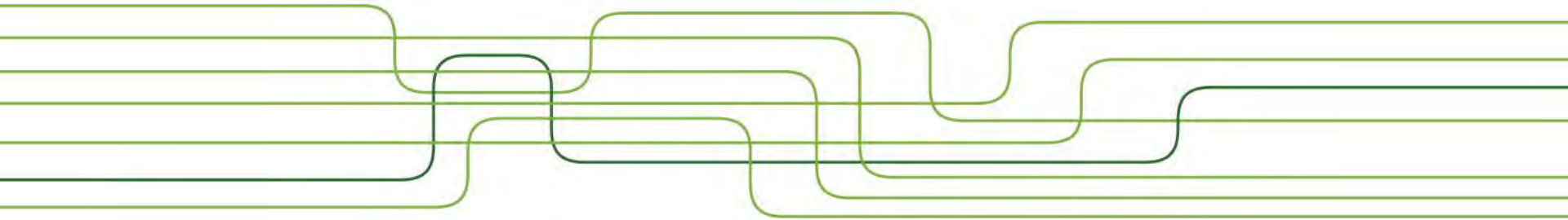


# Brasil12<sup>th</sup>Round

Oil & Gas Bidding Rounds

## Parecis Basin

Bolívar Haeser



**Location**

**Infraestrutture and Operational Conditions**

**Exploration Overview**

**Tectonostratigraphic Evolution**

**Petroleum Systems**

**Plays**

**Proterozoic Basins E&P**

**Area on Offer**

**Final Remarks**

**Location**

**Infraestrutura and Operational Conditions**

Exploration Overview

Tectonostratigraphic Evolution

Petroleum Systems

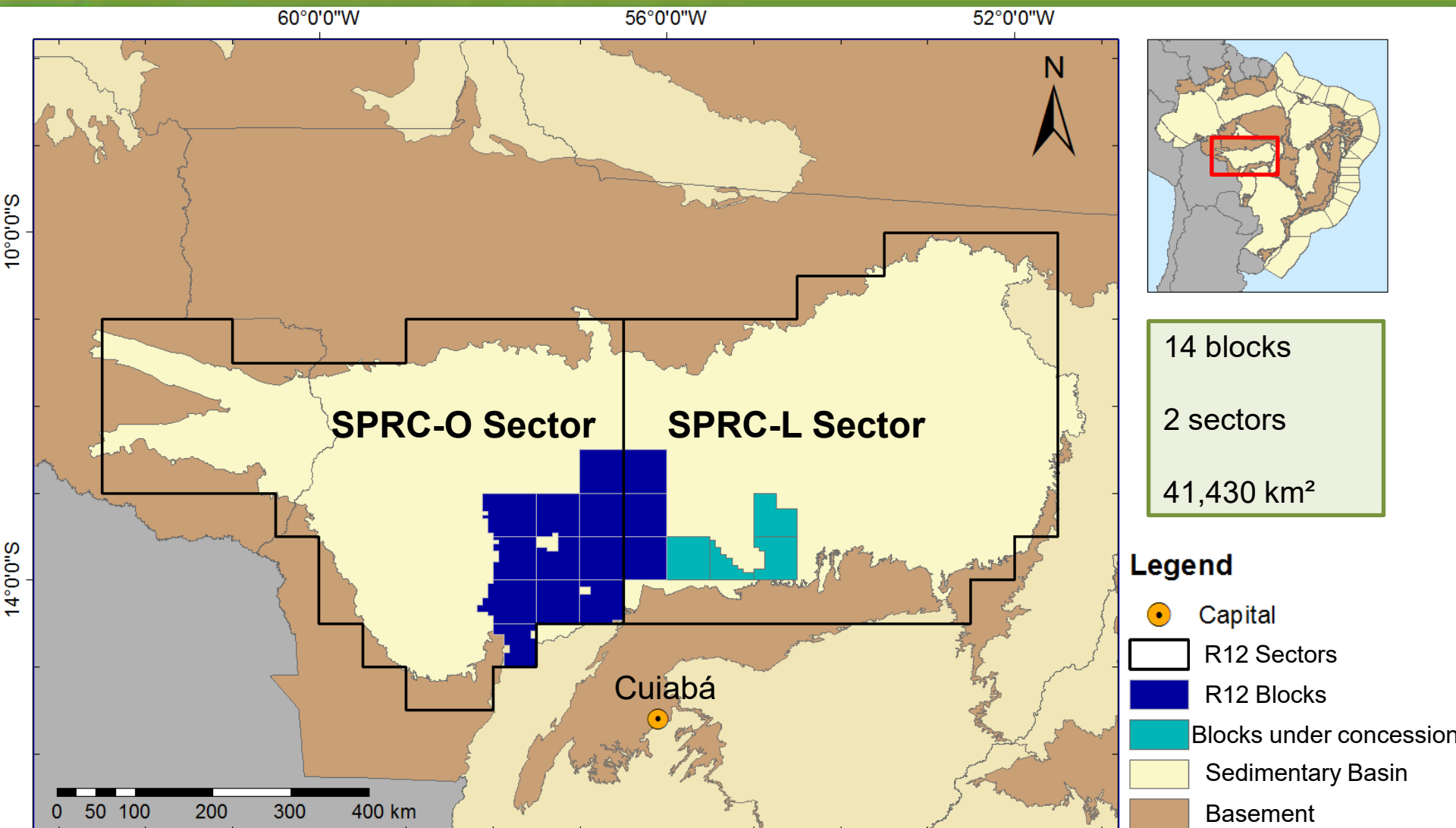
Plays

Proterozoic Basins E&P

Area on Offer

Final Remarks

# Location



# Area and Borders

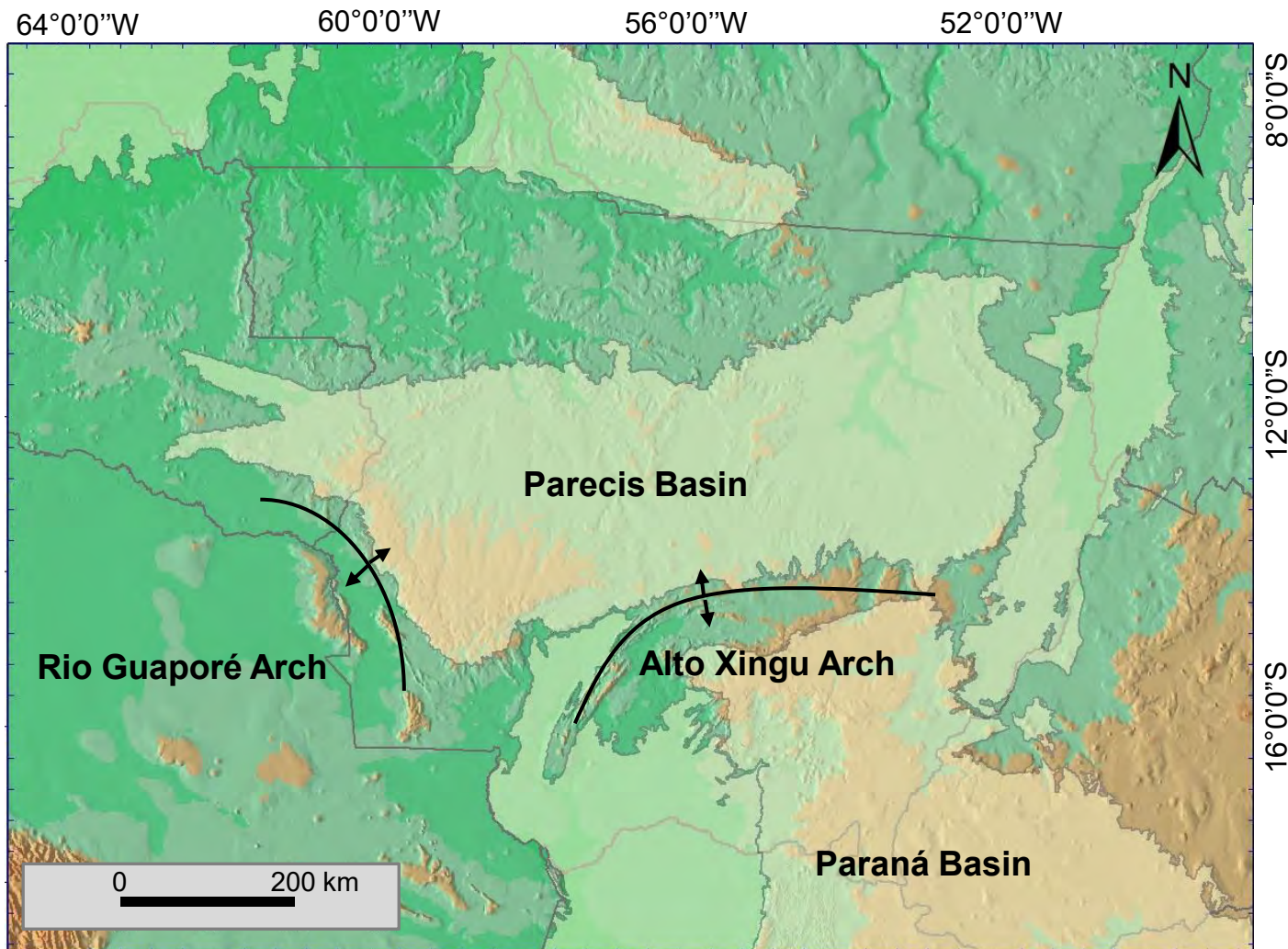
Age: Neoproterozoic

Outline defined by  
paleozoic outcrops

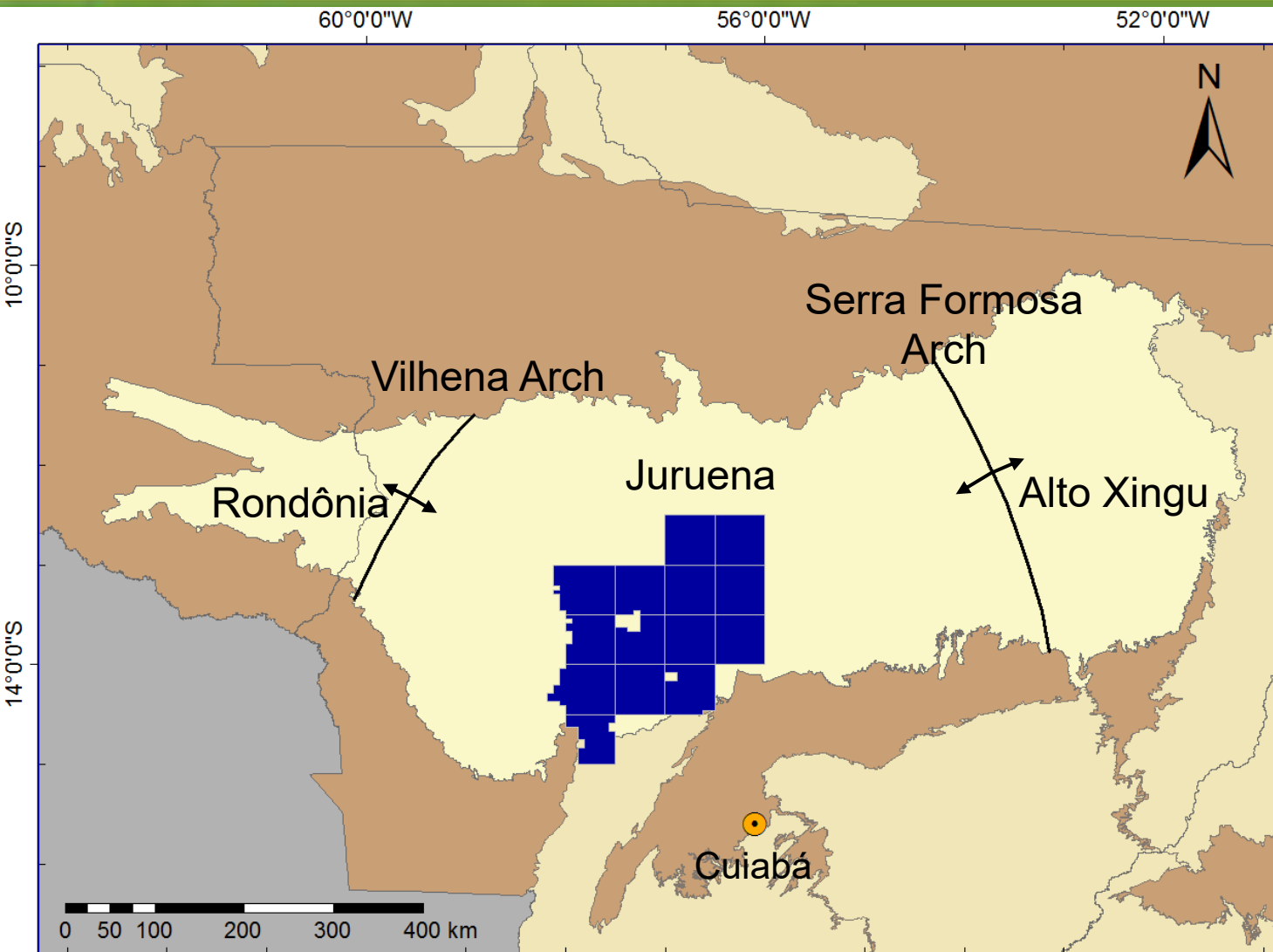
