

Upper Magdalena Valley Basin
UMV BASIN



¡Explore for new
oil in an
old place!

Colombia
2005
2006

Petroleum System

■ **Hydrocarbon Evidence:** Currently, the Upper Magdalena basin is producing 18 million barrels of oil per year from 28 fields. Numerous oil seeps abound in the basin.

■ **Reservoirs:** Three main reservoirs are distributed in the basin. The Cretaceous Caballos and Monserrate formations and the Miocene Honda formation, all produce from sandstone reservoir. High reservoir potential exists in fractured carbonates.

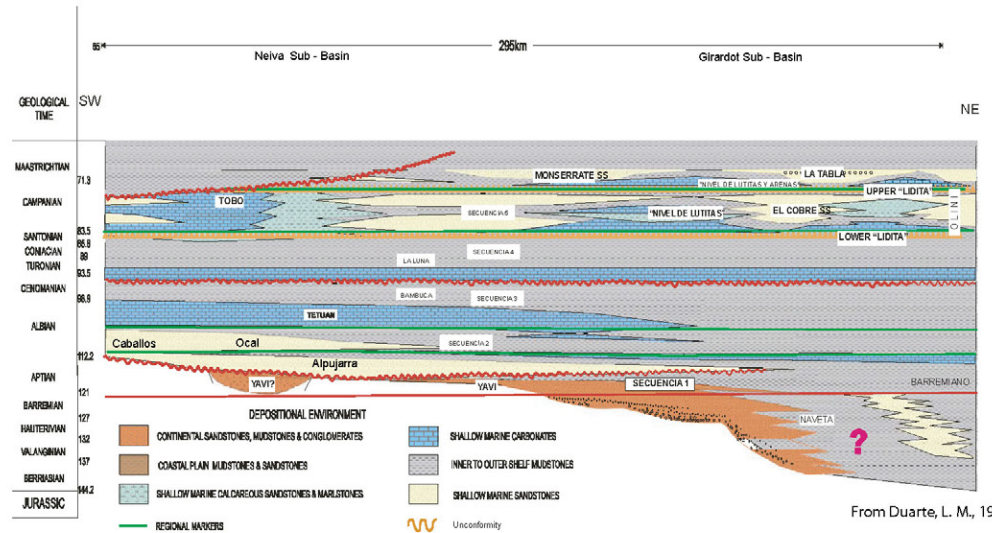
■ **Traps:** Structures like fault-bend fold anticlines, sub-thrust, sub-basement, imbricate fans, back-thrust and wrench related anticlines in both sides of the basins are all prospective. In addition, prospectivity exists in several types of stratigraphic traps. Trap formation begins in late Cretaceous and stop by late Neogene.

■ **Sources:** Two worldwide anoxic events of Middle Albian and Turonian age are the responsible for the deposition of shales and limestones, with high organic content in the Tetuan, Bambuca and La Luna formations. The predominant Kerogen is type II.

■ **Seals:** Top and lateral seals are provided by a very thick sequence of plastic claystone of the Bambuca, Guaduala and Honda formations of Cretaceous and Neogene age. Preservation is good for the Caballos sandstone, but fair for Monserrate reservoir.

■ **Migration and timing:** Migration starts soon after the first contractional event of Paleogene age and continues up to date.

Chronostratigraphic Chart



From Duarte, L. M., 1998

Petroleum System

PERIOD	FORMATIONS	LITOSTRATIGRAPHY	LITHOLOGY	PETROLEUM SYSTEM	PALEO-ENVIRONMENT	MAIN FIELDS
NEOGENE	Quaternary	Terraces, Aluvial Fans			Aluvial Lahar	
	Pliocene	Guacacallo Fm., Lajar de Altamira and other Units				
	Miocene	Gigante Fm. (Mesa)				
PALEOGENE		Honda Group	Villavieja Fm. La Victoria Fm.	(R) (B)	Fluvial	Rio Ceibas Andalucia
	Late Oligocene	Barzalosa Fm.			Lacustrine	
	Late to Mid. Eocene	Gualanday Group	Doima Fm. Potrerillo Fm. Chicoral Fm.	(R) ?	Aluvial to Fluvial	
	Paleocene to Early Eocene	Guaduala Fm. / Group (Guaduas)	Teruel Fm. San Francisco Fm.	(S)	Fluvial to coastal Plane	
	CRETACEOUS	Maastrichtian	Monserrate / La Tabla / Tobo		(R)	Shallow Marine
Campanian		Olina Group	Upper Shale Shale Level / Arenisca el Cobre Lower Chert	(R)	Platform to Marine	
Santonian		Villeta Group	La Luna		Netic	
Coniacian			Bambuca			
Turonian			Tetuan			
Cenomanian						
Late Albian			Caballos Fm.			Yaguara San Francisco Balcon
Mid. Aptian?-Mid. Albian						
Early Aptian (Barremian)		Yavi Fm.		(R) (S)	Shallow Marine Fluvial Estuarine	
		Pre-Cretaceous Basement (Saldaña Fm.)		(B) ?	Fluvial to Aluvial	
Economical Basement						

LITHOLOGY

- Sandstones
- Dark Gray Shales
- Siliceous Shales
- Light Gray Shales
- Marl
- Limestones
- Red And Vanicolor Shales
- Vulcanics

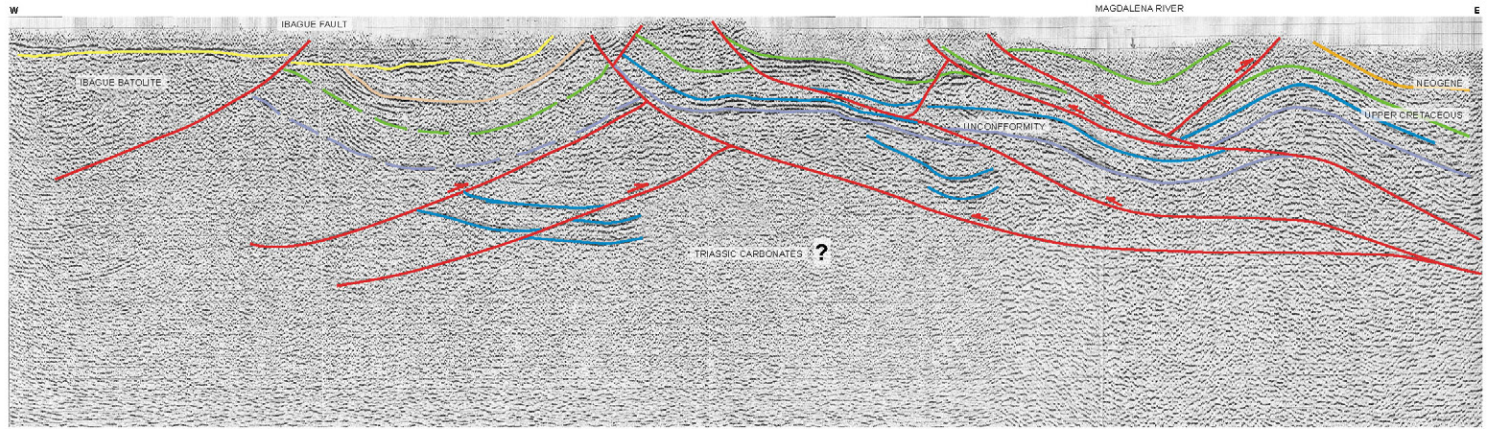
PETROLEUM SYSTEM

- (R) Main Reservoirs
- (S) Main Seals
- (B) Secondary Reservoirs, Seal And Sources
- (S) Main Sources

