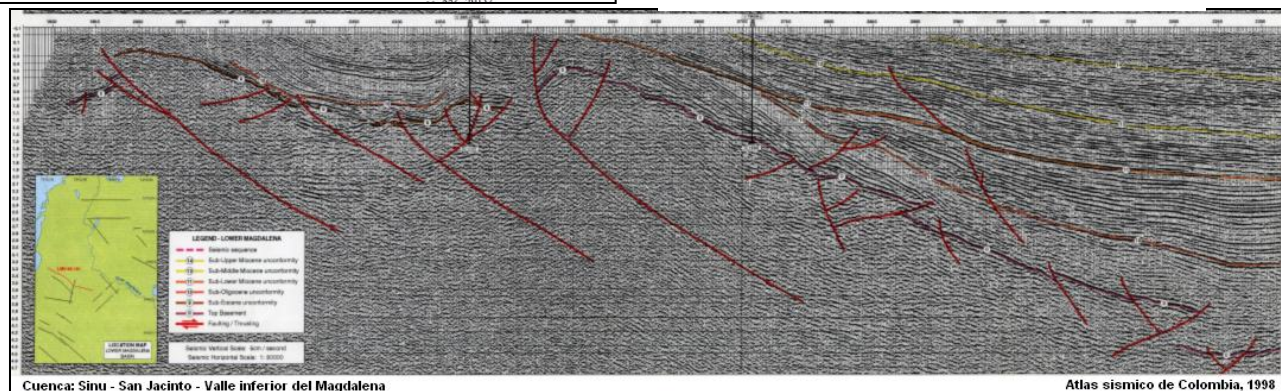


1- Wrench structure – San Jacinto Fold Belt



2- Fold propagation fault and diapiric structures - Sinu Fold Belt -offshore

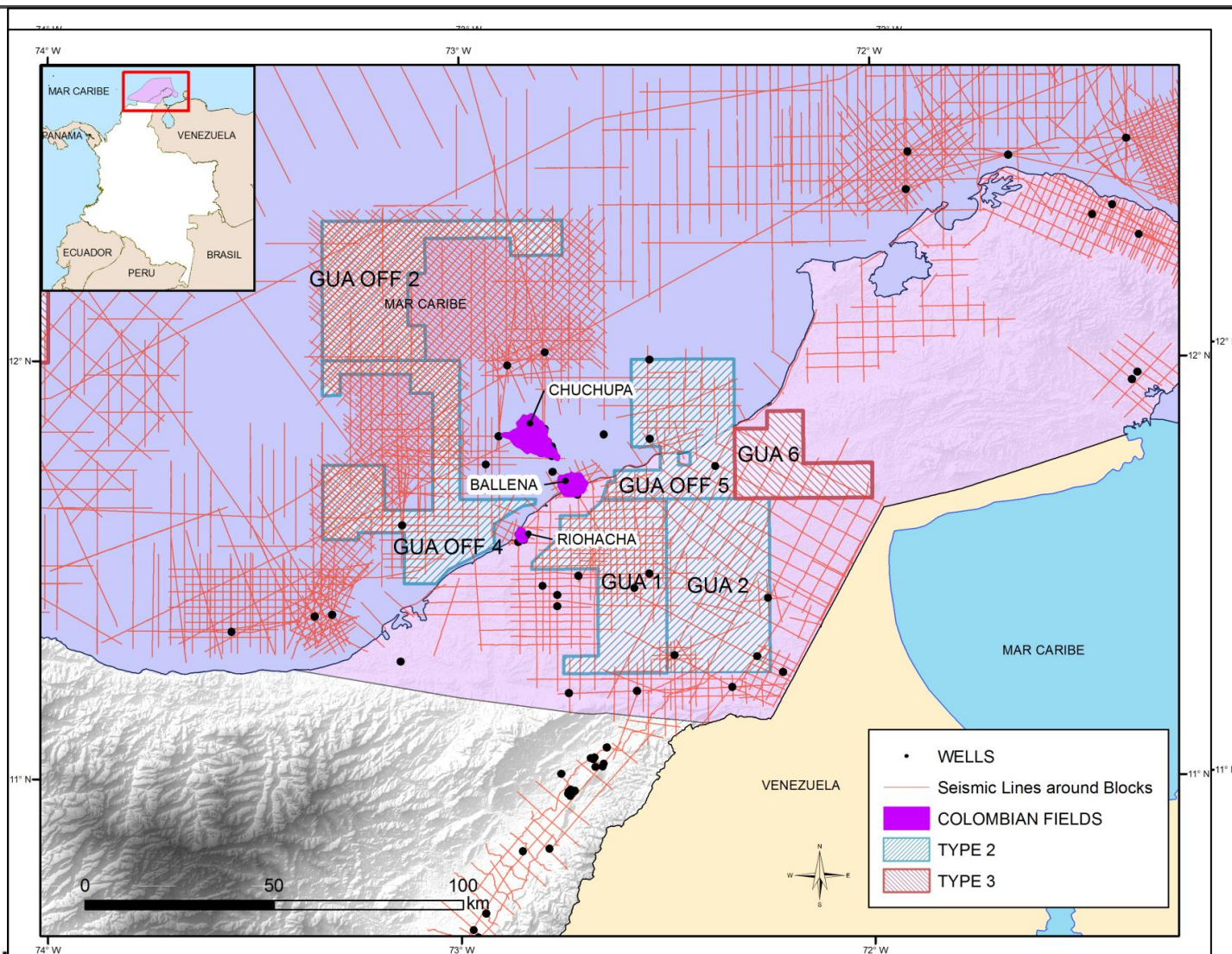
3- Inversion structure - Romeral Fault System



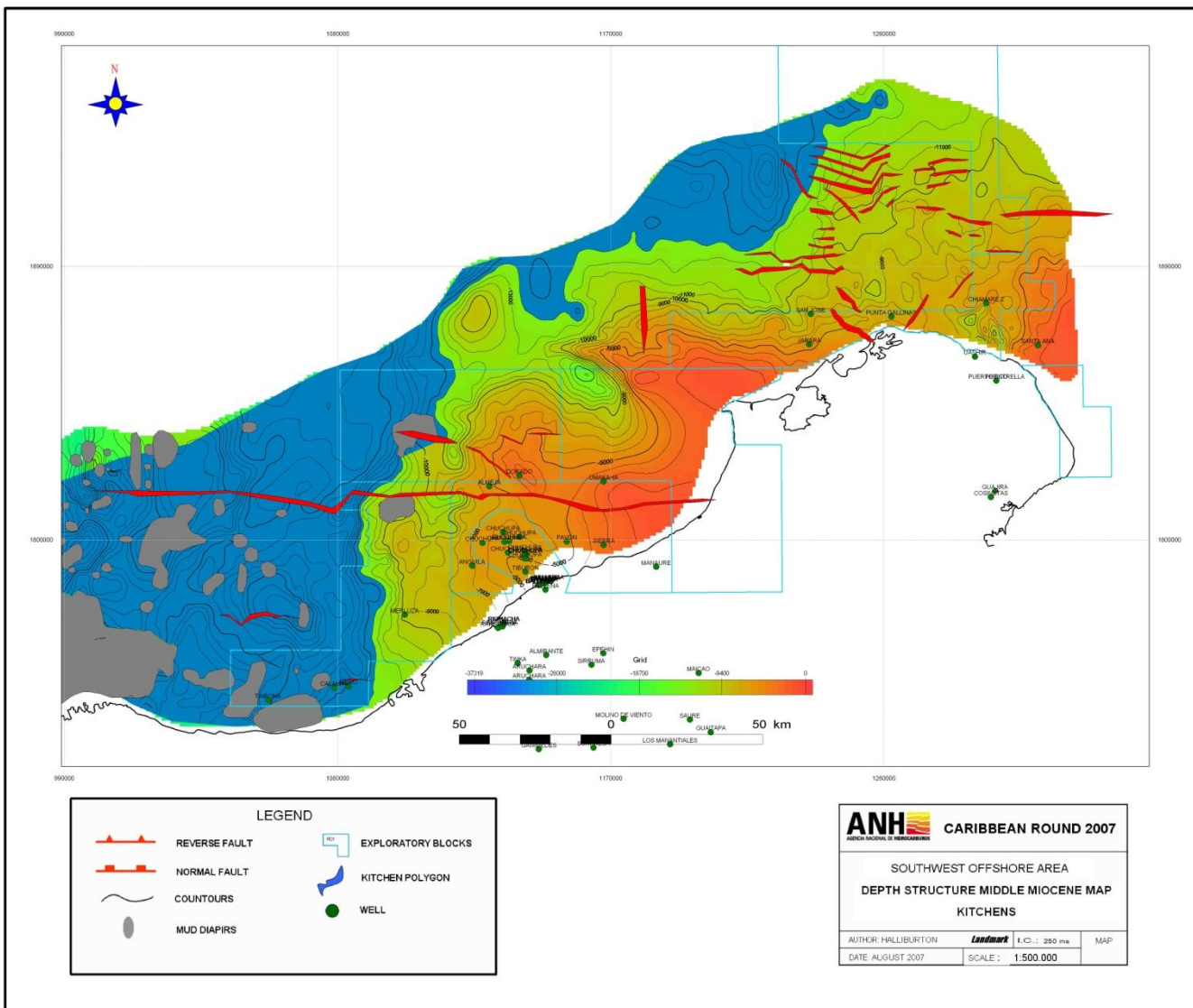
Cuenca: Sinu - San Jacinto - Valle inferior del Magdalena