Area: 355,000 km<sup>2</sup>

Southern Border:  
Alto Xingu Arch

Western Border:  
Rio Guaporé Arch



# Sub-Basins



3 Sub-Basins

Rondônia

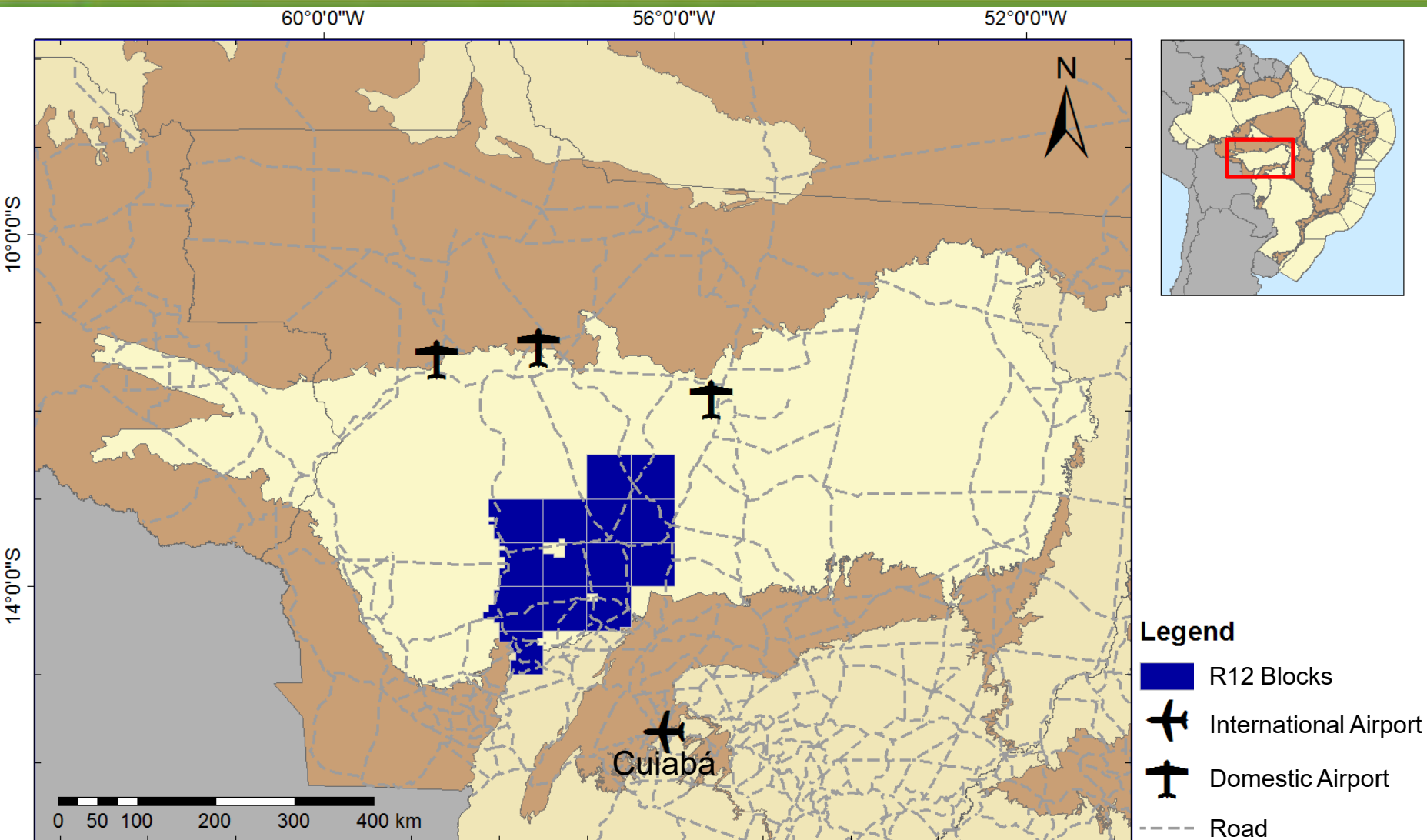
Juruena

Alto Xingu

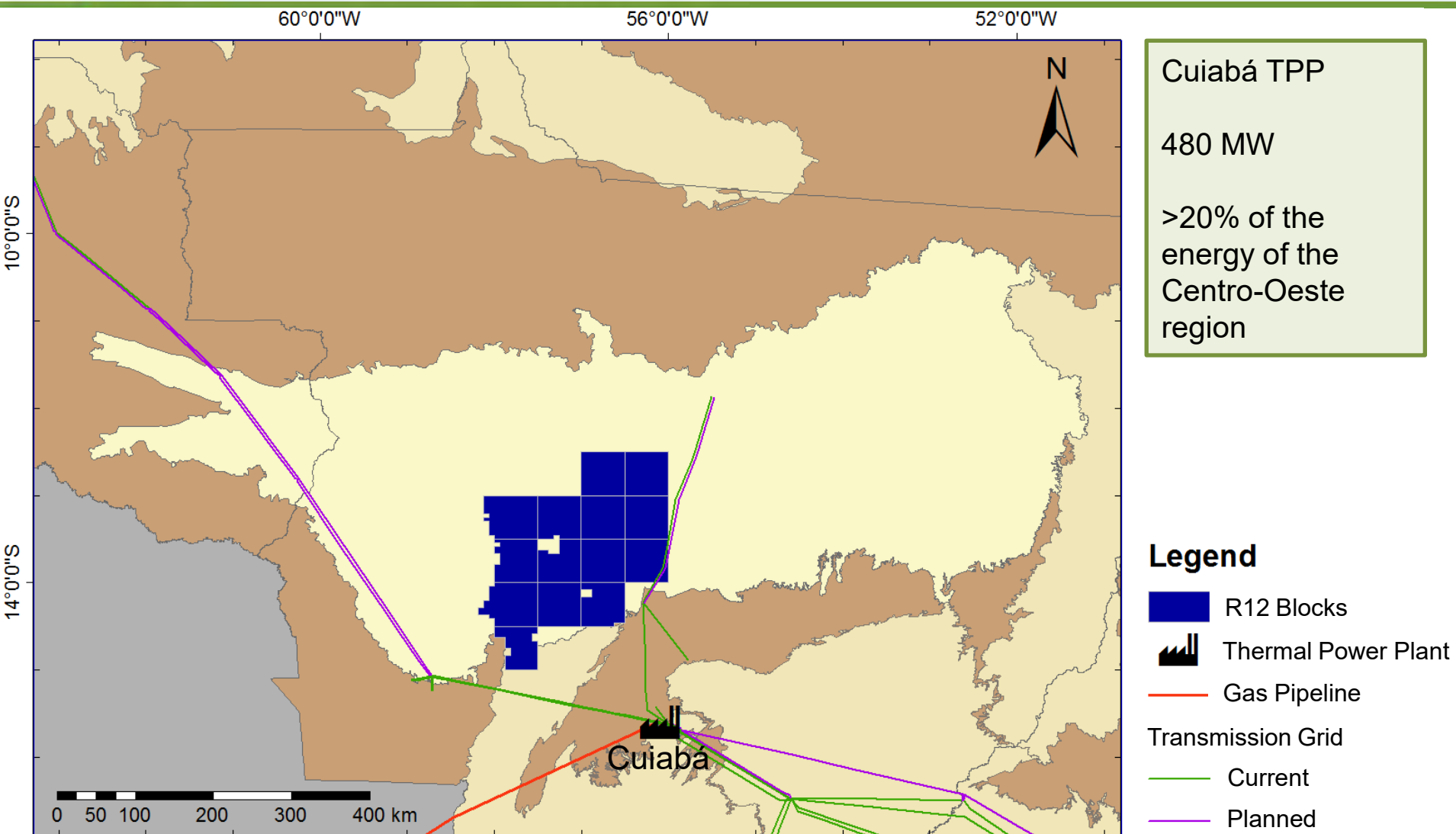
Vilhena Arch

Serra Formosa Arch

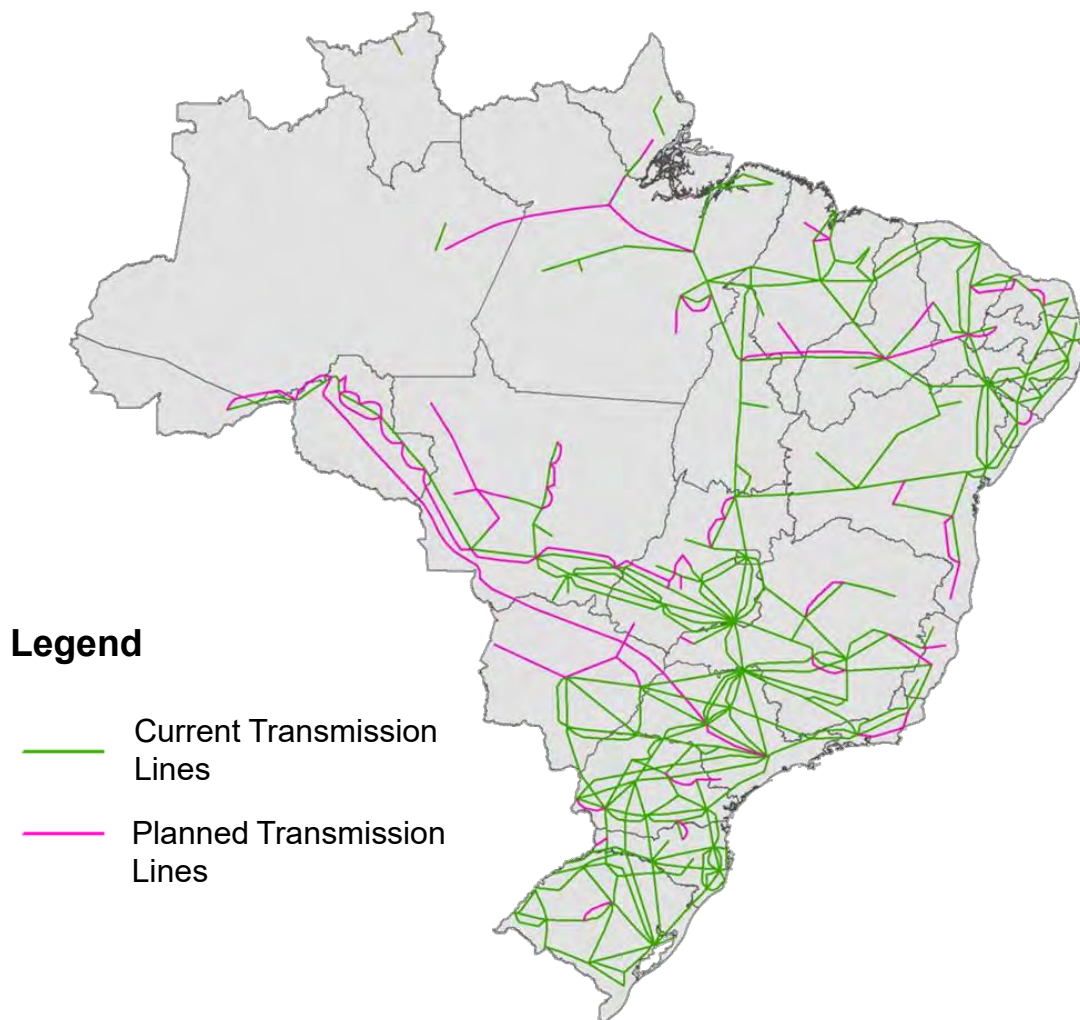
# Infrastructure



# Infrastructure



# Infrastructure



**Gas Monetization in  
Thermal Power Plants**

**Electricity Distribution  
through Transmission Grids**

Location

Infraestrutture and Operational Conditions

**Exploration Overview**

Tectonostratigraphic Evolution

Petroleum Systems

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Proterozoic Basins E&P

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Final Remarks

# Exploration Overview

**Phase 1**  
**1970s**

**1970s: reconnaissance geological surveys by DNPM-CPRM;**

# Exploration Overview

**Phase 1**  
**1970s**

**Phase 2**  
**1988-1995**

**1988 – Discovery of the Teles Pires River gas seep;**

**1988 – Aeromagnetic surveys;**

**1992 – First 2D seismic lines, 490 linear km. Depths greater than 5,000 m detected;**

**1993 – Land gravity survey;**

# Exploration Overview

**Phase 1**  
**1970s**

**Phase 2**  
**1988-1995**

**1993 – Drilling of the 2-FI-0001-MT stratigraphic well in the Juruena Sub-basin, reaching 2,386 m;**

**1995 – Drilling of the 2-SM-0001-MT stratigraphic well in the Juruena Sub-basin, reaching 5,777 m;**

**1995 – Airborne geophysical surveys over the whole basin, outlining its large features (paleozoic and proterozoic grabens);**