From Mora, J.A., 2003

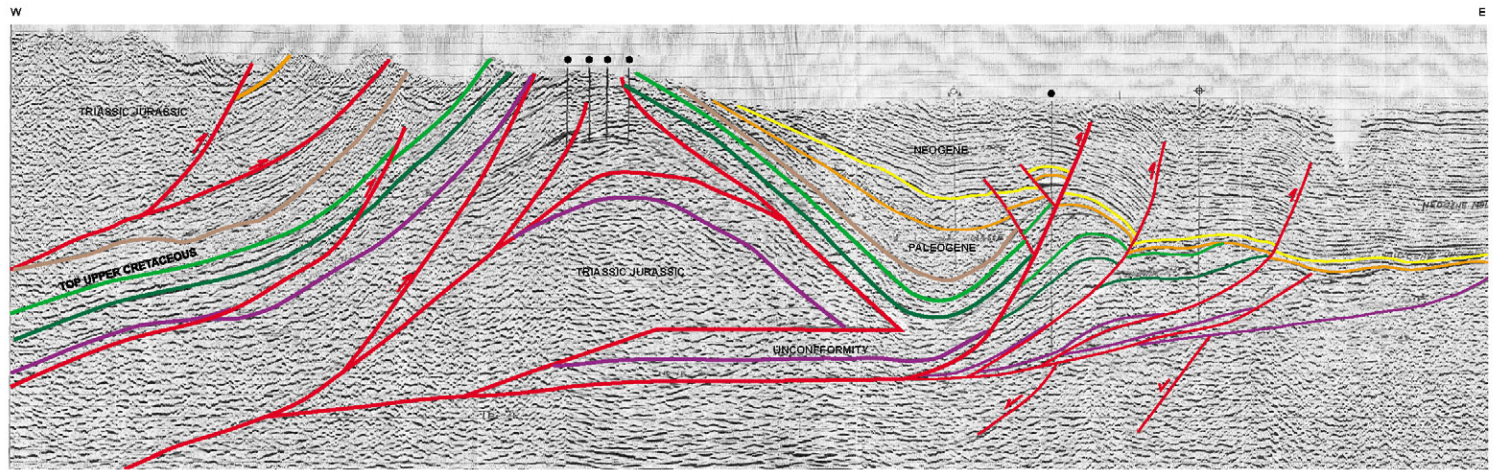
Seismic Expression of Prospective Traps

Line 1 SUB-THRUST AND THRUST ANTICLINES



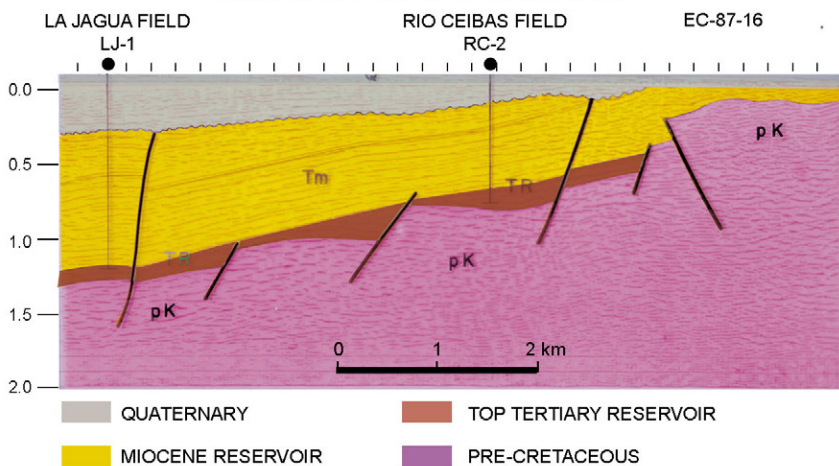
From Seismic Atlas, 1998

Line 4 FAULT-BEND FOLD AND IMBRICATE FANS



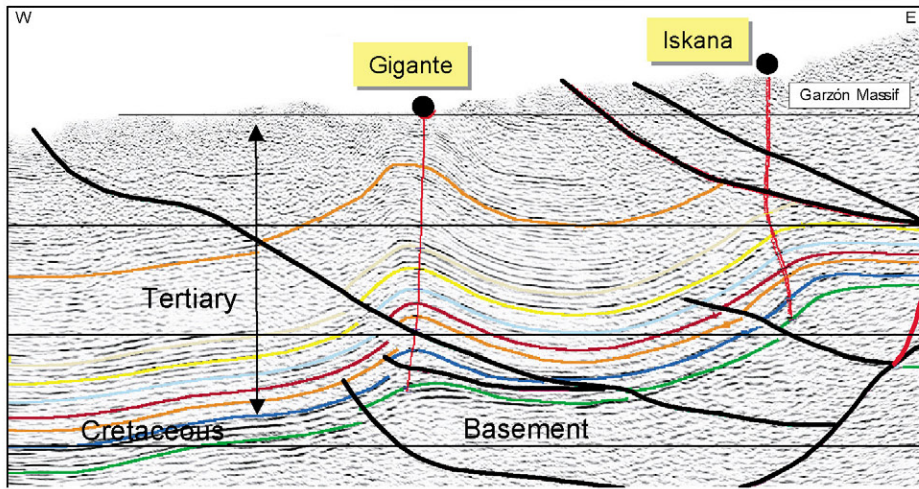
From Seismic Atlas, 1998

Line 5 INVERSION AND BASEMENT HIGH



From Barrero, 1998

Line 6
SUB-BASEMENT TRAP

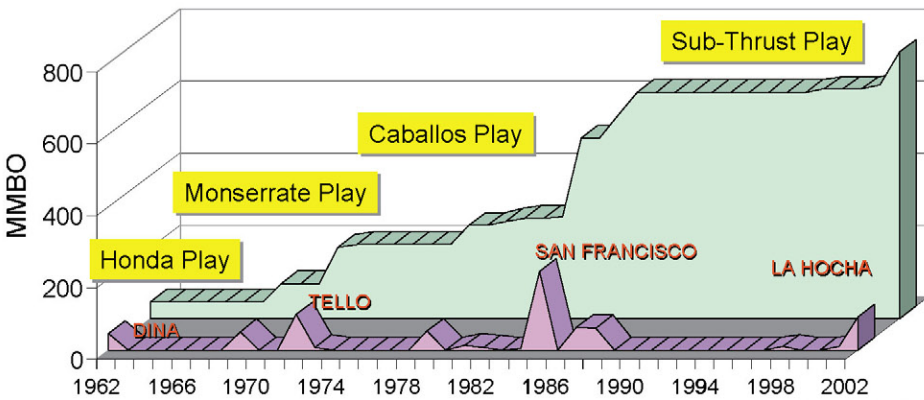


From Maceralli et al., 2003

Prospectivity

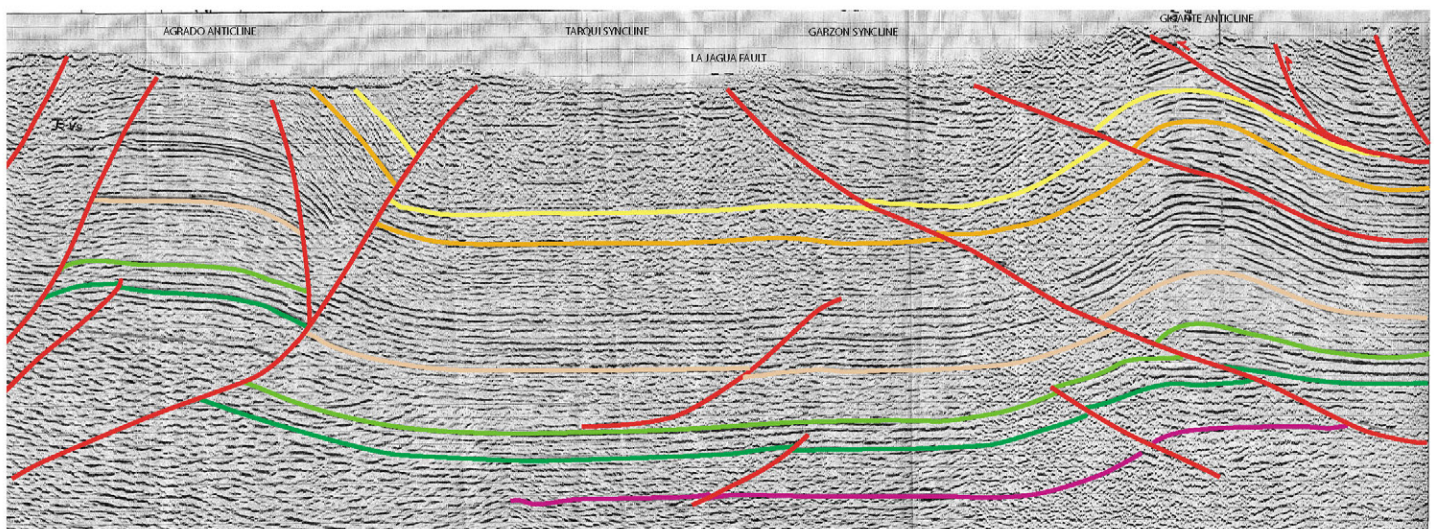
During the last two decades the basin has been actively explored for hydrocarbons. However, it is believed that important oil reserves remain trapped in stratigraphic and sub-thrust plays. The addition of new reserves will be linked to the development of new and maybe unconventional play concepts. More than 546 MMBO reserves have been found to date in 28 oil fields.

RESERVES INCREASE BY PLAY CONCEPT



From Maceralli et al., 1998

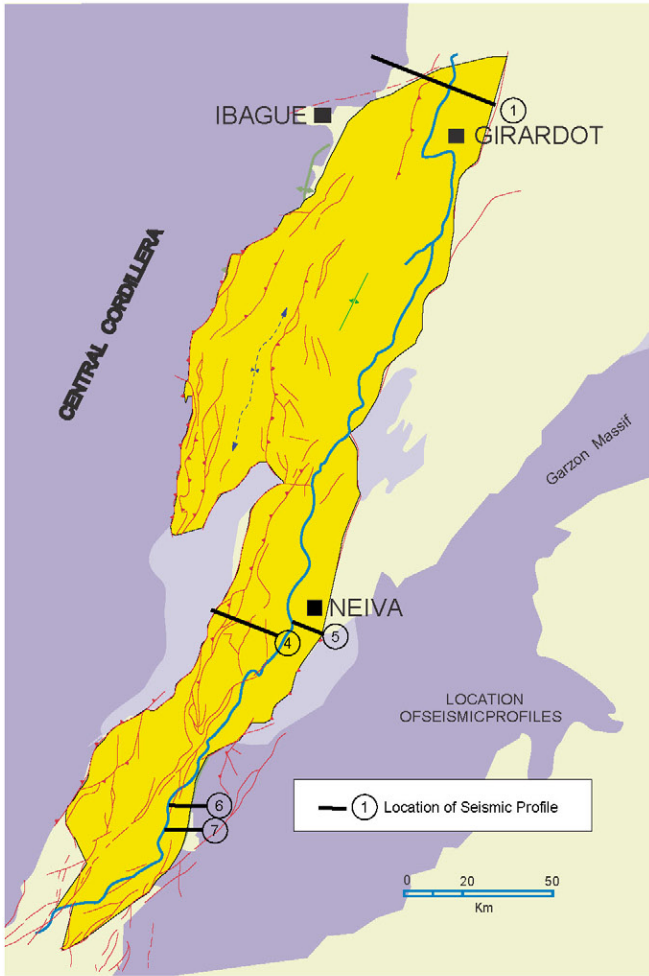
Line 7
SUB-THRUST ANTICLINAL TRAPS



From Seismic Atlas, 1998

Note: For information about lines 2 and 3, please go to poster or CD Rom.

Major Structural Trends



Basin Location and Evolution

The Upper Magdalena valley basin of

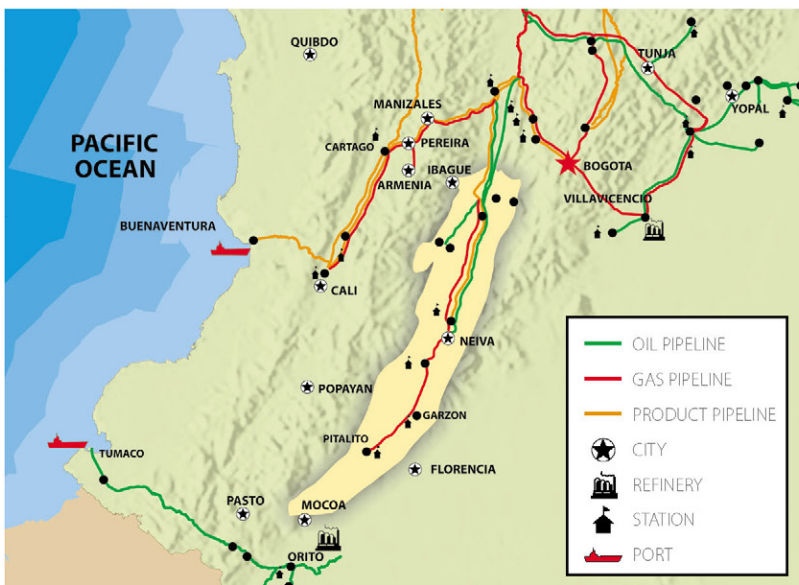
Colombia is a Neogene Intramontane basin that evolved from a larger collision-related paleogene foreland basin which extend to the east as far as the Guiana shield. The basin has an areal extent of about 26,200 km² (6,474,000 acres). It is bounded on both sides by Precambrian to Jurassic basement uplifts that define the flanks of the Eastern and Central Cordillera.