Atlas sísmico de Colombia, 1998

Guajira Onshore and Offshore Basins

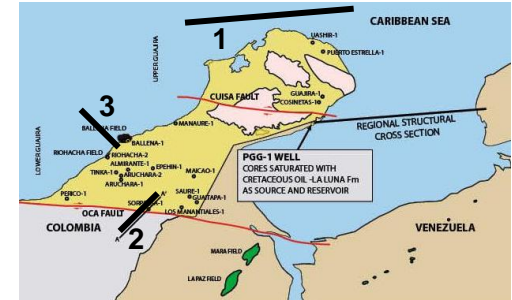
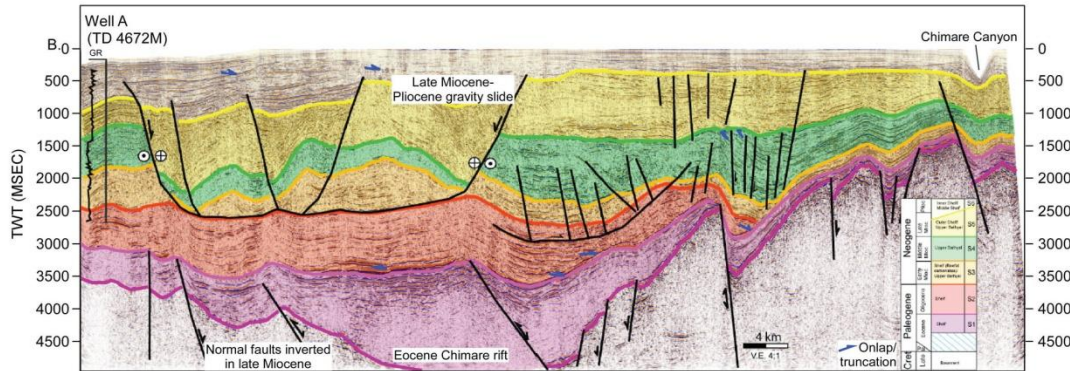


Kitchen Areas

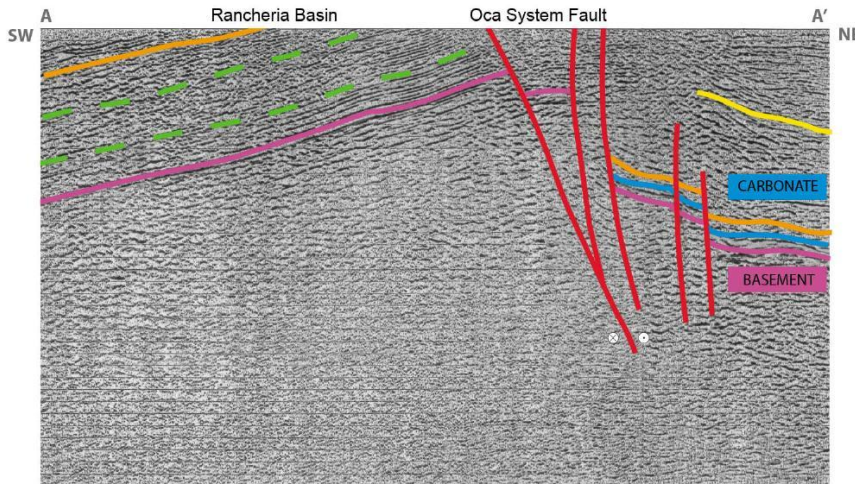


Structural Styles

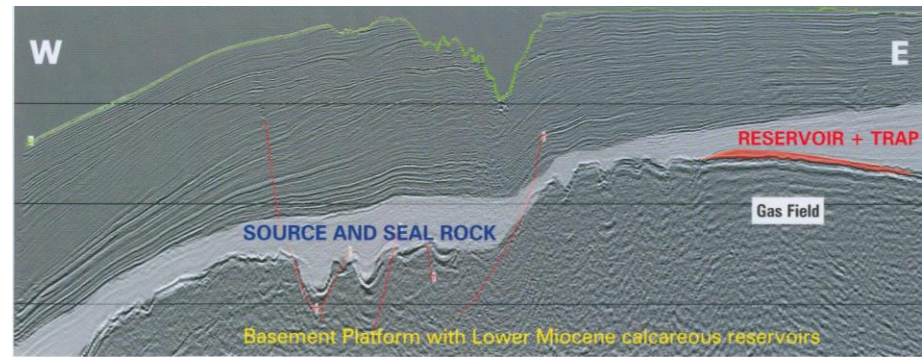
1- Normal Fault traps



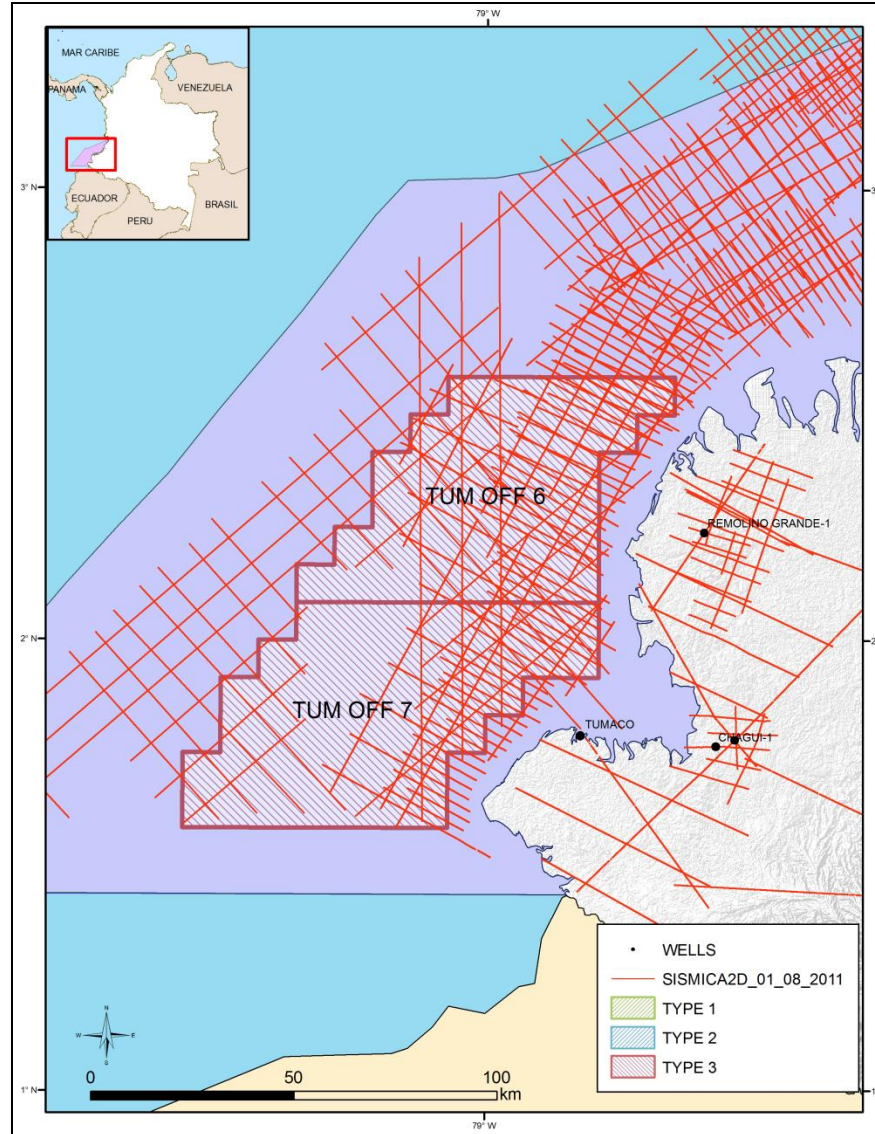
2- Oligocene carbonates strongly Fractured by the Oca Wrench System