# Exploration Overview

**Phase 1**  
**1970s**

**Phase 2**  
**1988-1995**

**Phase 3**  
**Since 2008**

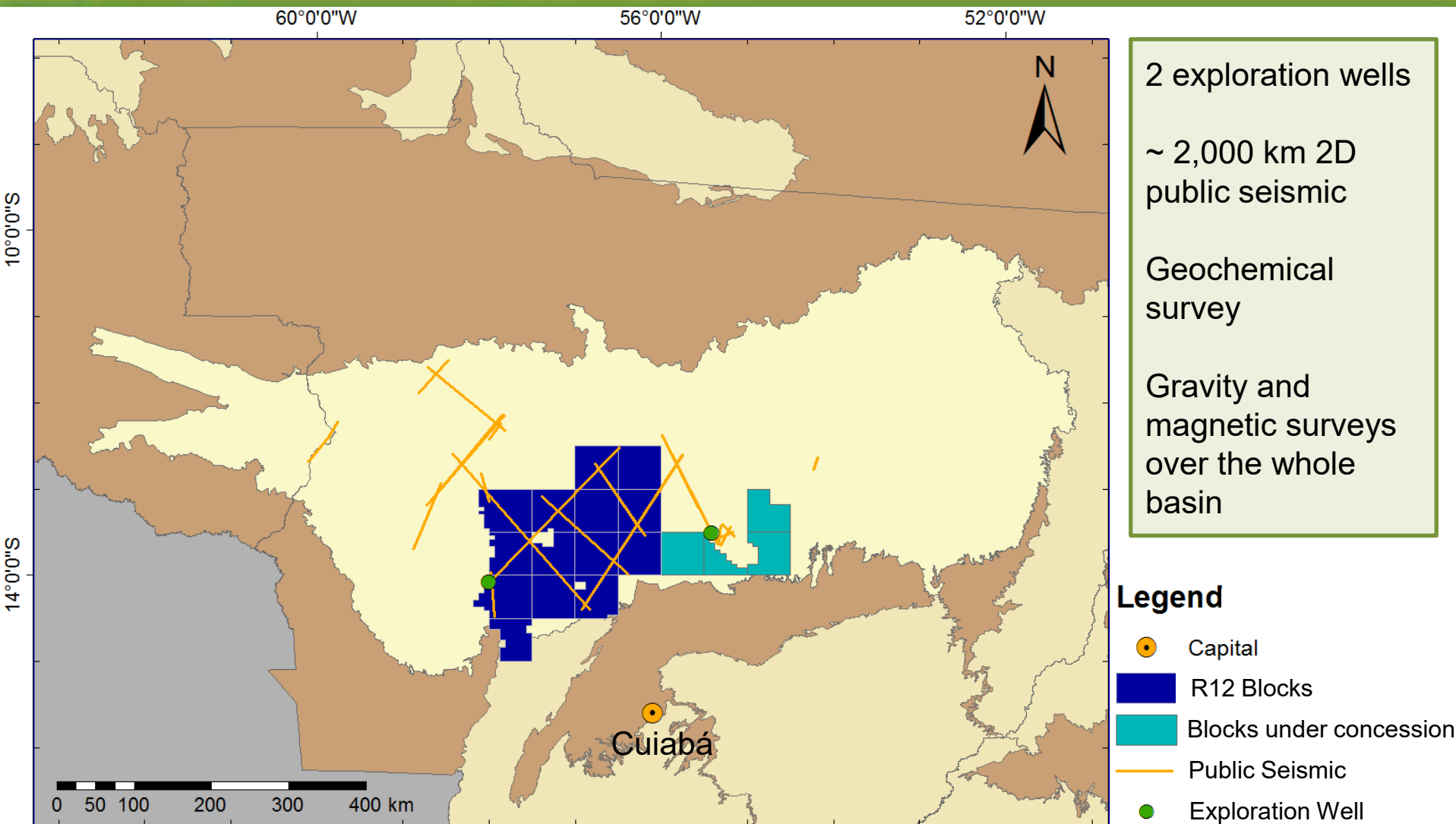
**2008 – ANP geochemical survey – 2,400 sampling points, detecting anomalous concentration of light hydrocarbons and indicating a thermogenic origin for them;**

**2008 – 10<sup>th</sup> Bidding Round – 6 blocks acquired;**

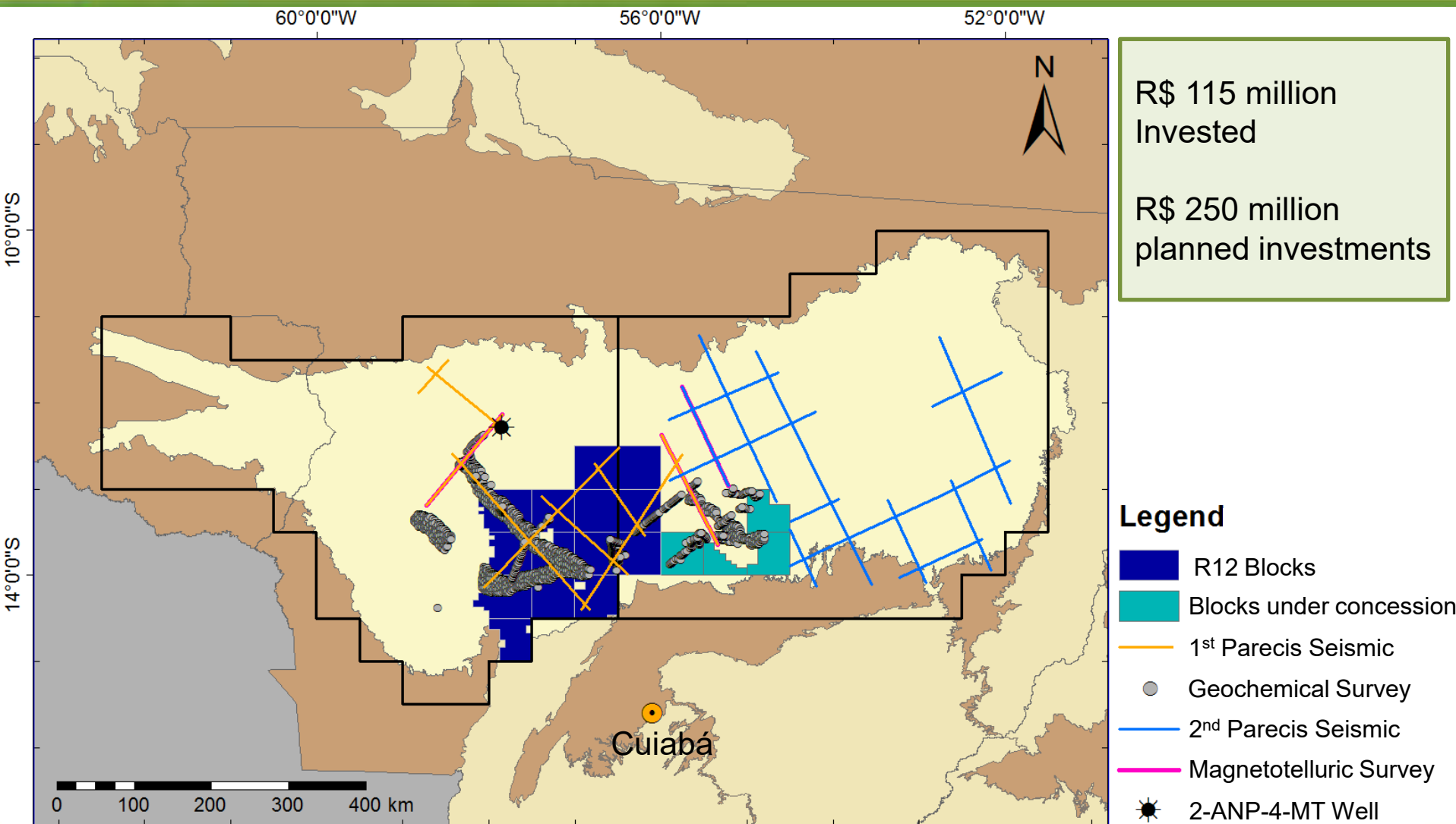
**2011 – ANP seismic survey – 1,500 km of linear seismics, detailing the intense structuration of the basin, with proterozoic grabens of large depths;**