The basin contains a Cretaceous sequence that starts with continental deposits followed by a transgressive sequence composed of shales and limestones (Ocal formation) followed by a sandstone unit (The Caballos formation) which is one of the main reservoirs in the basin. These units are followed by a sequence of limestones (Tetuan formation), shales (Bambuca) and cherts of Albian to Campanian age. Two levels of organic rich source rocks of middle Albian and Turonian age provide the source of hydrocarbons for all accumulations in the basin (Villeta Group).

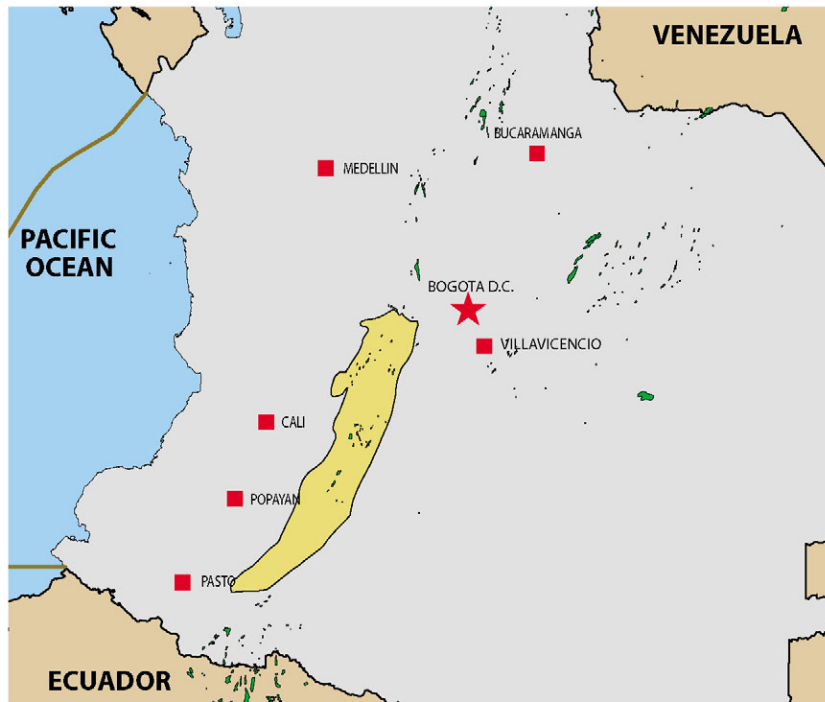
This sequence is overlain by the Campanian to Maastrichtian Monserrate formation composed mainly of sandstones. This unit, is also an important hydrocarbon reservoir.

The Tertiary sequence, deposited during the two collisional events that built the present day sedimentary basins in Colombia, is entirely non-marine and contains the Paleogene and Neogene molasses..

Infrastructure



Basin Location



HIGHLIGHTS

Total Basin Area **26,200 km² - 6,474,000 acres**

Discovered Oil Reserves **631 MBO**

Discovered Gas Reserves **123 GCFG**

Wildcats **210**

Discovered Fields **36**

Coverage **124 km²/well**

Produced by Geoconsult Ltda

Manager: Nelson Álvarez

Technical Director: Darío Barrero

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

Petroleum Engineer: Yolanda Ojeda

Design Mantis Estudio

Cover Picture
Ecopetrol S.A.



Agencia Nacional de Hidrocarburos
República de Colombia

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Upper Magdalena Valley Basin UMV Basin

Broken Foreland

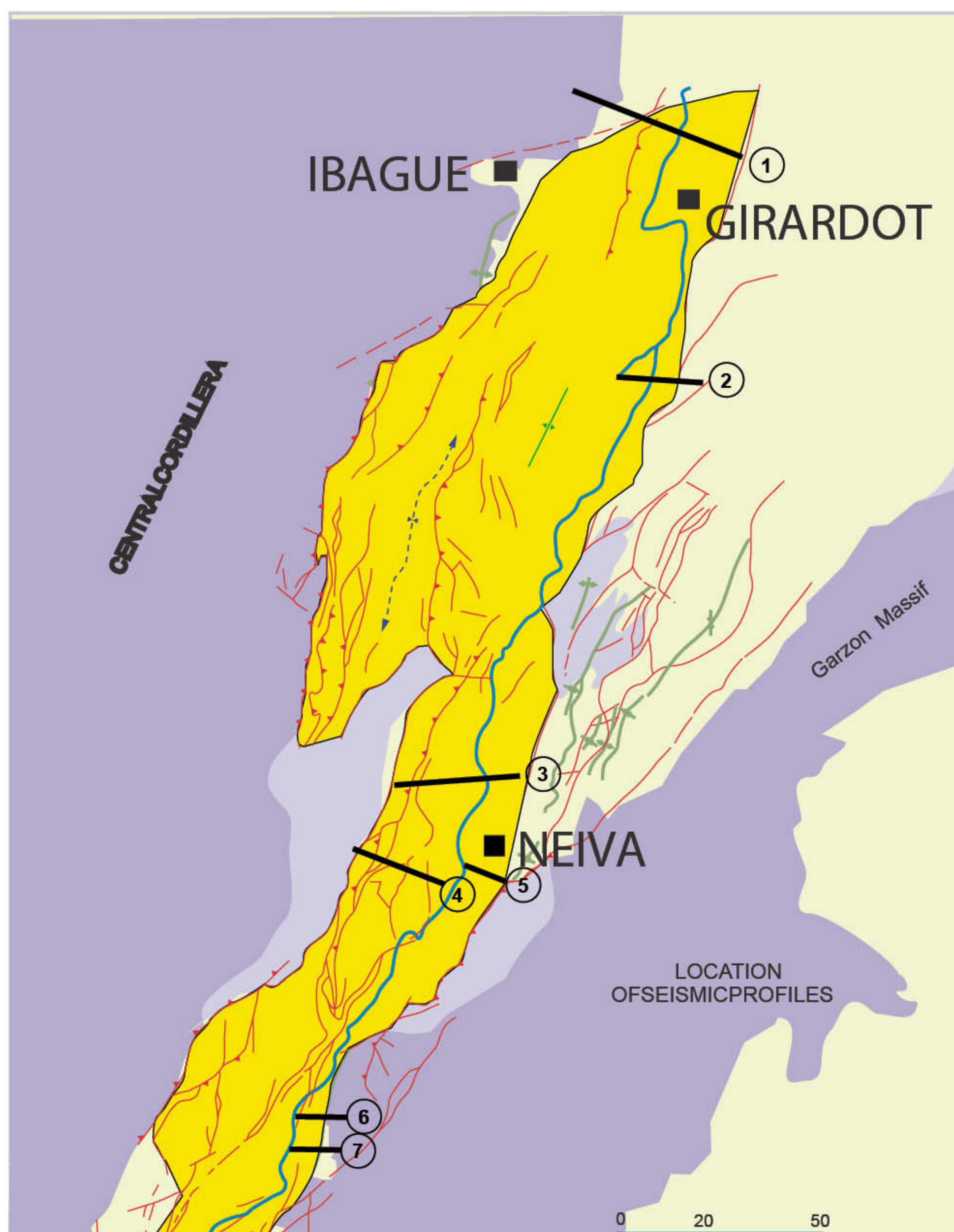
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PACIFIC OCEAN