3- Combined (structural and stratigraphic) traps

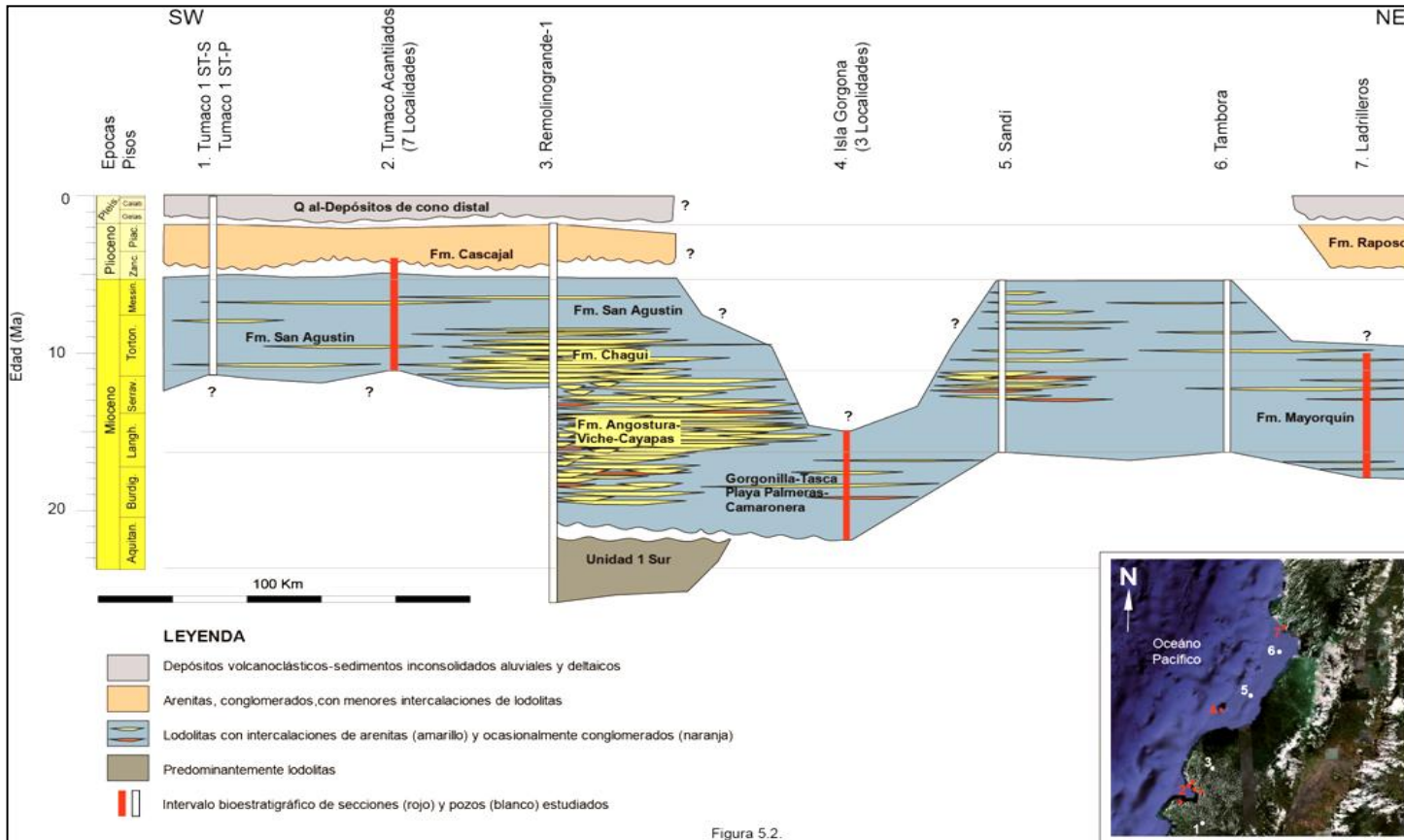


Tumaco Basin Offshore (Tum)



Tumaco Basin Offshore (Tum)

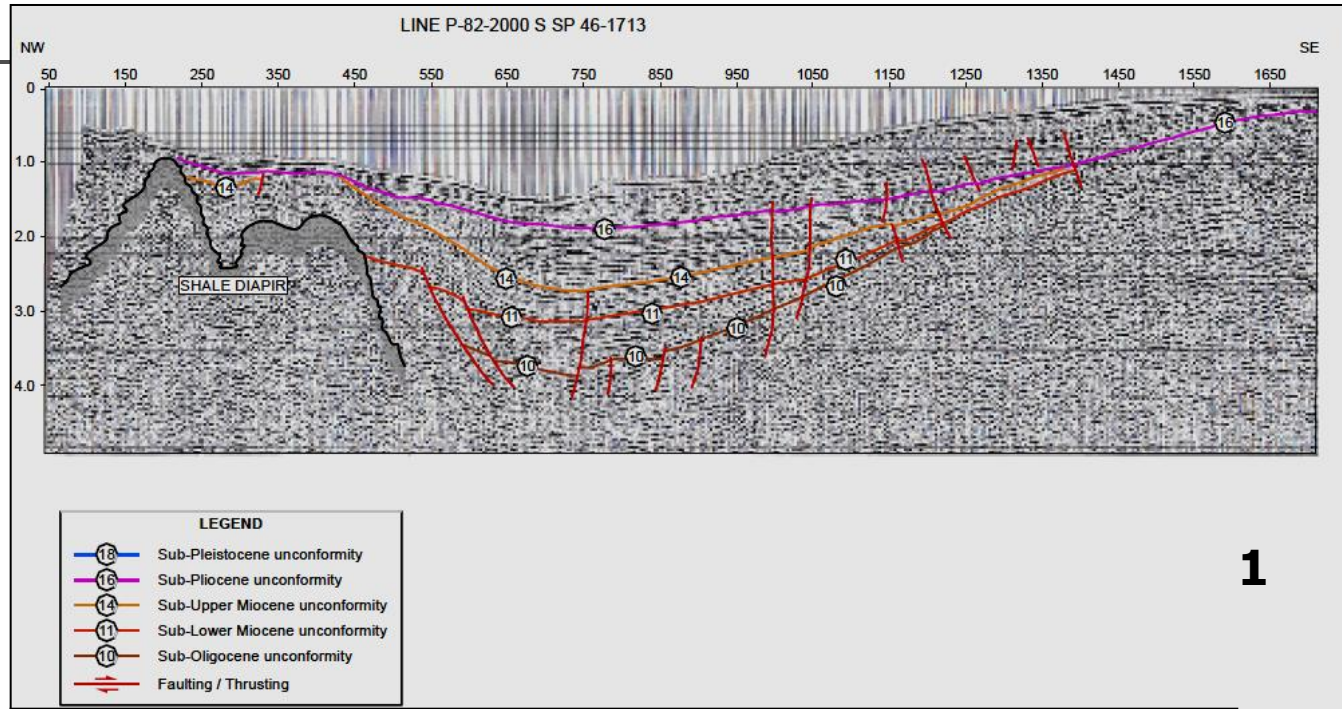
Stratigraphic chart



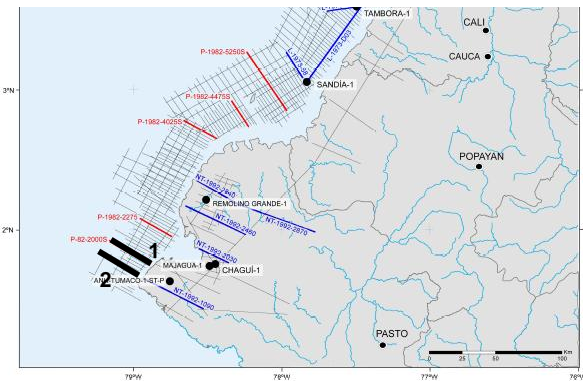
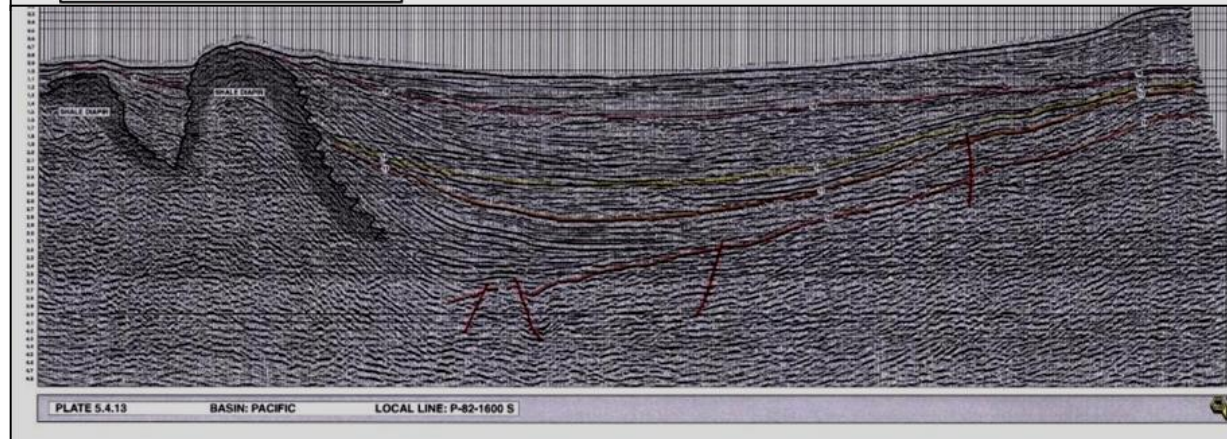
PETROLEUM SYSTEM