**2013 – Beginning of the 2,200 km ANP 2D seismic survey (Juruena and Alto Xingu sub-basins)**

# Available Data



# Pluriannual Plan



Location

Infraestrutture and Operational Conditions

Exploration Overview

**Tectonostratigraphic Evolution**

Petroleum Systems

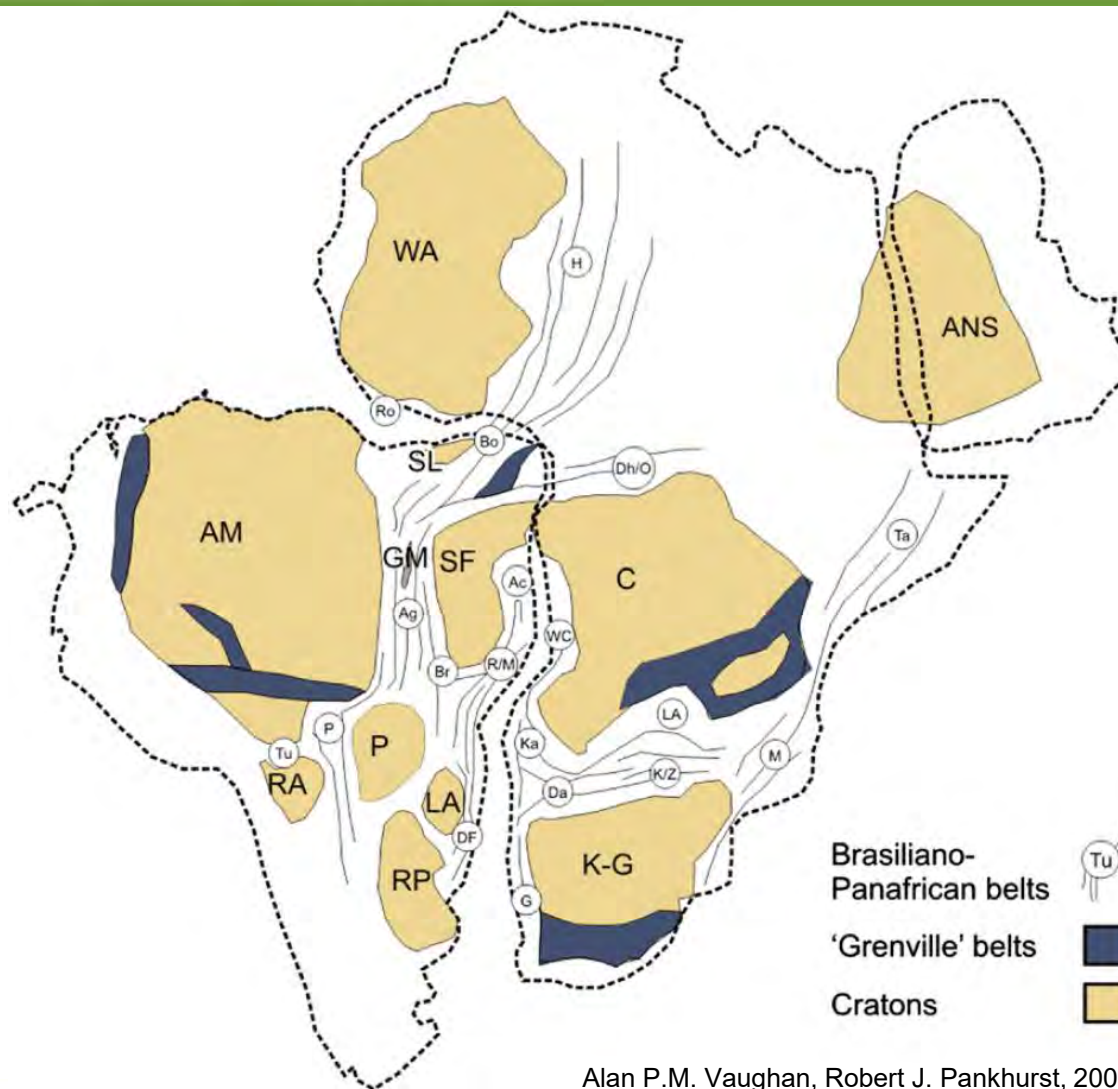
Plays

Proterozoic Basins E&P

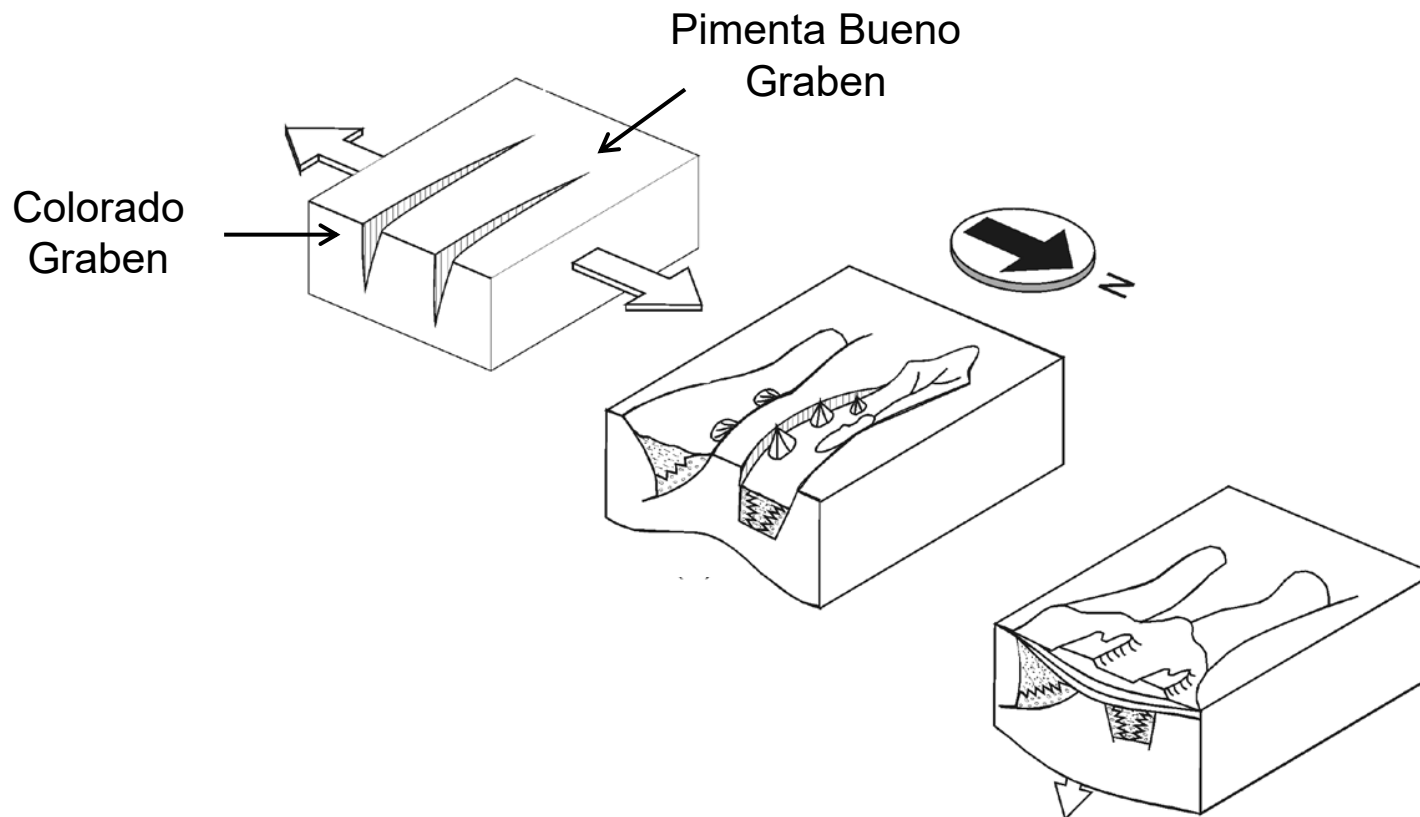
Area on Offer

Final Remarks

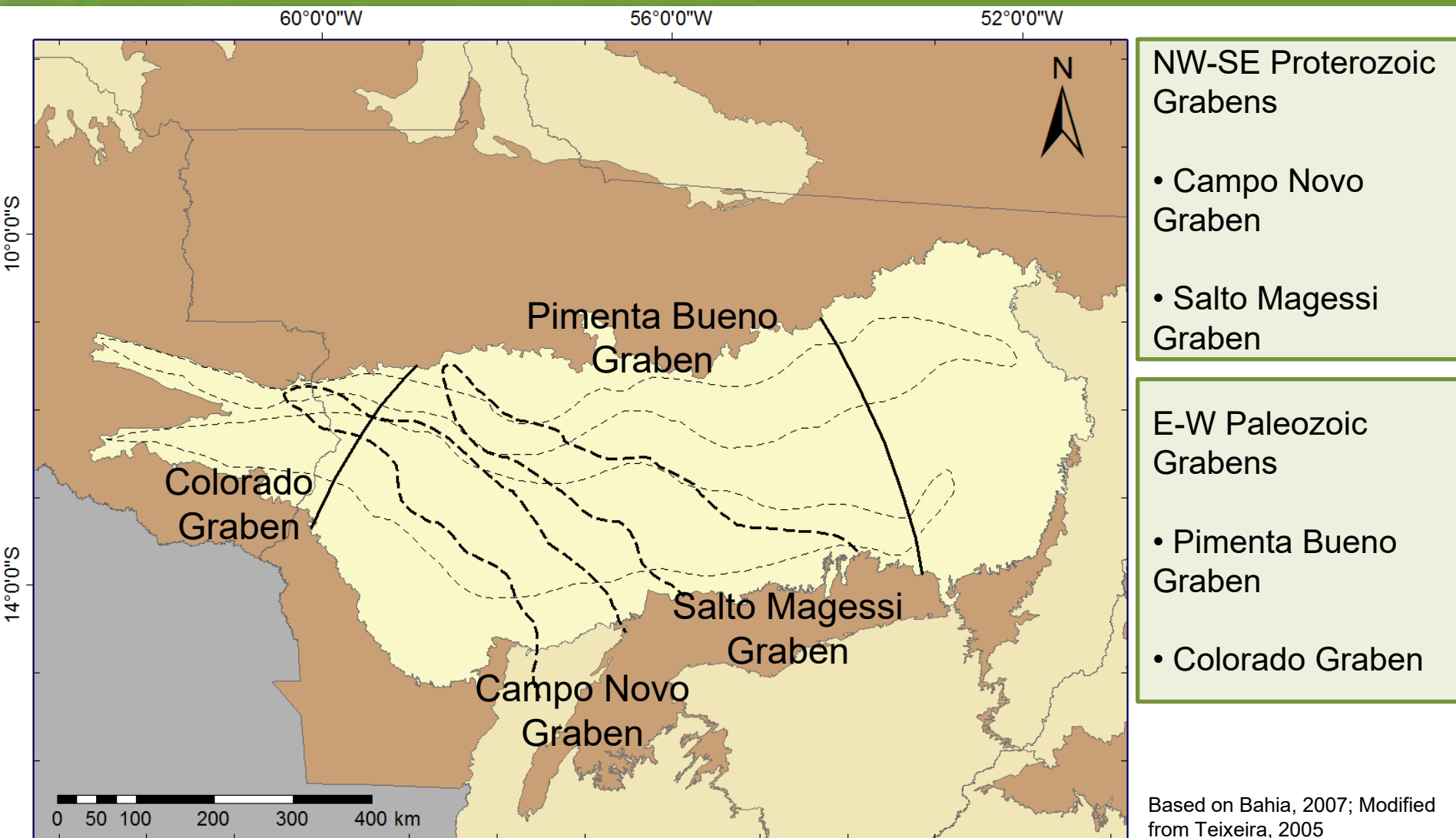
# Tectonic Framework



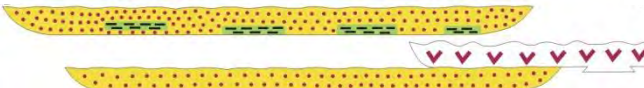
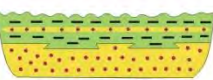
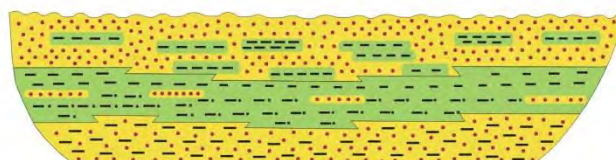