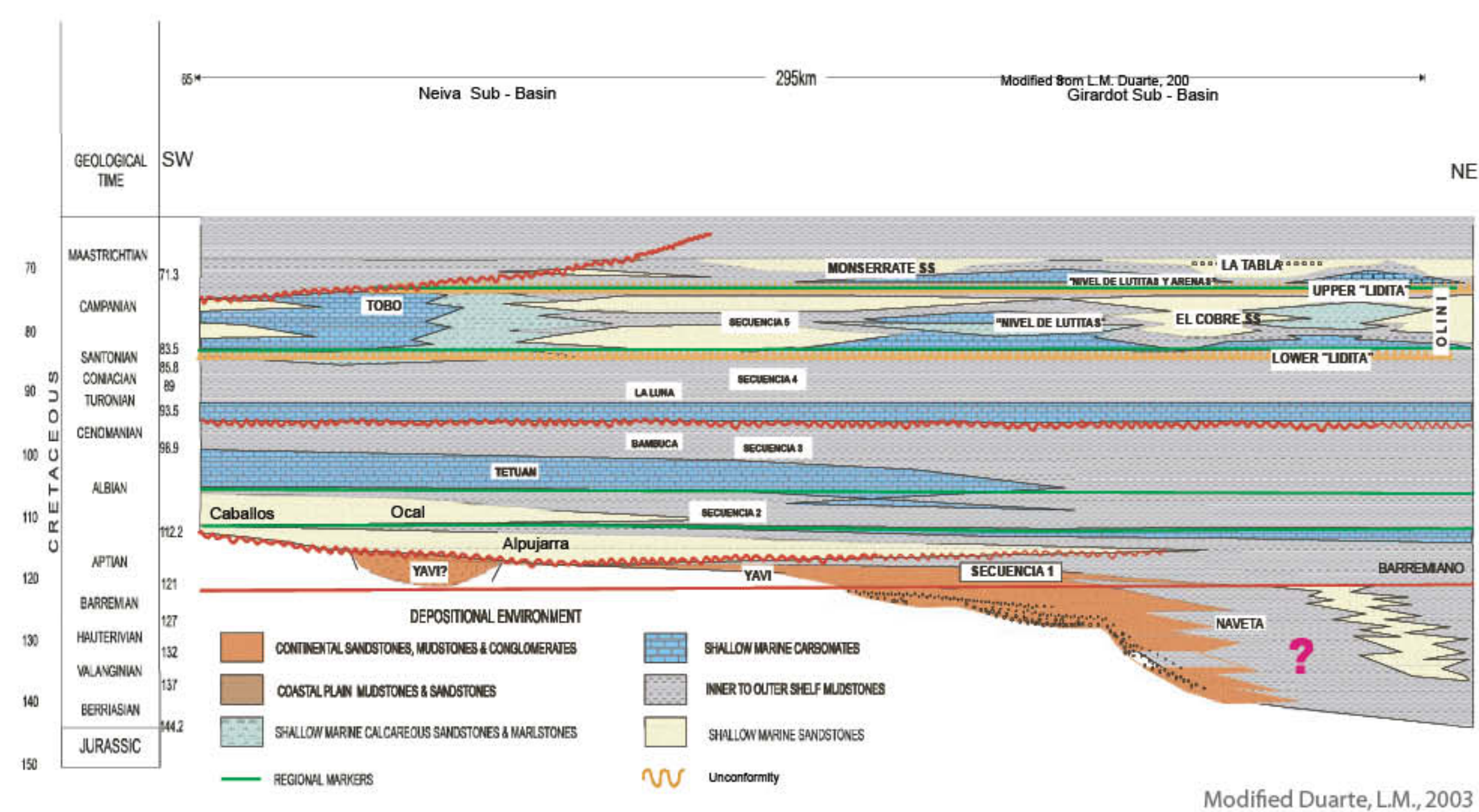


Geological Map

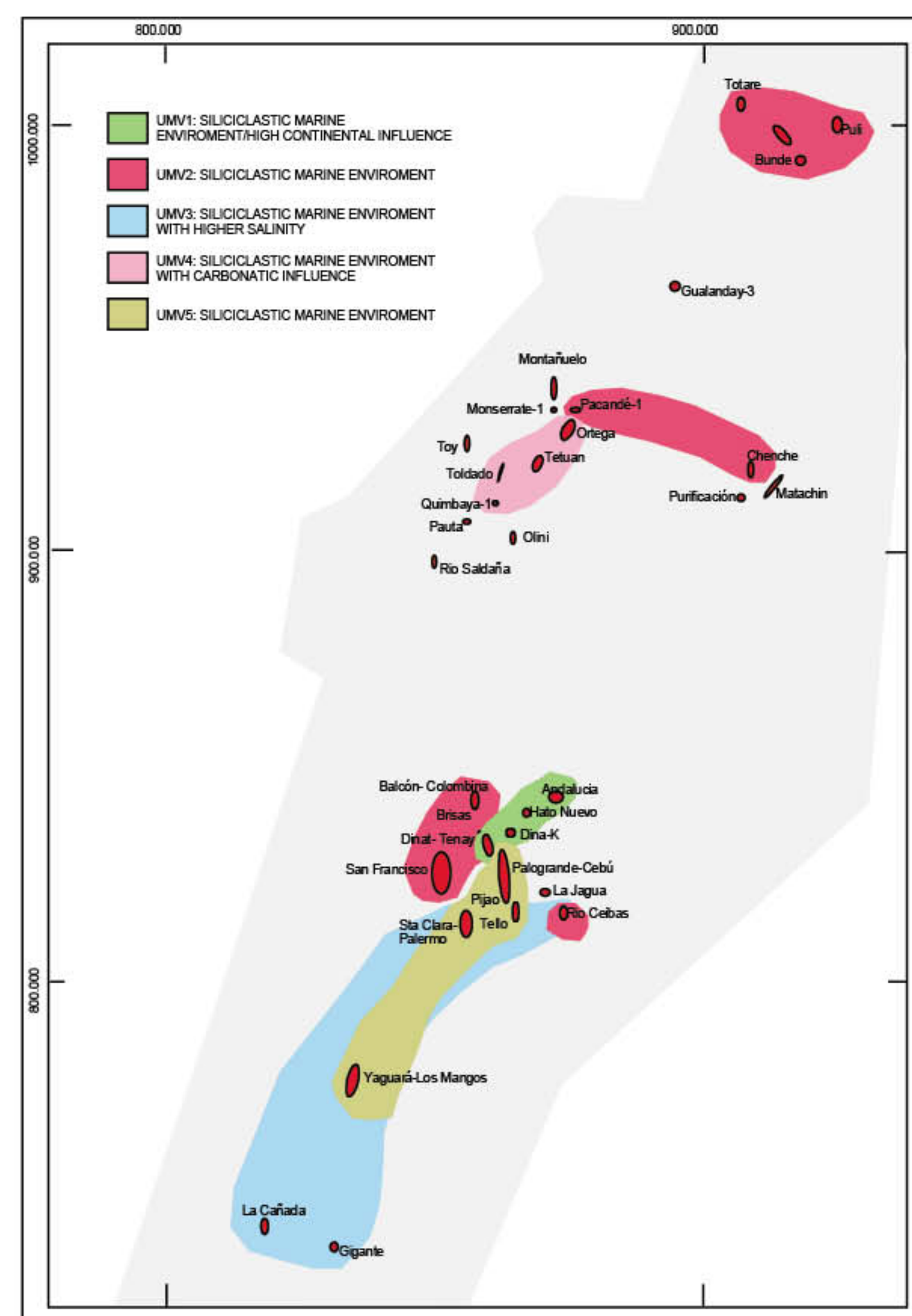
Main Structural Trends



Chronostratigraphic Chart



Oils Families



Highlights

Area	26,200 km ² 6,474,000 acres
Discovered Oil Reserves	631 MBO
Discovered Gas Reserves	123 GCFG
Wildcats	210
Discovered Fields	36
Coverage	124 km ² /well

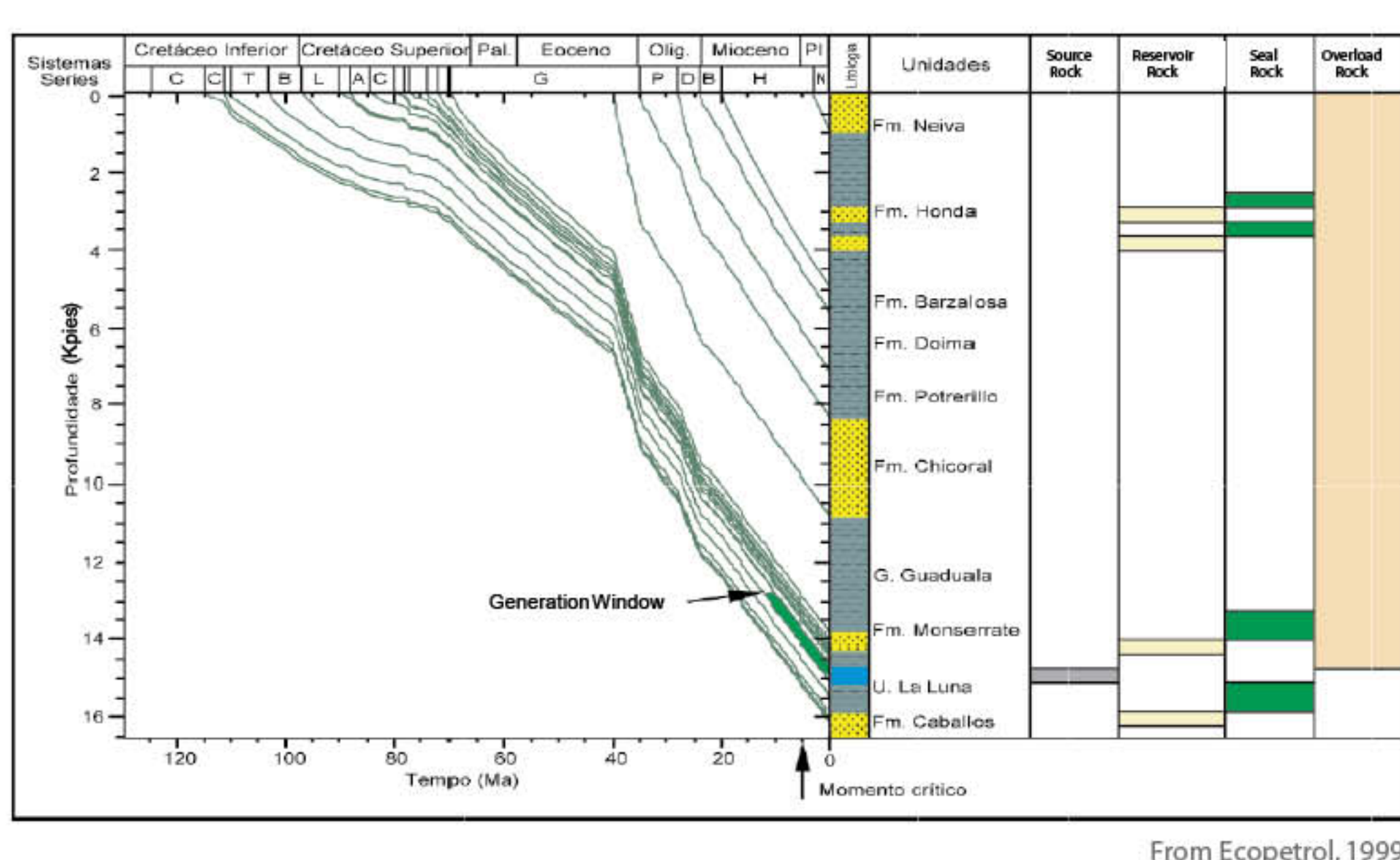
Petroleum System

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	Miocene	Honda Group Vilavega Fm. La Victoria Fm.			Fluvial	Rio Ceballos Andalucia
PALEOGENE	Late Oligocene Late to Mid. Eocene	Barzalosa Fm. Guadalupe Group Doña Fm. Potrerillo Fm. Chicoral Fm.			Lacustrine Alluvial to Fluvial	
	Paleocene to Early Eocene	Guadalupe Fm. / Group (Guadalupe) San Francisco Fm.			Fluvial to coastal Plane	
CRETACEOUS	Maastrichtian	Monserate / La Tabla / Tobo "Shale And Sands Level"			Shallow Marine	Dina-K Toto Cebu
	Campanian	Olimi Group Upper Shale Shale Level Azuarcas el Cobre			Platform to Fluvial	
	Santonian	Lower Chert				
	Turonian	Villeta Group La Luna			Nearctic	
	Cenomanian	Bambuca				
	Late Albian Mid Albian? - Early Albian Early Aptian (Chertian)	Caballos Fm. Yavi Fm.			Shallow Marine Fluvial Estuaries Fluvial to Marine	Yaguari San Francisco Bacon
Pre-Cretaceous Basement (Saldalía Fm.)					Economical Basement	