P? () – N (Angostura -Cayapas)

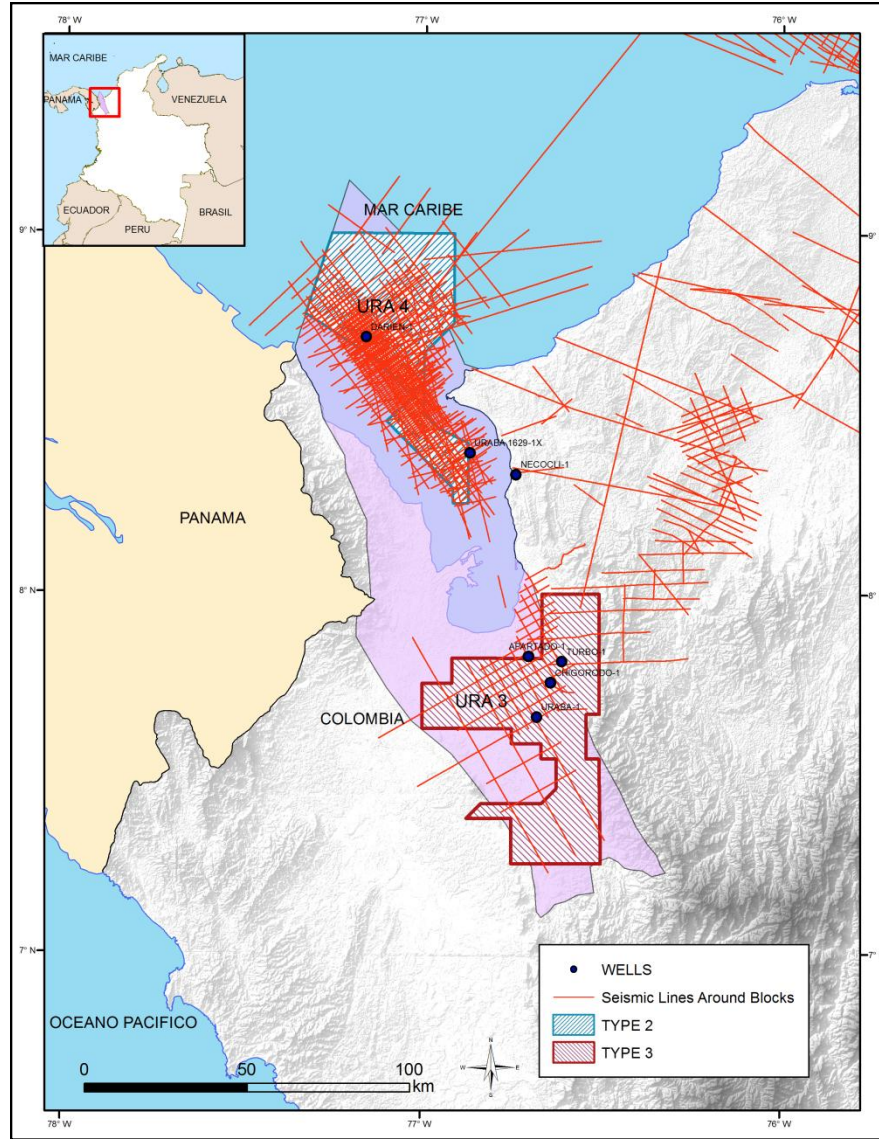
Structural Styles



1- 2 Normal faults and stratigraphic traps, diapiric structures

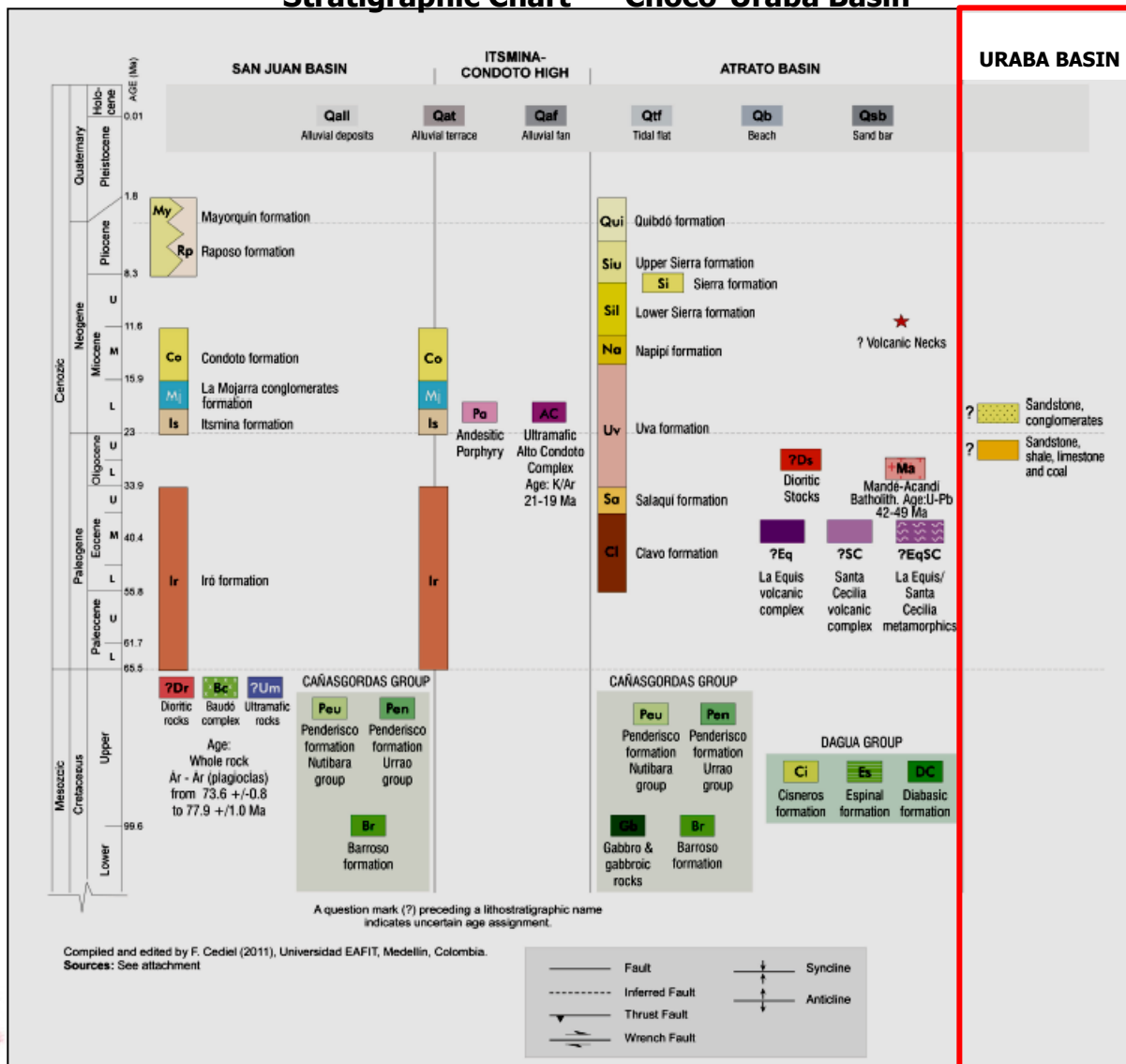


Urabá Basin (Ura)