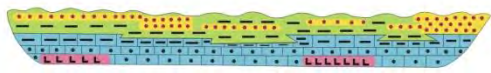
# Tectonic Framework



# Structural Framework



# Stratigraphic Evolution

IDADE	LITOESTRATIGRAFIA		
	GRUPO	FORMAÇÃO	LITOLOGIA
CRETÁCEO		PARECIS	
JURÁSSICO		SERRA GERAL BOTUCATU	
DEVONIANO	PARANÁ	PONTA GROSSA FURNAS	
CAMBRIANO	ALTO PARAGUAI	DIAMANTINO	
541 Ma		SEPOTUBA	
569 ± 20 Ma		RAIZAMA	
NEOPROTEROZOICO	ARARAS	SERRA AZUL	
Glaciação Gaskiers 582 Ma			
627 ± 32 Ma	INOMINADO	PUGA	
Glaciação Marinoan 635 Ma		SEQ. SILICICL. SUP SEQ. CARBON. INF.	
	INOMINADO	SEQ. RIFTE BASAL	

Parecis Fm.: Sandstones and shales  
Botucatu Fm.: Sandstones

Ponta Grossa Fm.: shales  
Furnas Fm.: sandstones

Diamantino: sandstones with pelitic levels  
Sepotuba: shales and siltstones with sandstone levels  
Raizama: sandstones interbedded with siltstones

Diamictites, shales and sandstones










Calcilutite, calcarenite and anhydrite

Diamictites, shales and sandstones

Upper Siliciclastic Sequence  
Lower Carbonatic Sequence

Basal Rift Sequence: Sandstones

Baseado na re-interpretação dos poços SM e FI da Petrobras com base em Della Giustina et al (2005), Figueiredo et al (2006), Riccomini et al (2007) e Nogueira et al (2007).

Legenda	 Diamictitos	 Calcarenitos	 Arenitos
	 Folhelhos	 Calcilitutos	 Basaltos/Diabásios
	 Siltitos	 Dolomititos	 Anidritas

Zalán and Haeser, 2013 (unpublished)

Location

Infraestruture and Operational Conditions

Exploration Overview

Tectonostratigraphic Evolution

**Petroleum Systems**

**Plays**



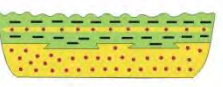




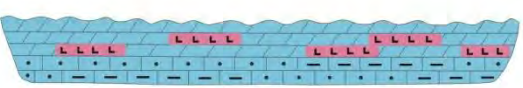

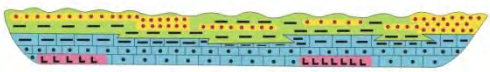


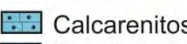
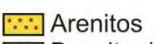

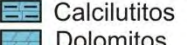

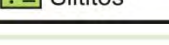

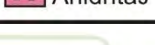
Proterozoic Basins E&P

Area on Offer

Final Remarks

# Source Rocks

Puga Formation  
shales



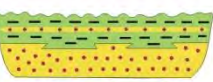
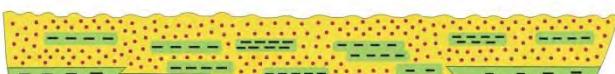




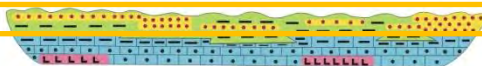

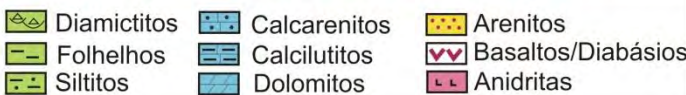
IDADE	LITOESTRATIGRAFIA			PETRÓLEO		
	GRUPO	FORMAÇÃO	LITOLOGIA	G	R	S
CRETÁCEO		PARECIS				
JURÁSSICO		SERRA GERAL BOTUCATU				
DEVONIANO	PARANÁ	PONTA GROSSA FURNAS				
CAMBRIANO 541 Ma 569 ± 20 Ma	ALTO PARAGUAI	DIAMANTINO				
		SEPO TUBA				
		RAIZAMA				
NEOPROTEROZOICO Glaciação Gaskiers 582 Ma 627 ± 32 Ma Glaciação Marinoan 635 Ma	ARARAS	SERRA AZUL				
						
	INOMINADO	PUGA				
		SEQ. SILICICL. SUP SEQ. CARBON. INF.				
	INOMINADO	SEQ. RIFTE BASAL				
Baseado na re-interpretação dos poços SM e FI da Petrobras com base em Della Giustina et al (2005), Figueiredo et al (2006), Riccomini et al (2007) e Nogueira et al (2007).			<p>Legenda</p> <div>  Diamictitos          Calcarenitos          Arenitos       </div> <div>  Folhelhos          Calcilitos          Basaltos/Diabásios       </div> <div>  Siltitos          Dolomitos          Anidritas       </div>			

# Source Rocks



Puga Formation:  
100 m thick shale  
interval;  
strong anomaly in the  
gamma-ray log

# Reservoir Rocks

IDADE	LITOESTRATIGRAFIA			PETRÓLEO		
	GRUPO	FORMAÇÃO	LITOLOGIA	G	R	S
CRETÁCEO		PARECIS				
JURÁSSICO		SERRA GERAL BOTUCATU				
DEVONIANO	PARANÁ	PONTA GROSSA FURNAS				
CAMBRIANO	ALTO PARAGUAI	DIAMANTINO				
541 Ma 569 ± 20 Ma		SEPO TUBA				
		RAIZAMA				
NEOPROTEROZOICO	ARARAS	SERRA AZUL				
Glaceração Gaskiers 582 Ma Glaceração Marinoan 635 Ma 27-32 Ma		PUGA				
		SEQ. SILICICL. SUP SEQ. CARBON. INF.				
	INOMINADO	SEQ. RIFTE BASAL				
Baseado na re-interpretação dos poços SM e FI da Petrobras com base em Della Giustina et al (2005), Figueiredo et al (2006), Riccomini et al (2007) e Nogueira et al (2007).			<p>Legenda</p> 			

Gas in the Salto Magessi well:



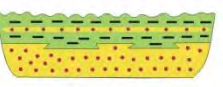
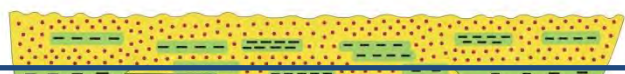








-sandstones of Puga Formation;

-sandstone levels of the Upper Siliciclastic Sequence;

-sandstones of the Alto Paraguai Group;



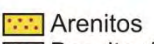



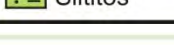
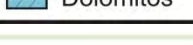
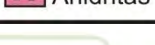
Carbonates of the Araras Group impregnated with oil (Mirassol d'Oeste, 100 km to the south of the basin)

# Seals

IDADE	LITOESTRATIGRAFIA			PETRÓLEO		
	GRUPO	FORMAÇÃO	LITOLOGIA	G	R	S
CRETÁCEO		PARECIS				
JURÁSSICO		SERRA GERAL BOTUCATU				
DEVONIANO	PARANÁ	PONTA GROSSA FURNAS				
CAMBRIANO	ALTO	DIAMANTINO				
541 Ma	PARAGUAI	SEPO TUBA				
569 ± 20 Ma		RAIZAMA				
Glaceração Gaskiers 532 Ma		SERRA AZUL				
627 ± 32 Ma		ARARAS				
Glaceração Marinoan 635 Ma		PUGA				
NEOPROTEROZOICO	INOMINADO	SEQ. SILICICL. SUP				
		SEQ. CARBON. INF.				
	INOMINADO	SEQ. RIFTE BASAL				

Baseado na re-interpretação dos poços SM e FI da Petrobras com base em Della Giustina et al (2005), Figueiredo et al (2006), Riccomini et al (2007) e Nogueira et al (2007).