From Mora, J.A., 2003

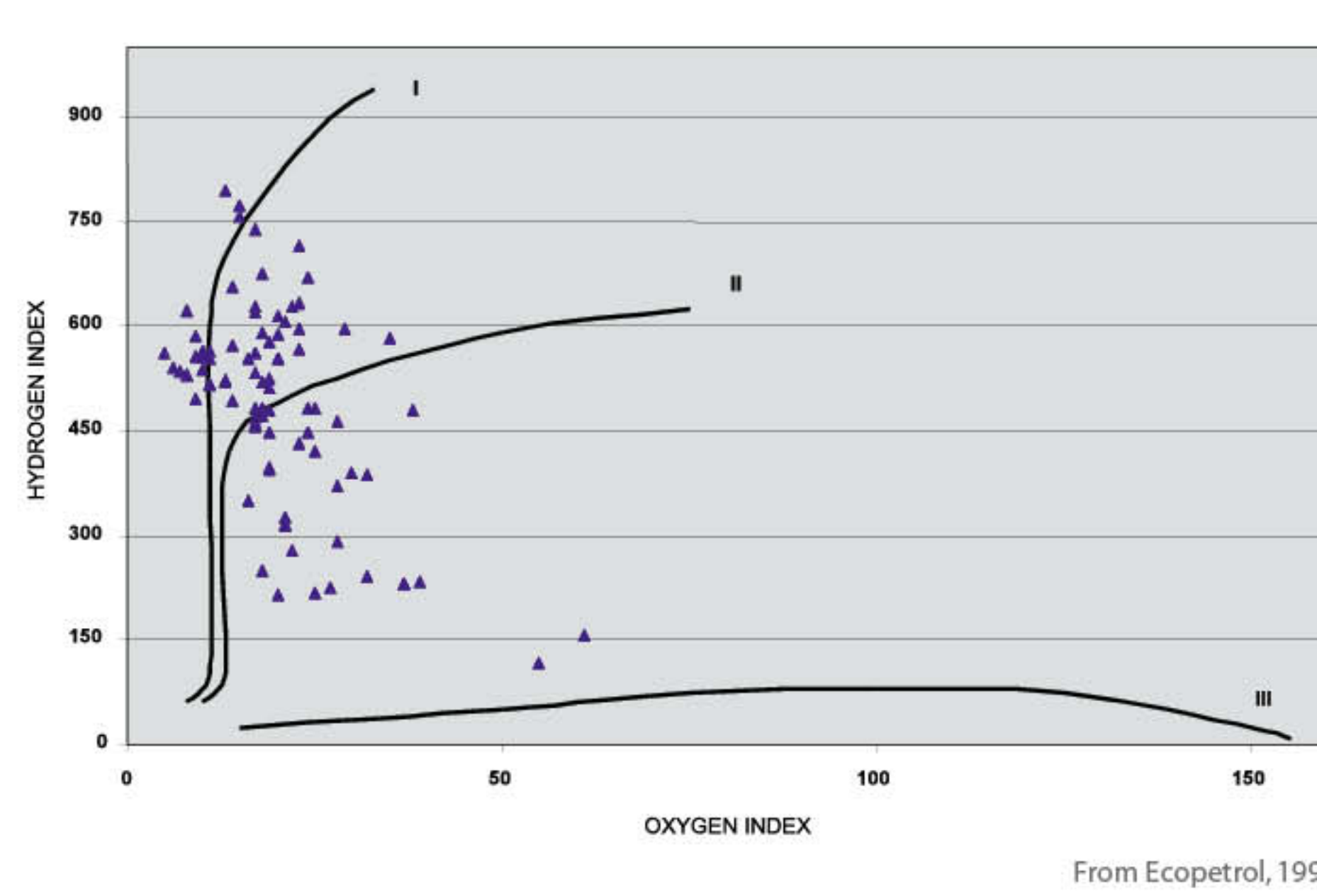
Geochemical Data

Burial History Diagram La Luna Limestones



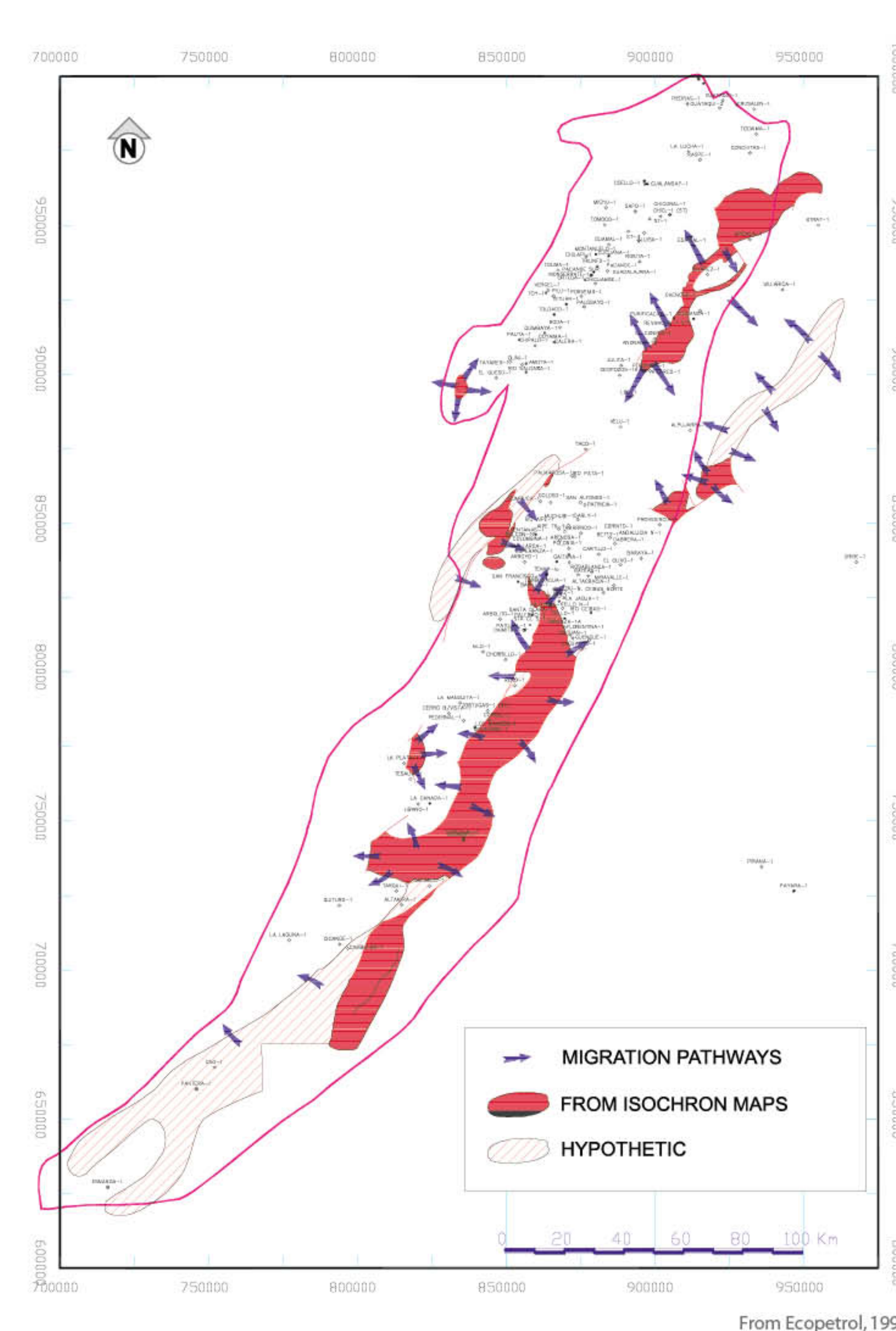
From Ecopetrol, 1999

La Luna Limestones Kerogen Type



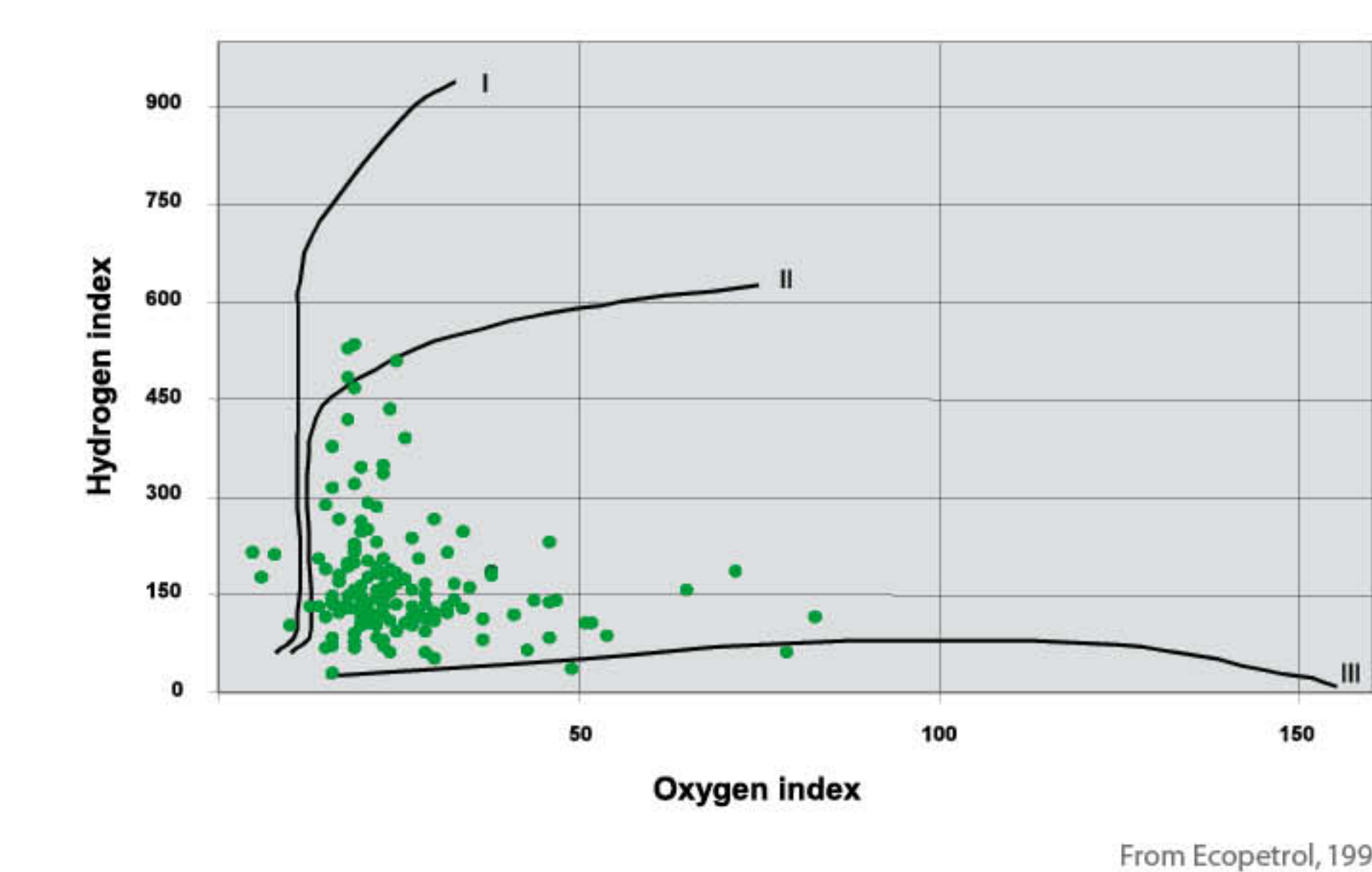
From Ecopetrol, 1999

Generation PODS and Migration Pathways



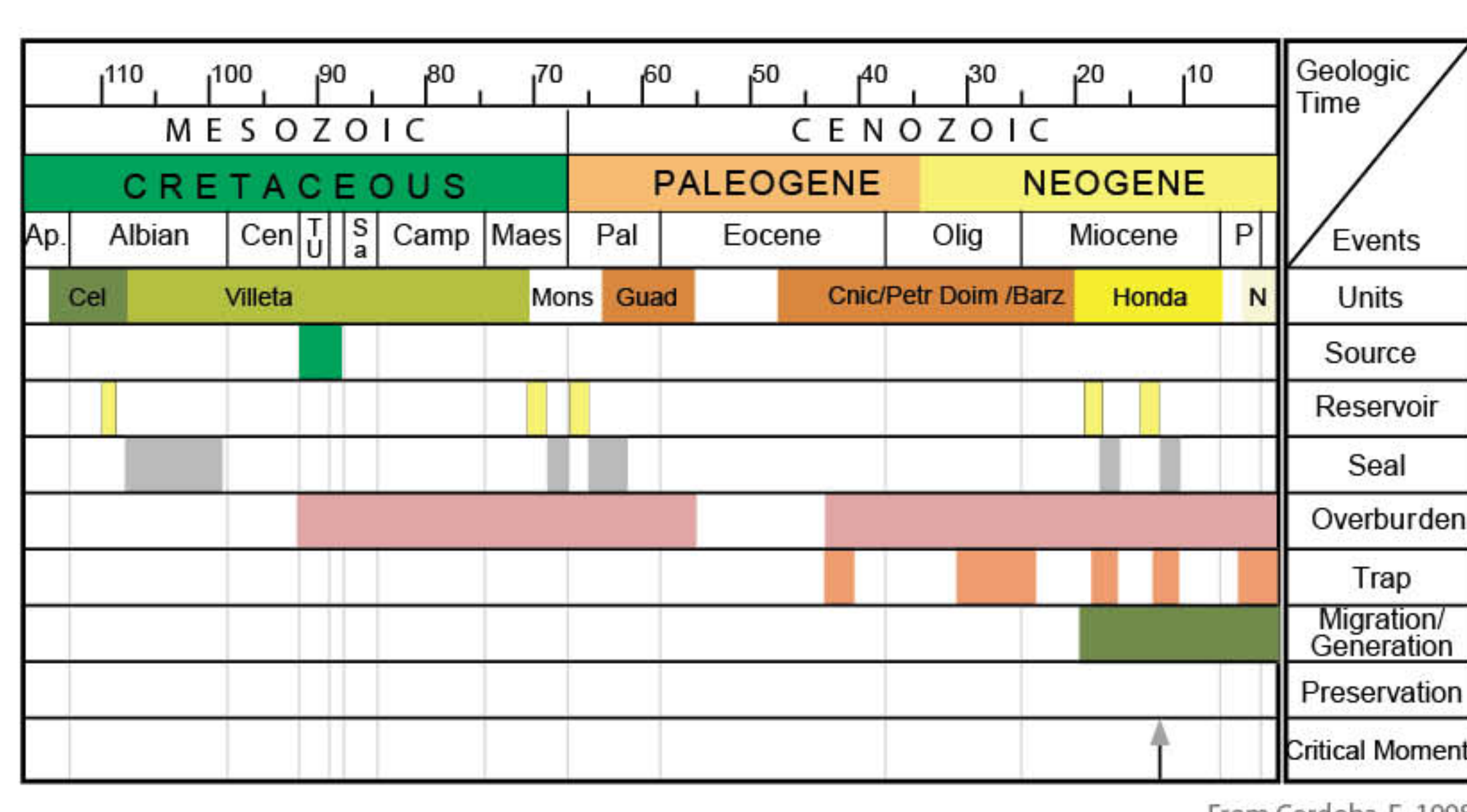