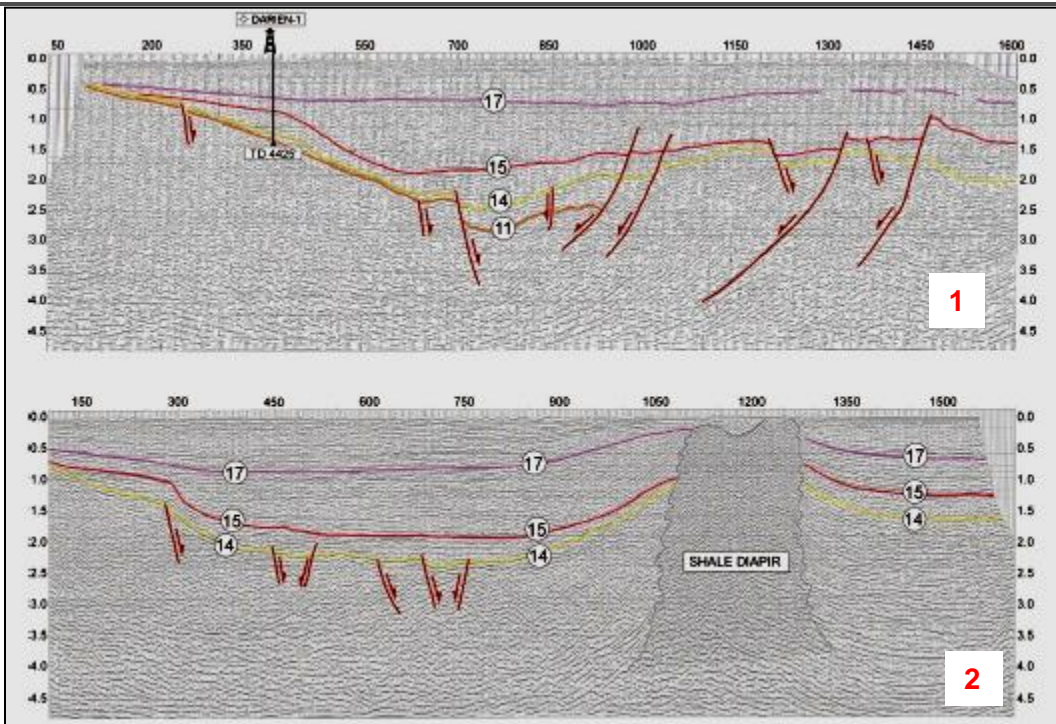


Urabá Basin (Ura)

Stratigraphic Chart – Chocó-Urabá Basin



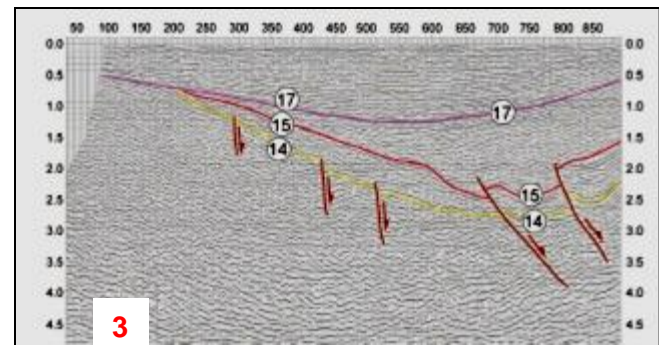
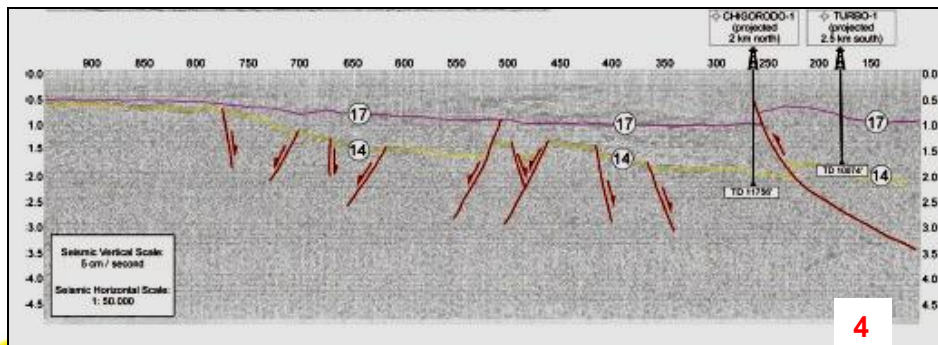
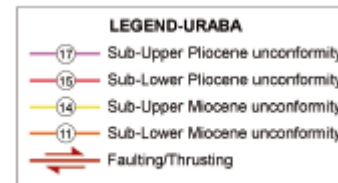
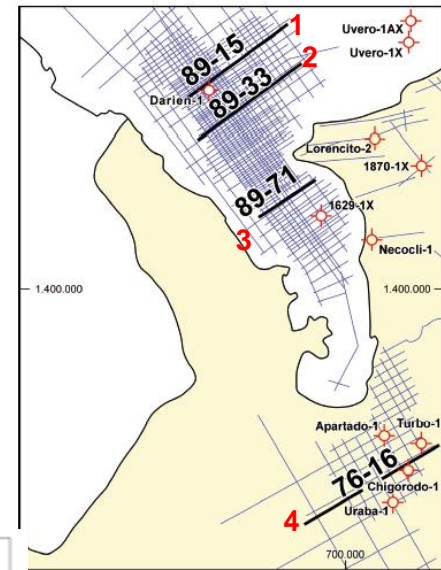
Structural Styles



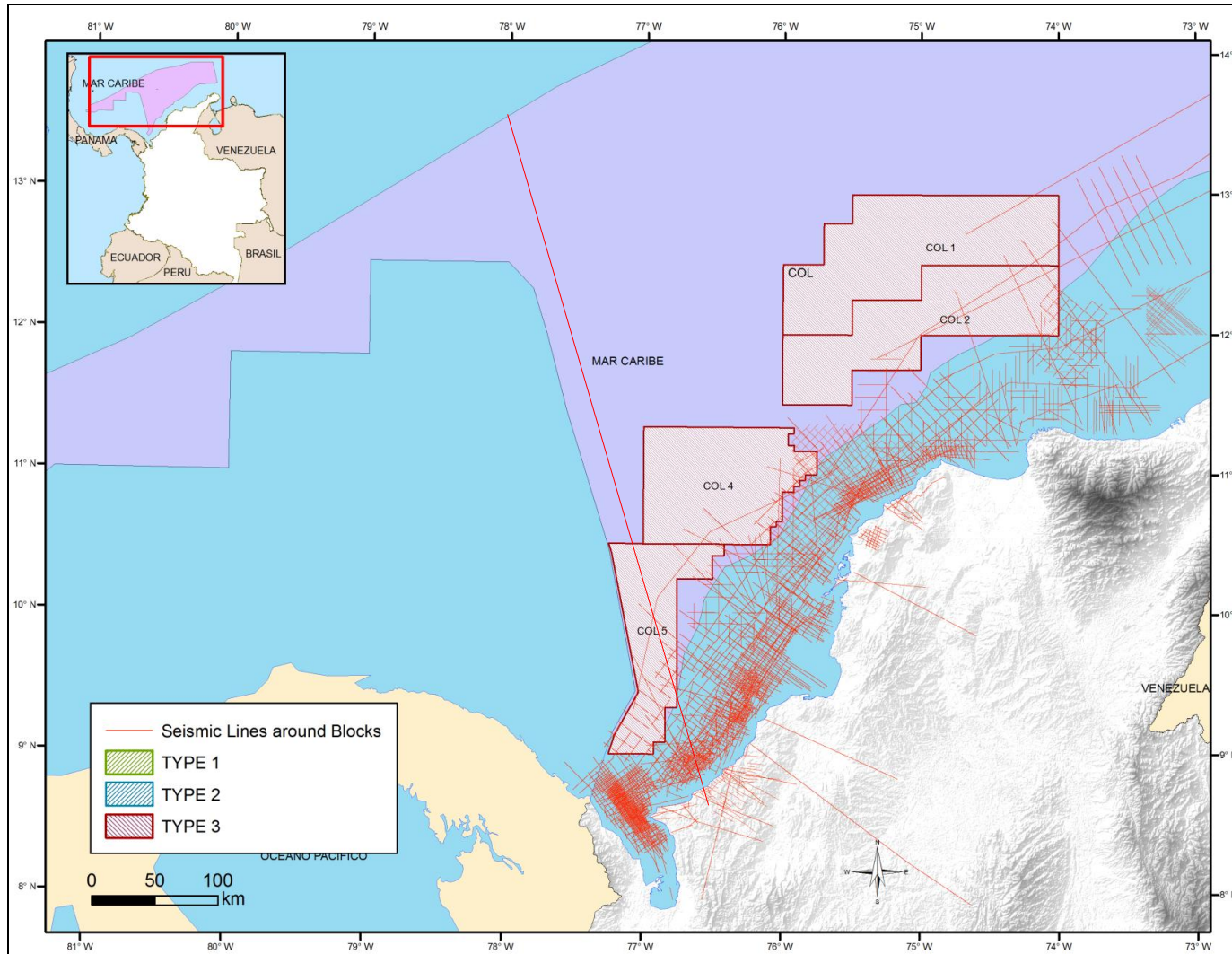
1-3 Normal fault and stratigraphic traps