**Legenda**

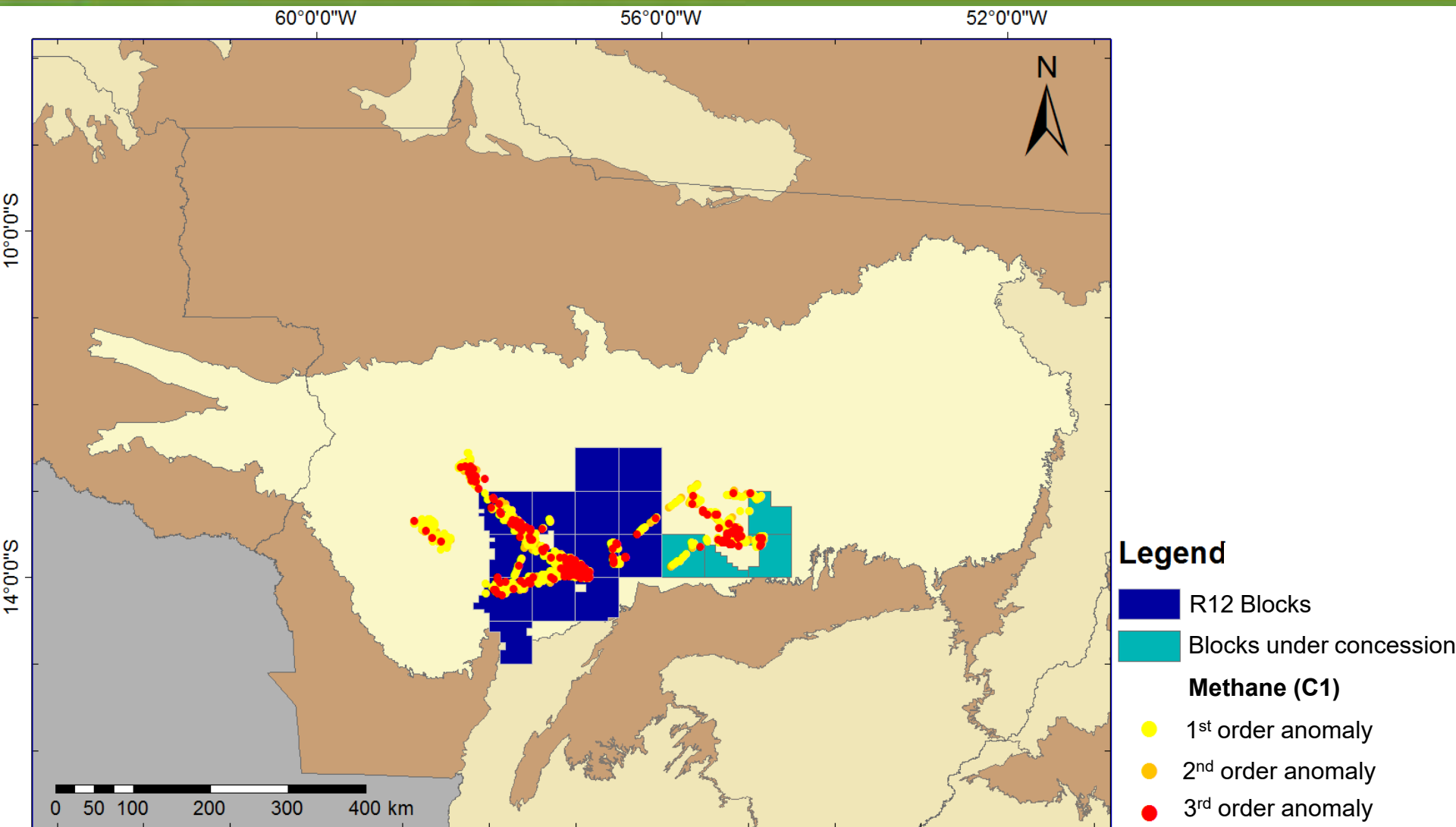
	Diamictitos		Calcarenitos		Arenitos
	Folhelhos		Calcilutitos		Basaltos/Diabásios
	Siltitos		Dolomitos		Anidritas

Shales and  
diamictites of the  
Serra Azul Formation

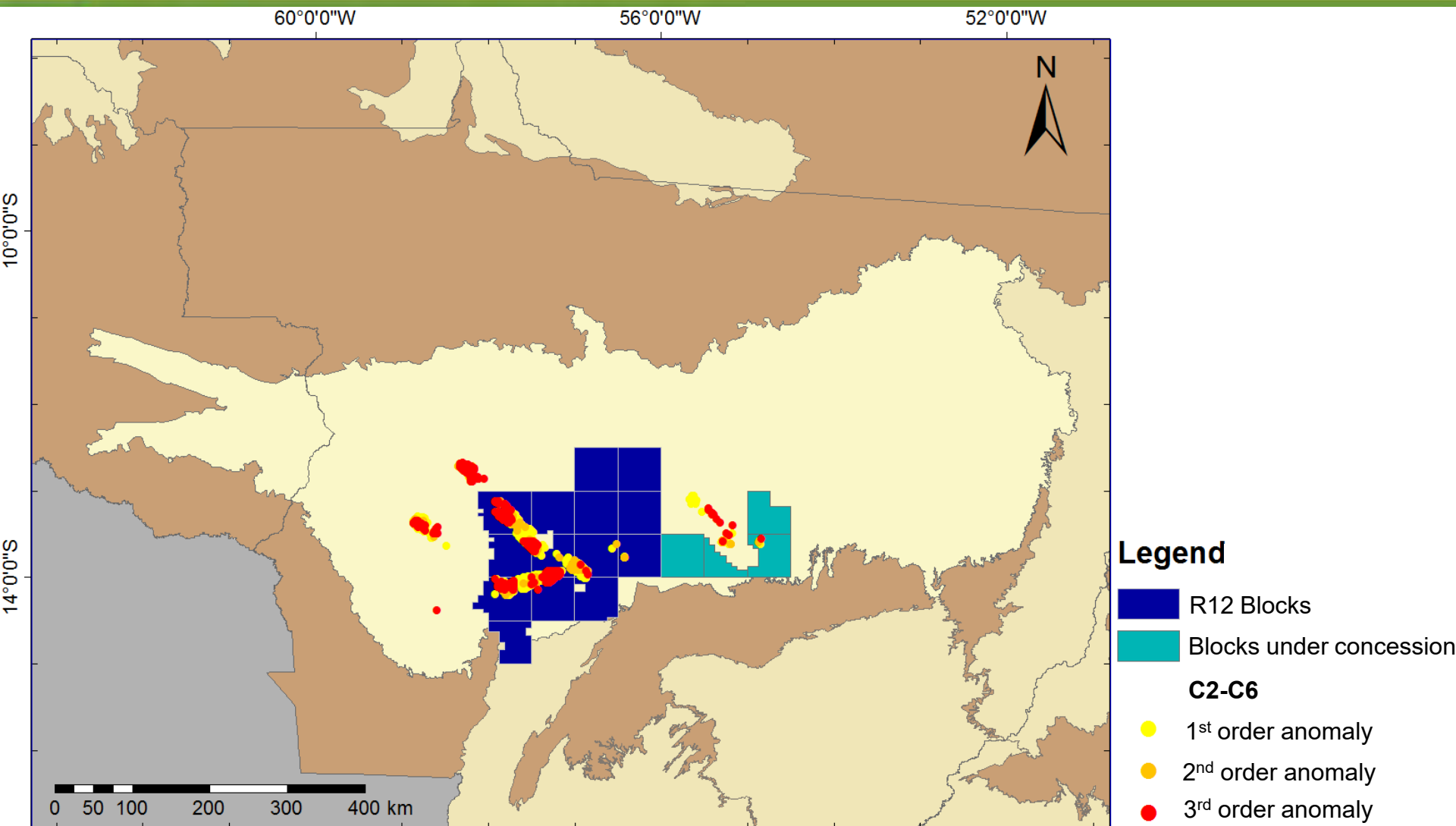
Shales and  
diamictites of the  
Puga Formation