From Ecopetrol, 1999

Bambuca Shale Kerogen Type



From Ecopetrol, 1999

Events Chart for Tetuan - Caballos



From Cordoba, F., 1998



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Colombia
2005

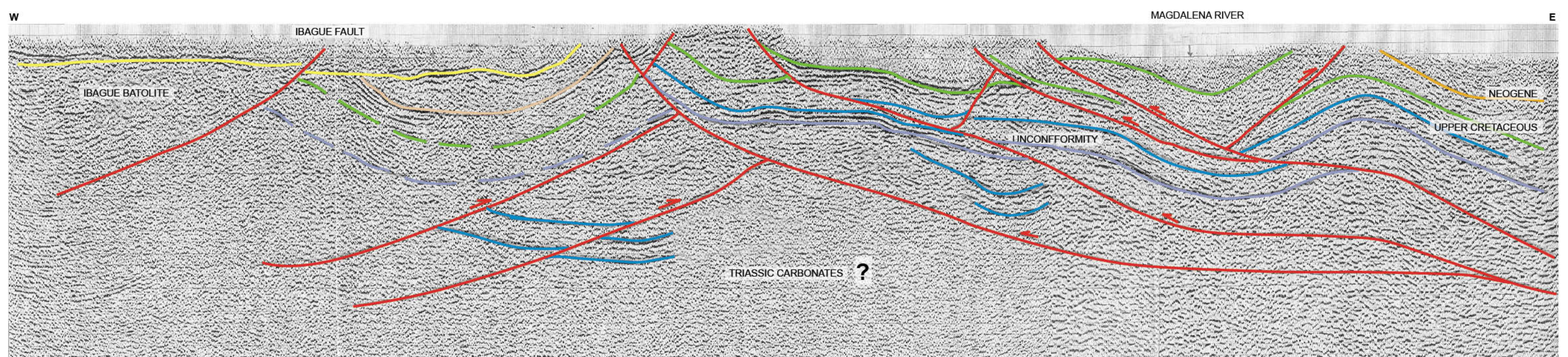
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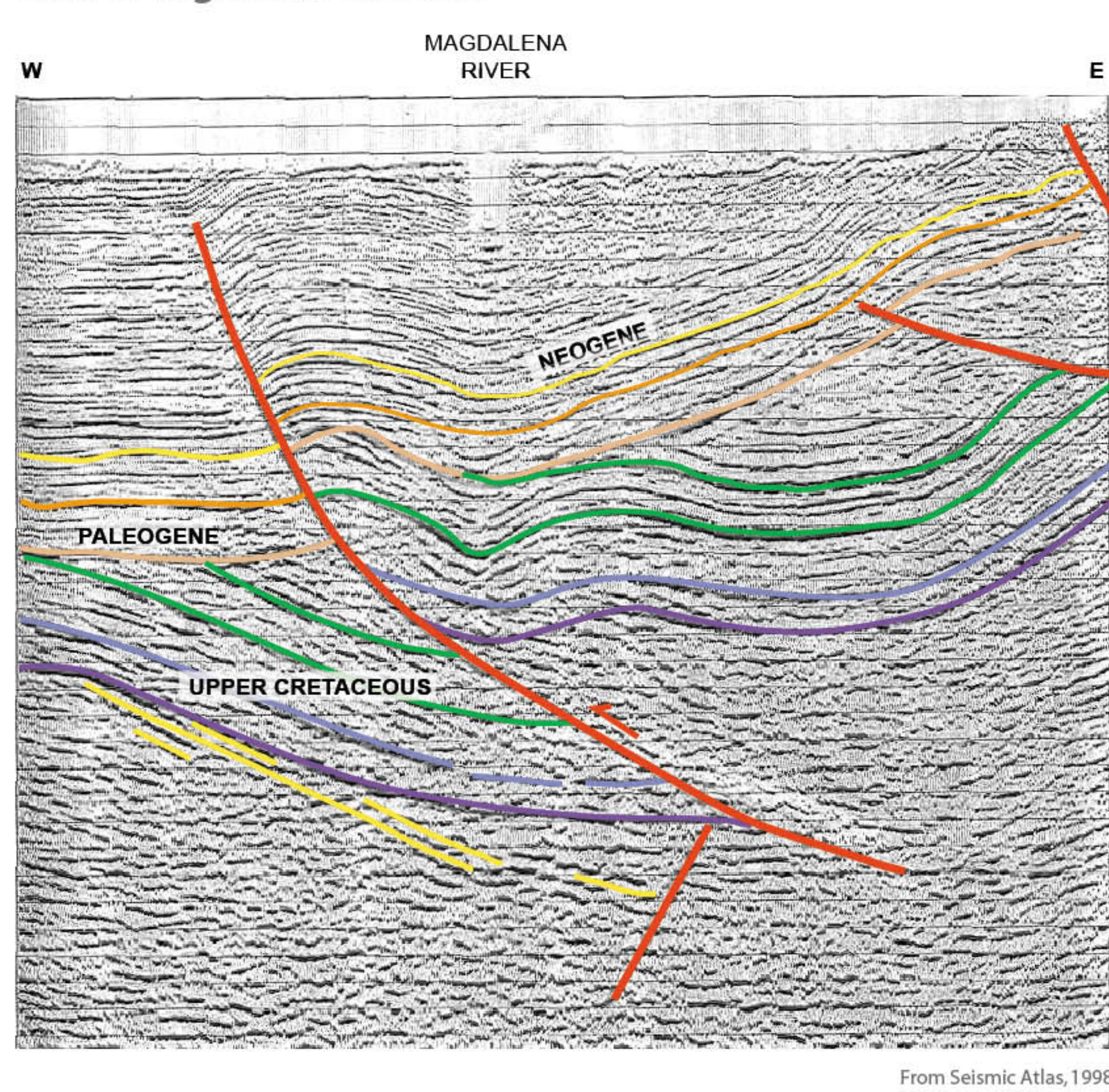
Main Structural Plays