2 Diapiric structures

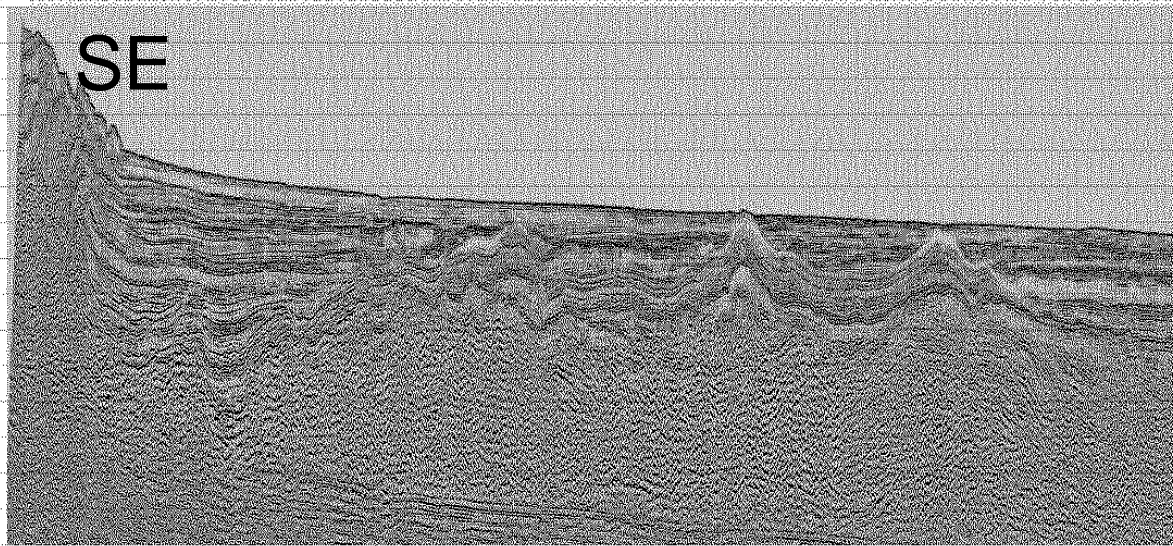
4 inversion structures



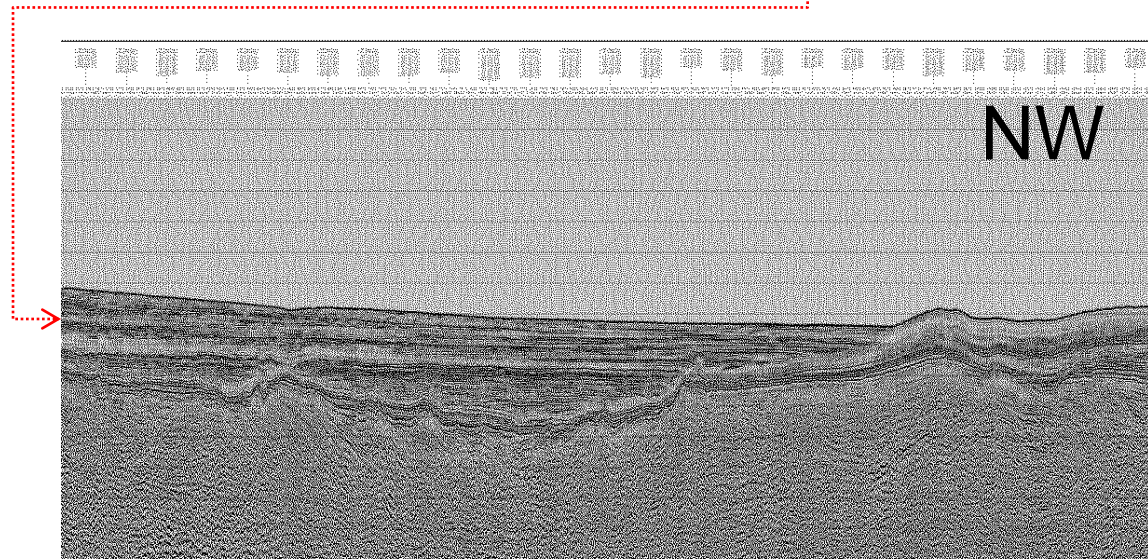
Colombia Basin (Col)



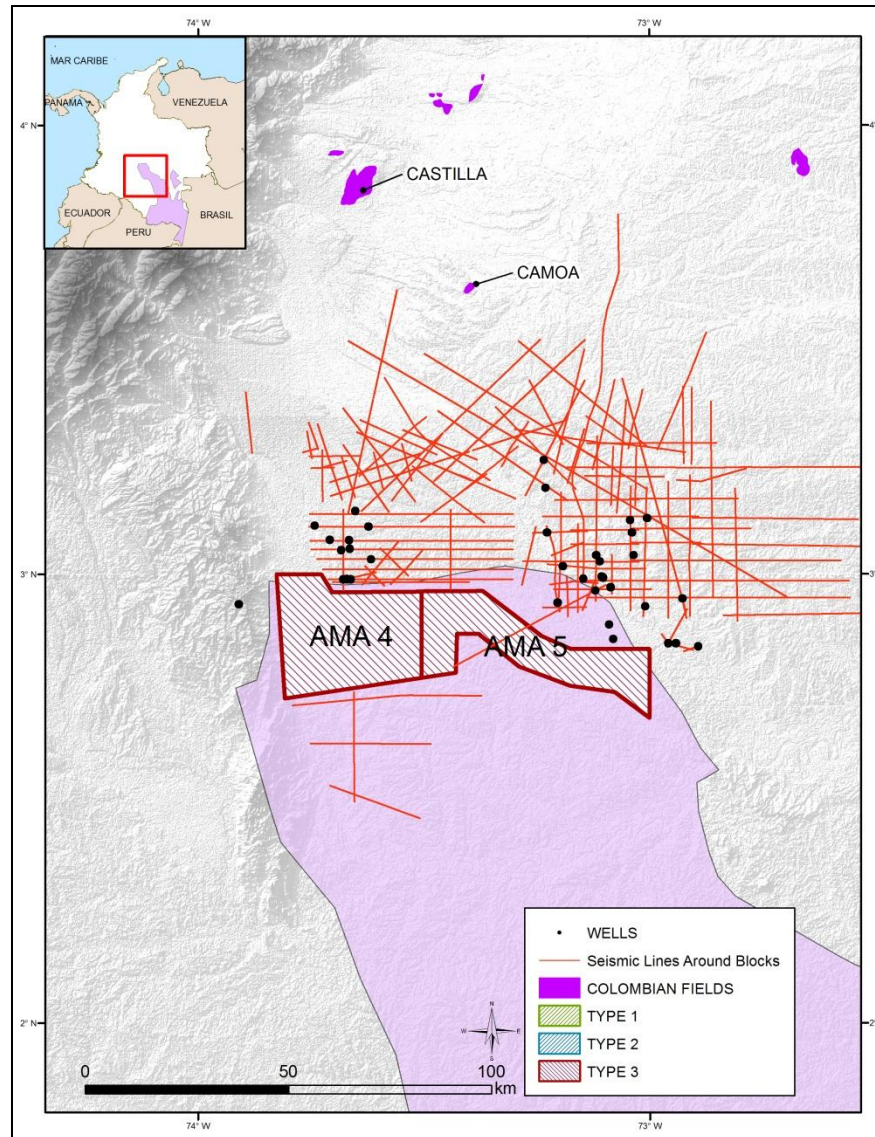
Colombia Basin (Col)



Seismic Line Colombia Basin



Vaupés-Amazonas Basin (Vau)





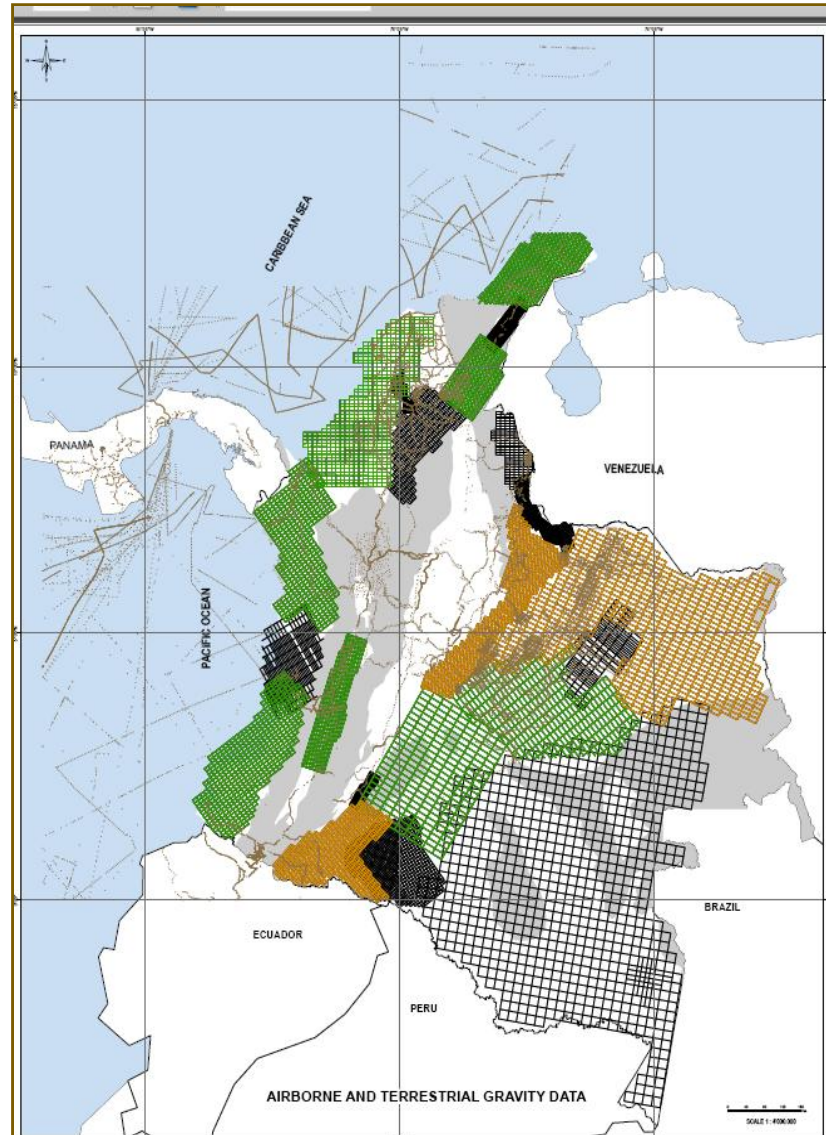
Contents



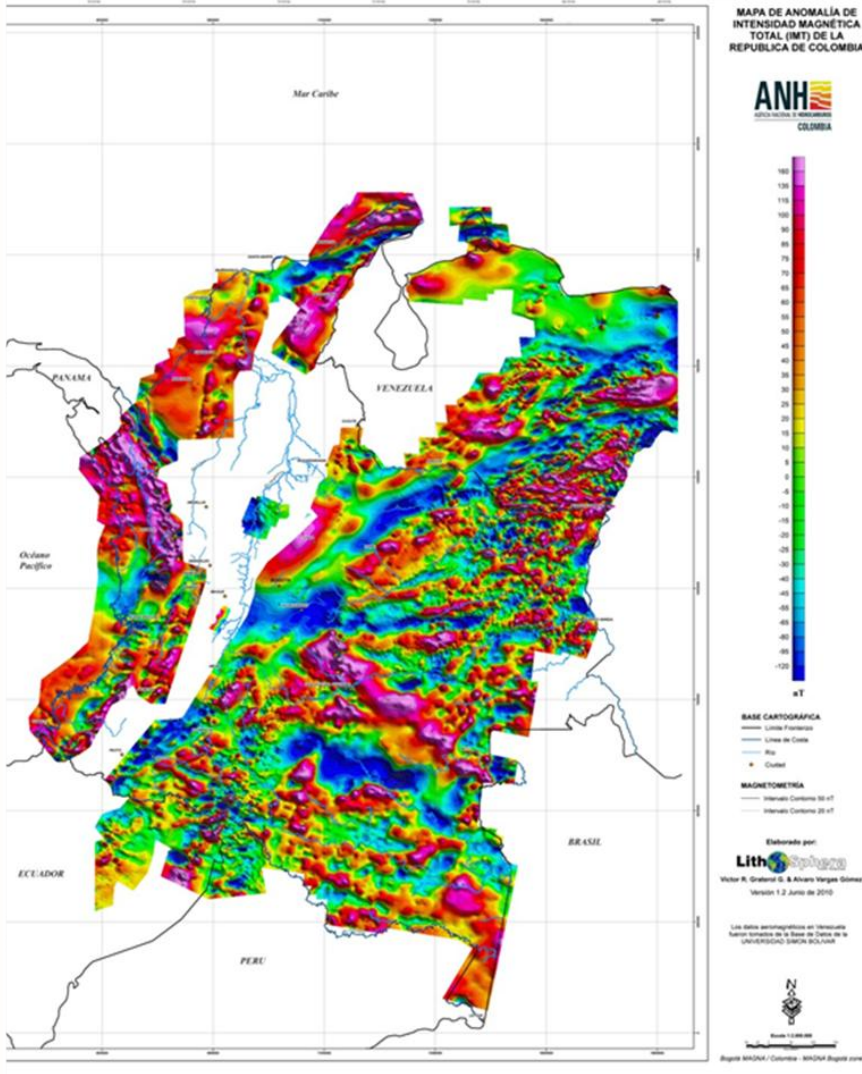
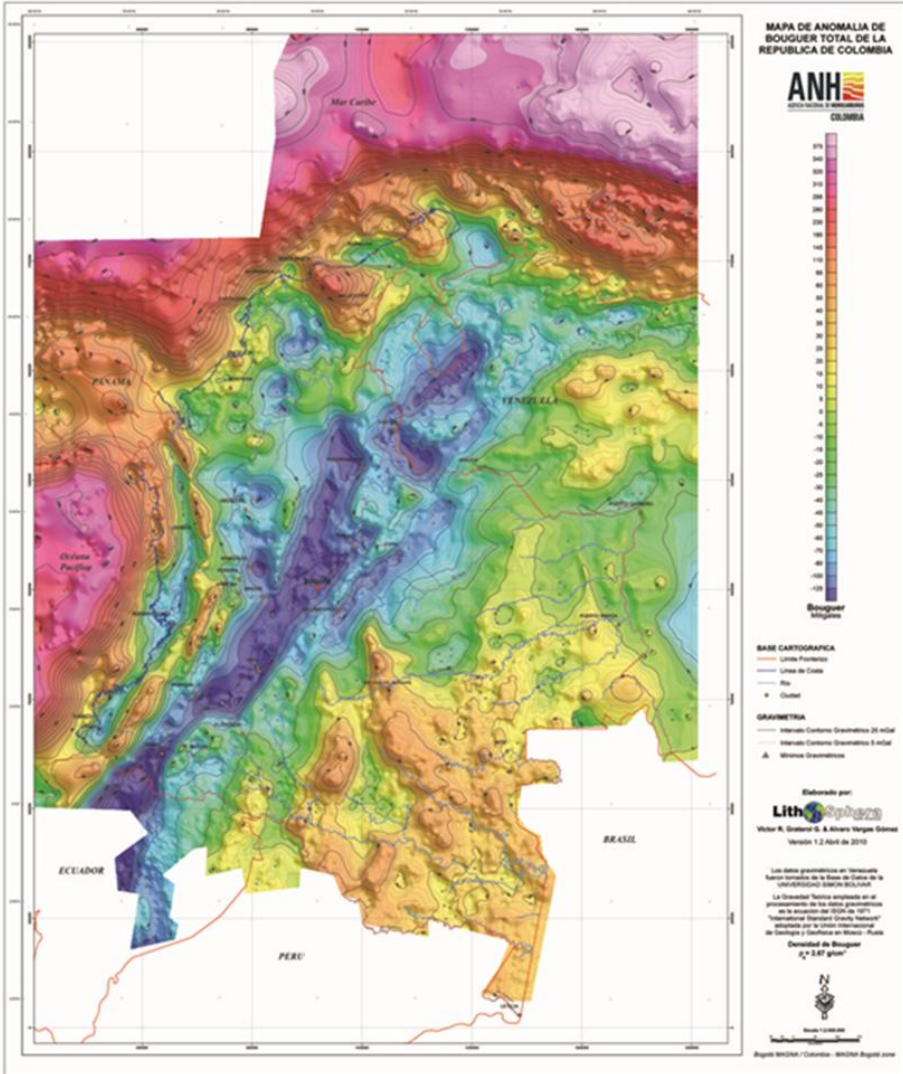
1. Introduction
2. Colombian General Geological Framework and Basins Technical Aspects
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4. Summary and Conclusions