Seismic lines in different scales

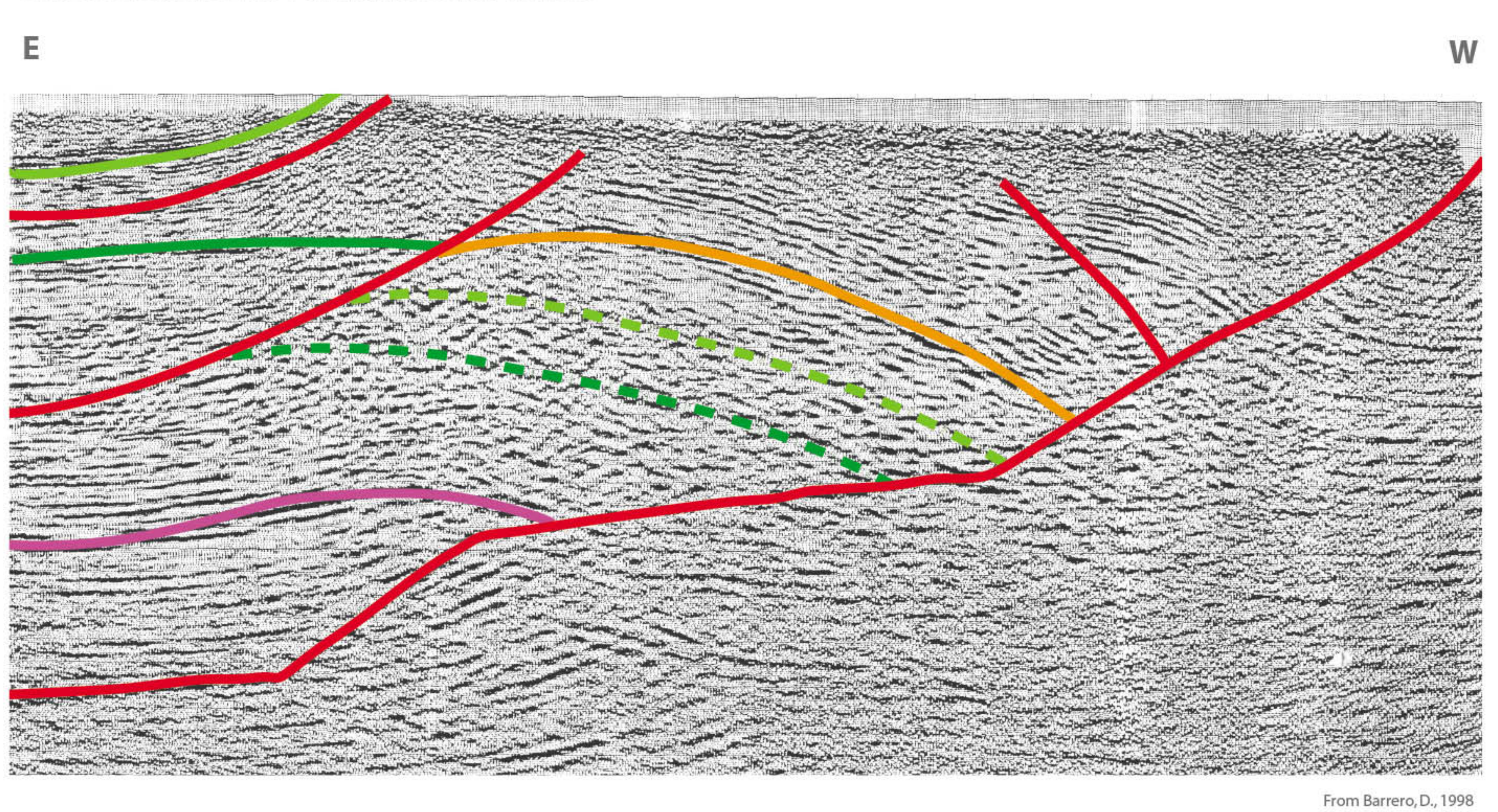
Line 1. Subthrust and Thrust Anticlines



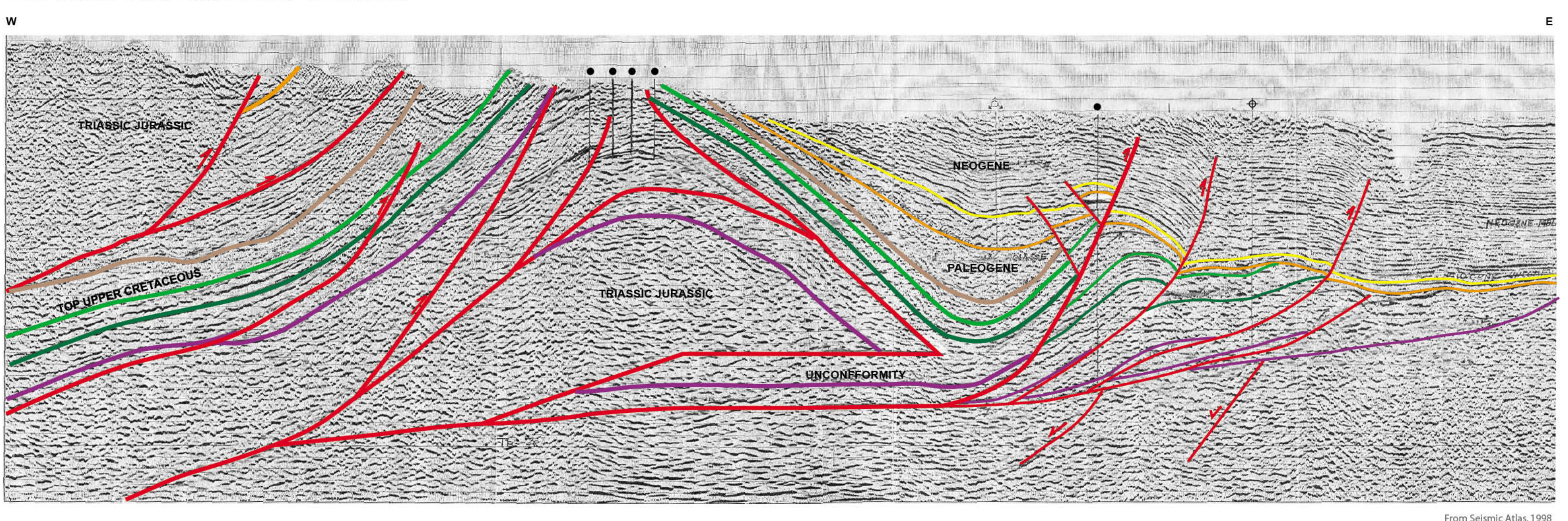
Line 2. High-side Closure



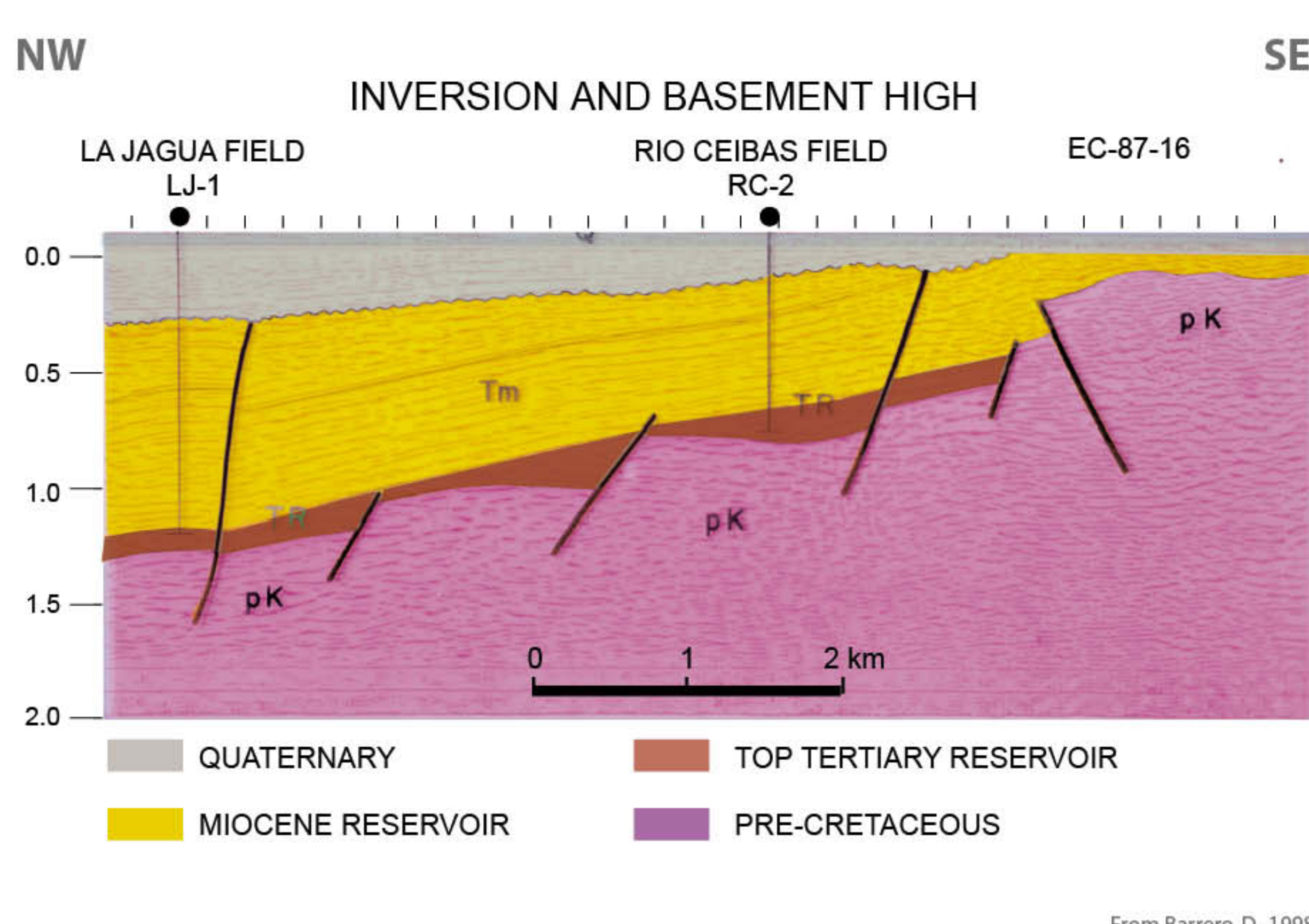
Line 3. Fault Bend Fold and Back Thrust



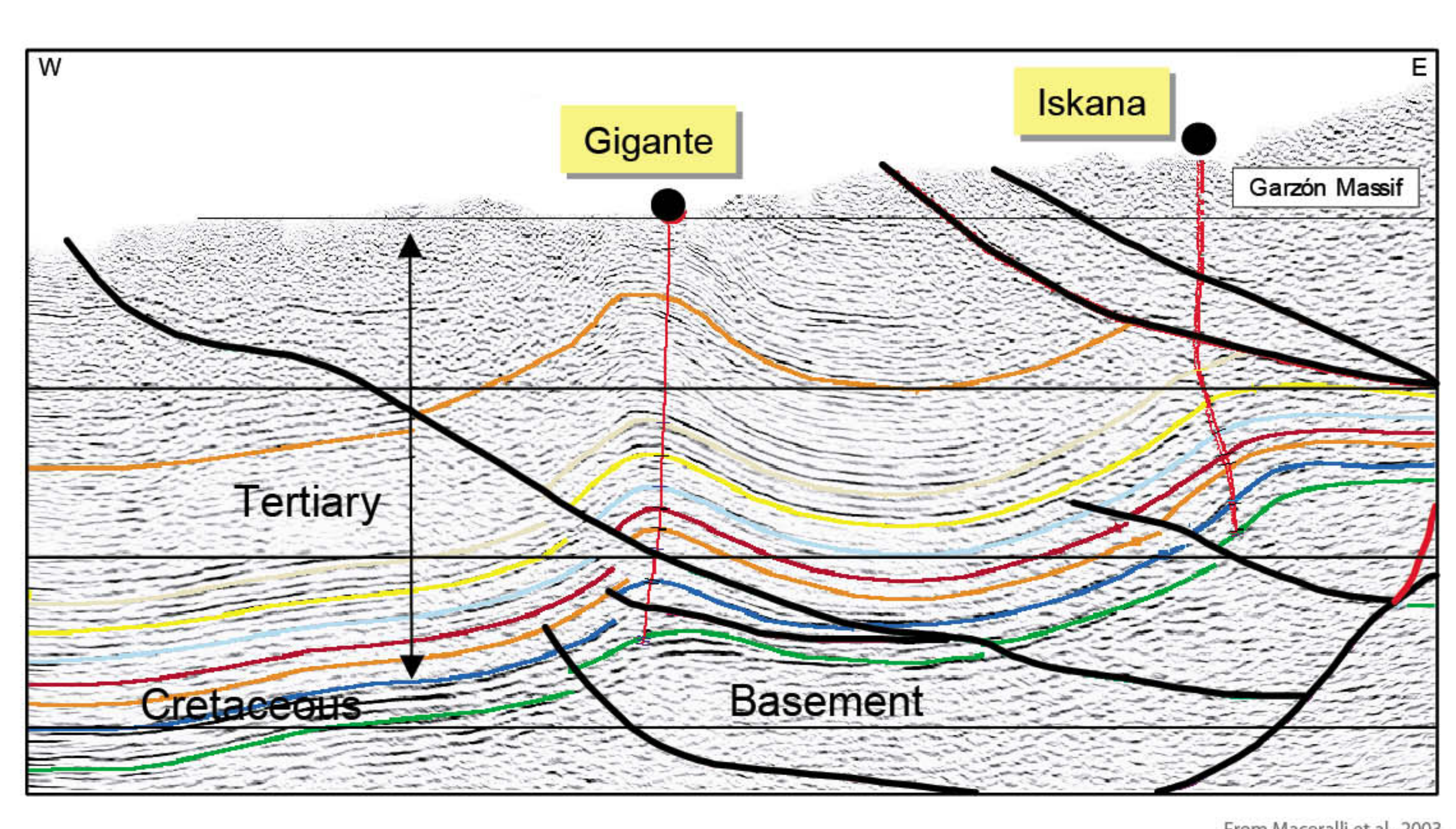