Airborne Geophysical Coverage

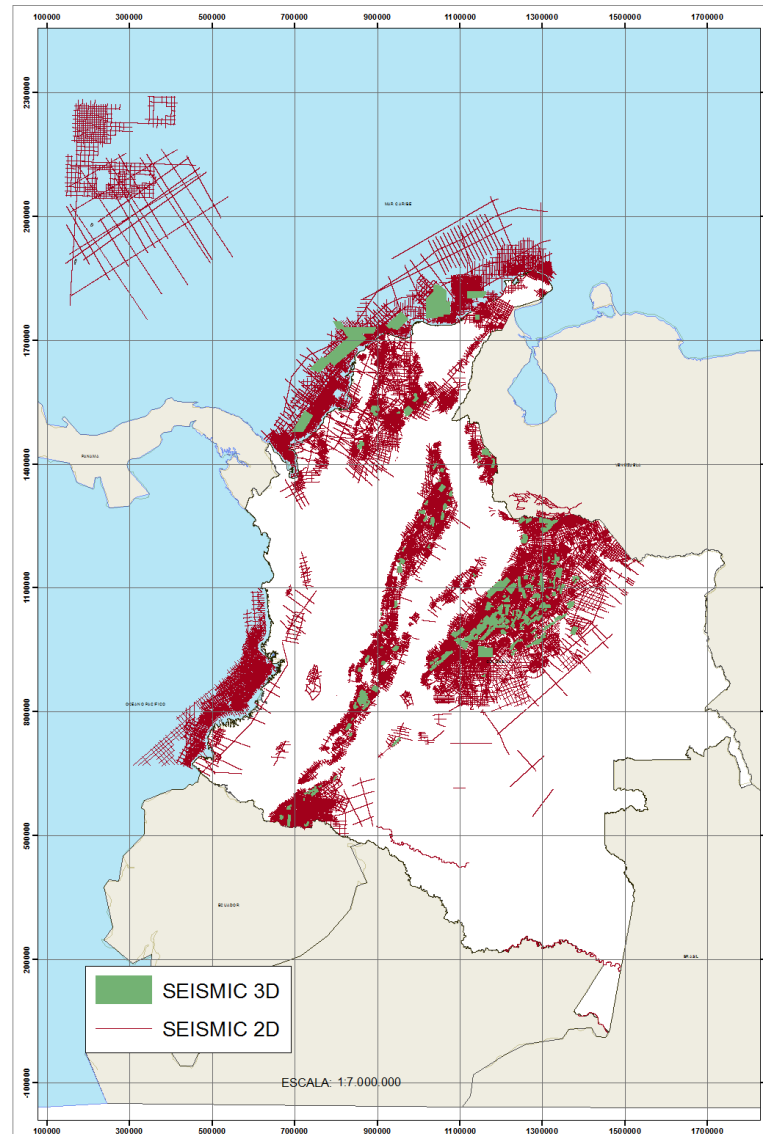
-  ANH 2005-2007
-  ANH 2008-2009



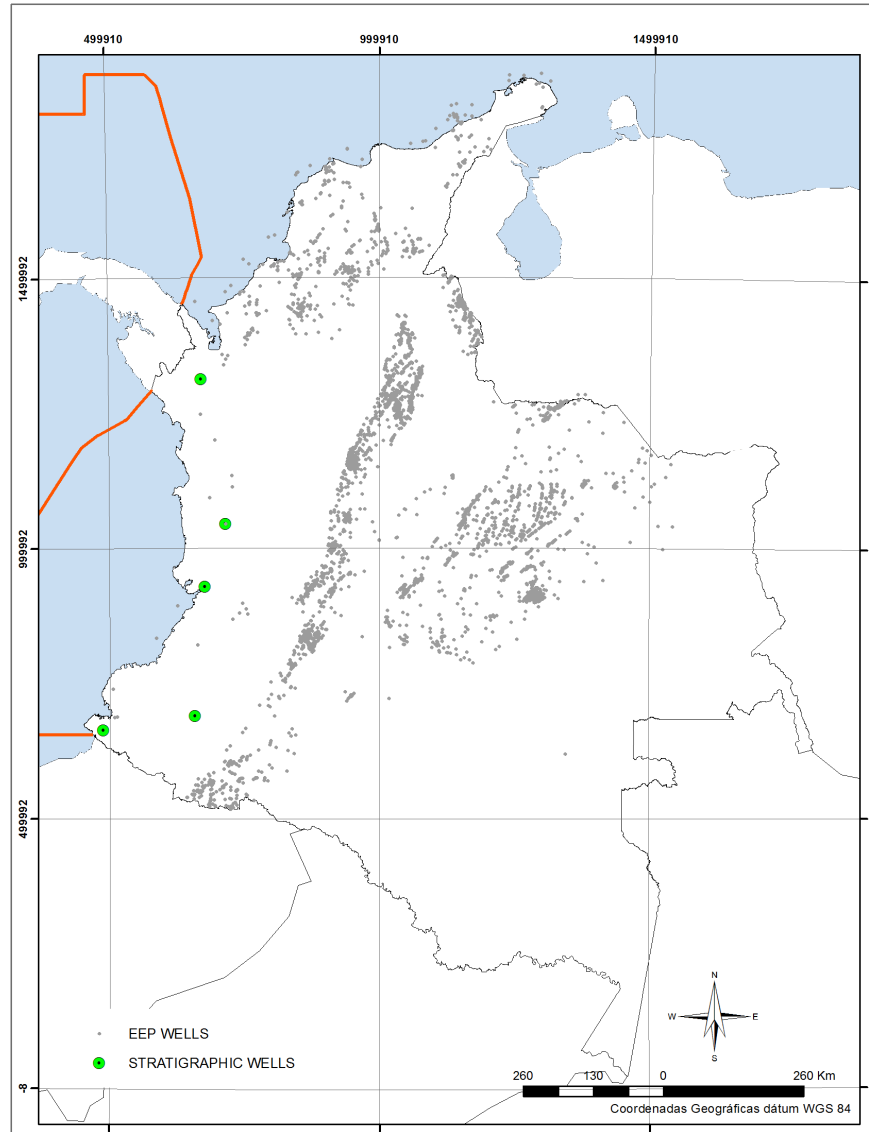
Gravity and Magnetic Anomalies Maps



2D and 3D Seismic Coverage



Exploration, Evaluation, Production and Stratigraphic Wells Map



Information Packages

CAG-PUT	27	131	1	11
CAT	13	106	0	13
COL	1	10	0	0
COR	41	201	0	8
GUA	21	187	0	6
GUA OFF	3	5	0	2
LLA	136	648	10	31
PAC-OFF	2	72	0	4
SIN OFF	4	38	0	0
SIN SJ	23	135	0	25
URA	8	126	0	4
VIM	33	170	4	36
VMM	94	561	2	79
VSM	94	601	3	66
TOTAL	504	2,996	20	285

Information Packages



<http://www.anh.gov.co/>

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Todas las preguntas y respuestas del Proceso de la Ronda Colombia 2012, se publicarán a través del Sitio web www.rondacolombia2012.com

RONDA COLOMBIA 2012, INICIATIVA ESTRATÉGICA PARA DARLE SOSTENIBILIDAD AL DESARROLLO PETROLERO DEL PAÍS
22-02-2012

MME, Bogotá D.C., febrero 21 de 2012. La Ronda Colombia 2012 que presentó oficialmente la Agencia Nacional de Hidrocarburos (ANH) en Bogotá es un paso fundamental para darle sostenibilidad al desarrollo petrolero del país, dijo este martes el ministro de Minas y Energía, Mauricio Cárdenas.

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Summary and Conclusions



Colombia has.....

- World class petroleum systems.
- Significant underexplored areas.
- Significant upside potential for unconventional hydrocarbon resources.

Therefore, there are excellent exploration opportunities, on a global scale, in **mature**, **emerging** and **frontier** basins



***New Ideas + New Technologies
+ New Licenses***

=



Significant new discoveries