Line 4. Fault Bend Fold and Inbricated Fans



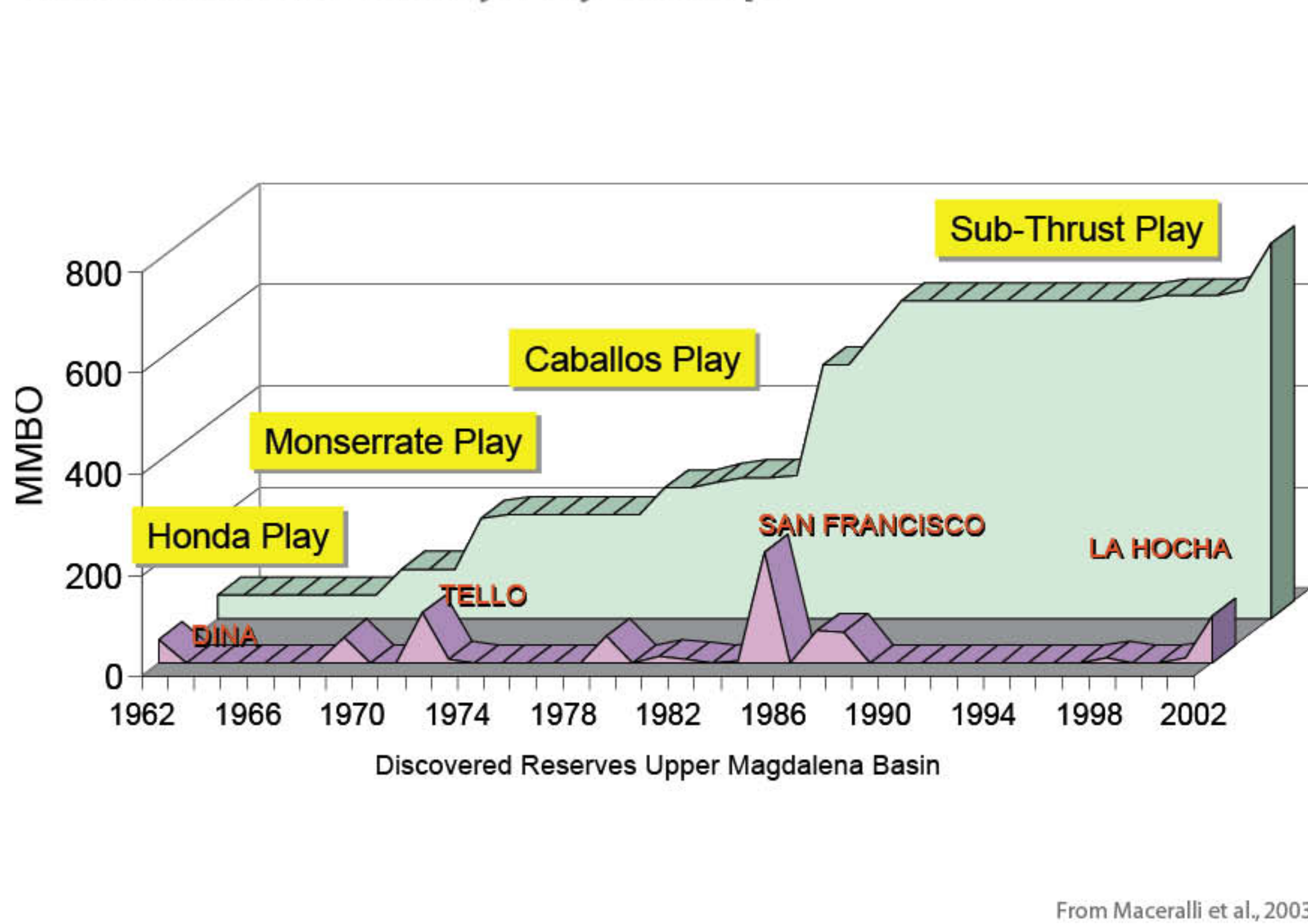
Line 5



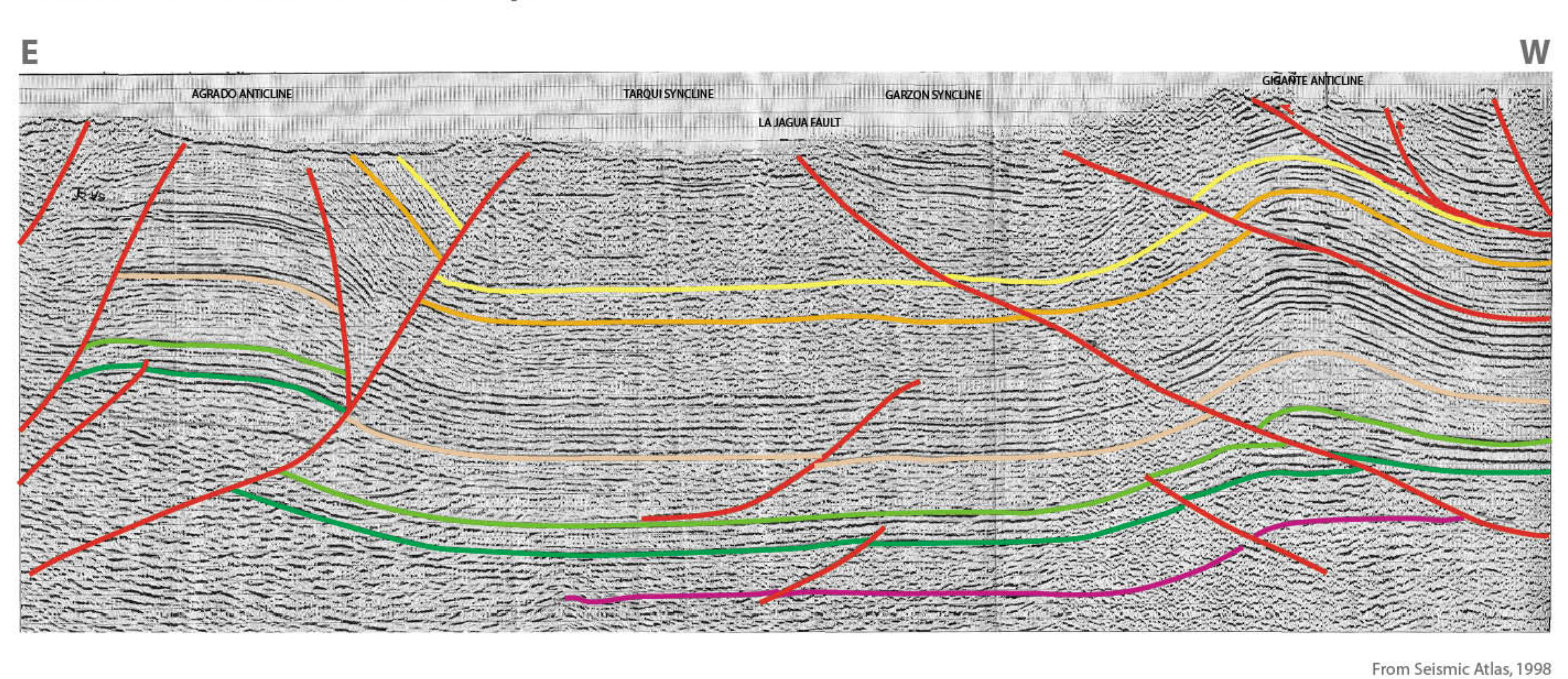
Line 6. Sub-basement Trap



Reserves Increased by Play Concept



Line 7. Sub-thrust Anticlinal Traps



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