Shales of the Upper  
Siliciclastic Sequence

# Hydrocarbon Indications



# Hydrocarbon Indications



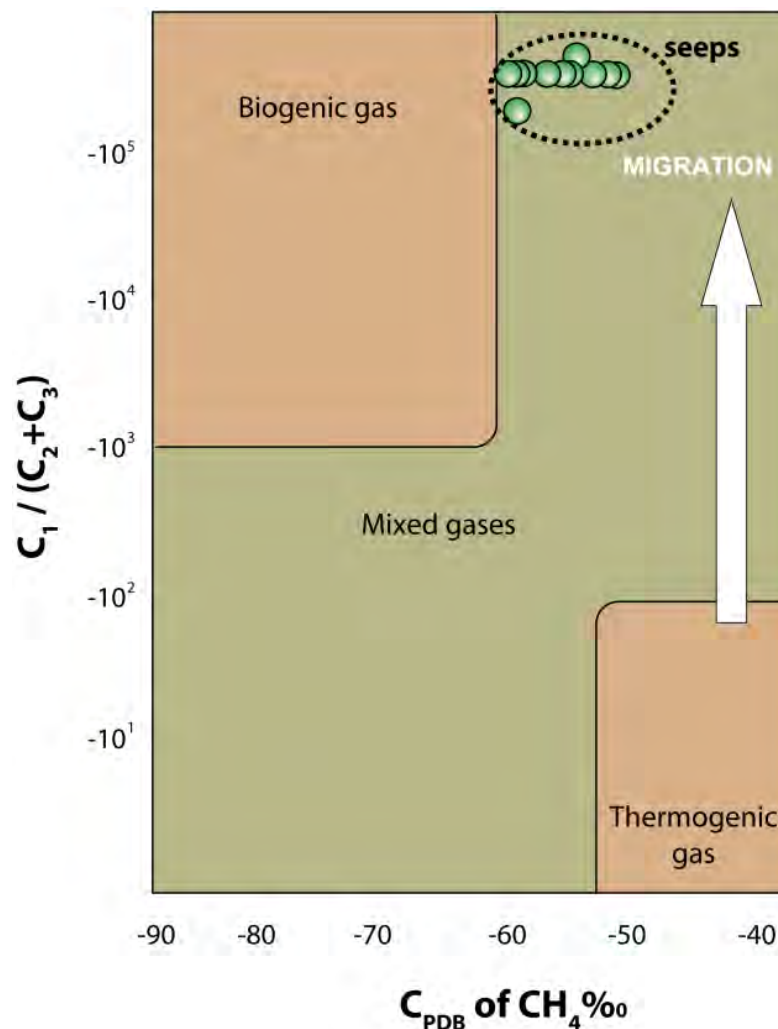
# Petroleum Systems

Unknown petroleum system

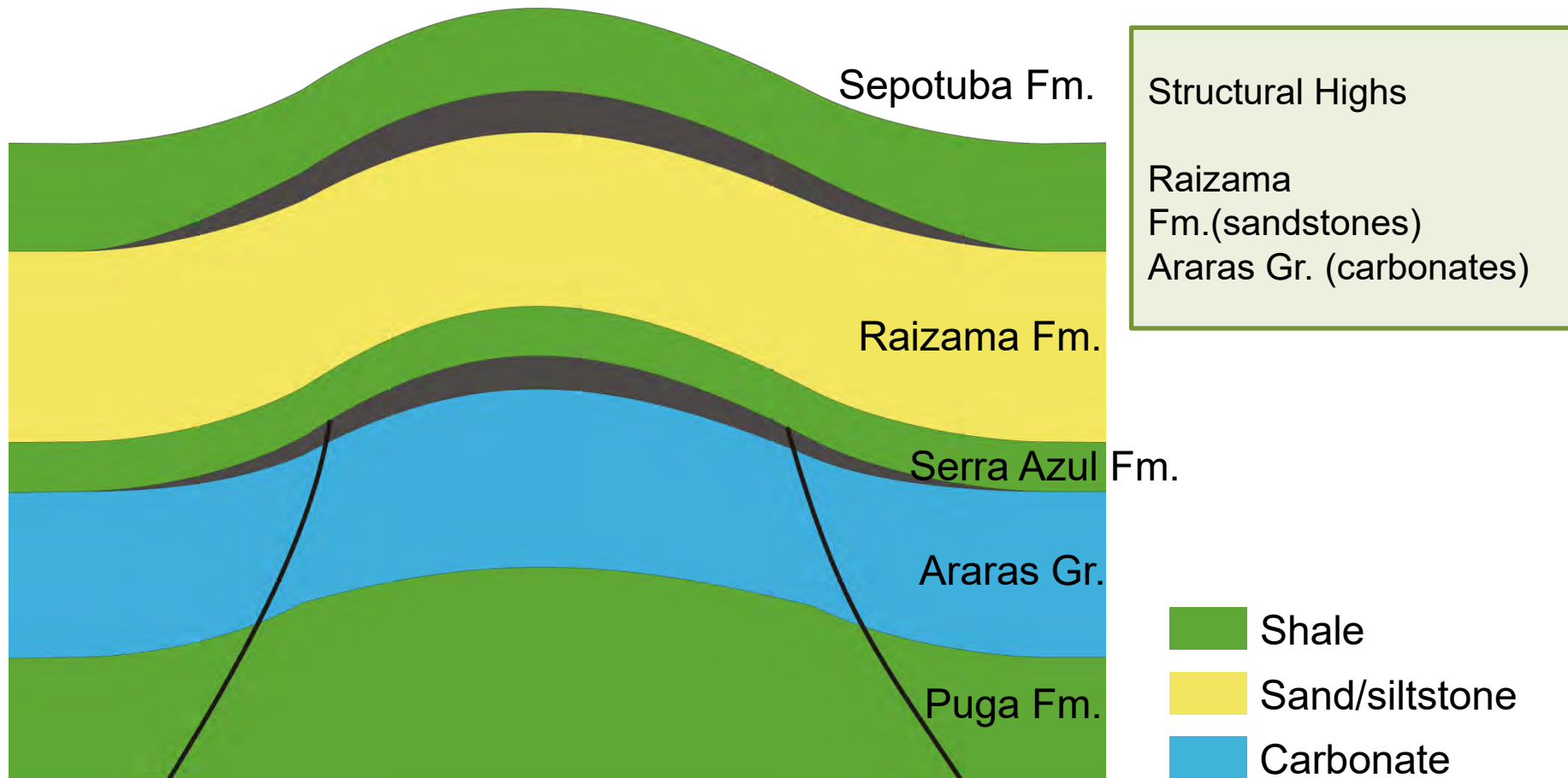
Active petroleum system proven  
by geochemical survey

Teles Pires River gas seep:  
thermogenic gas.

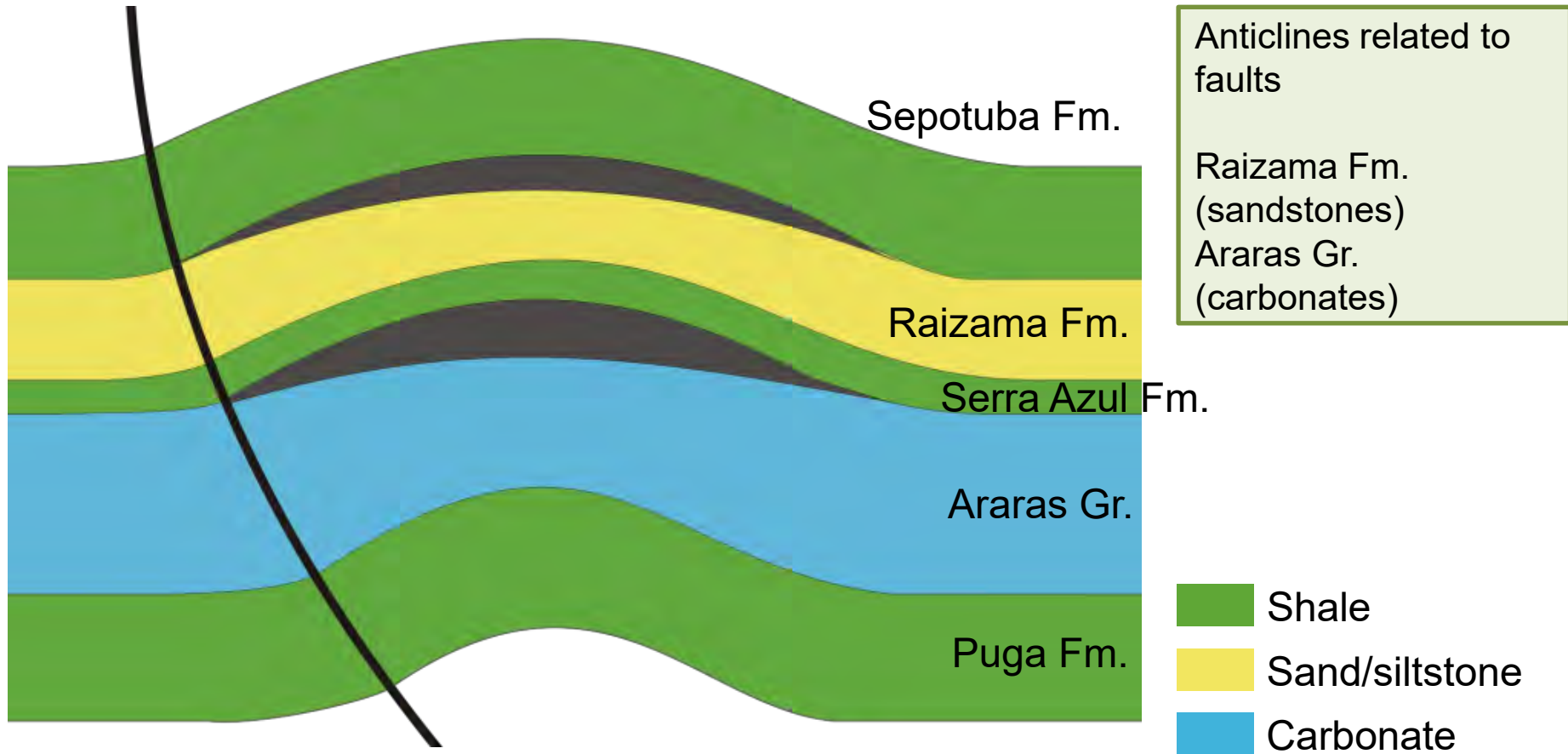
Thermogenic microseeps.



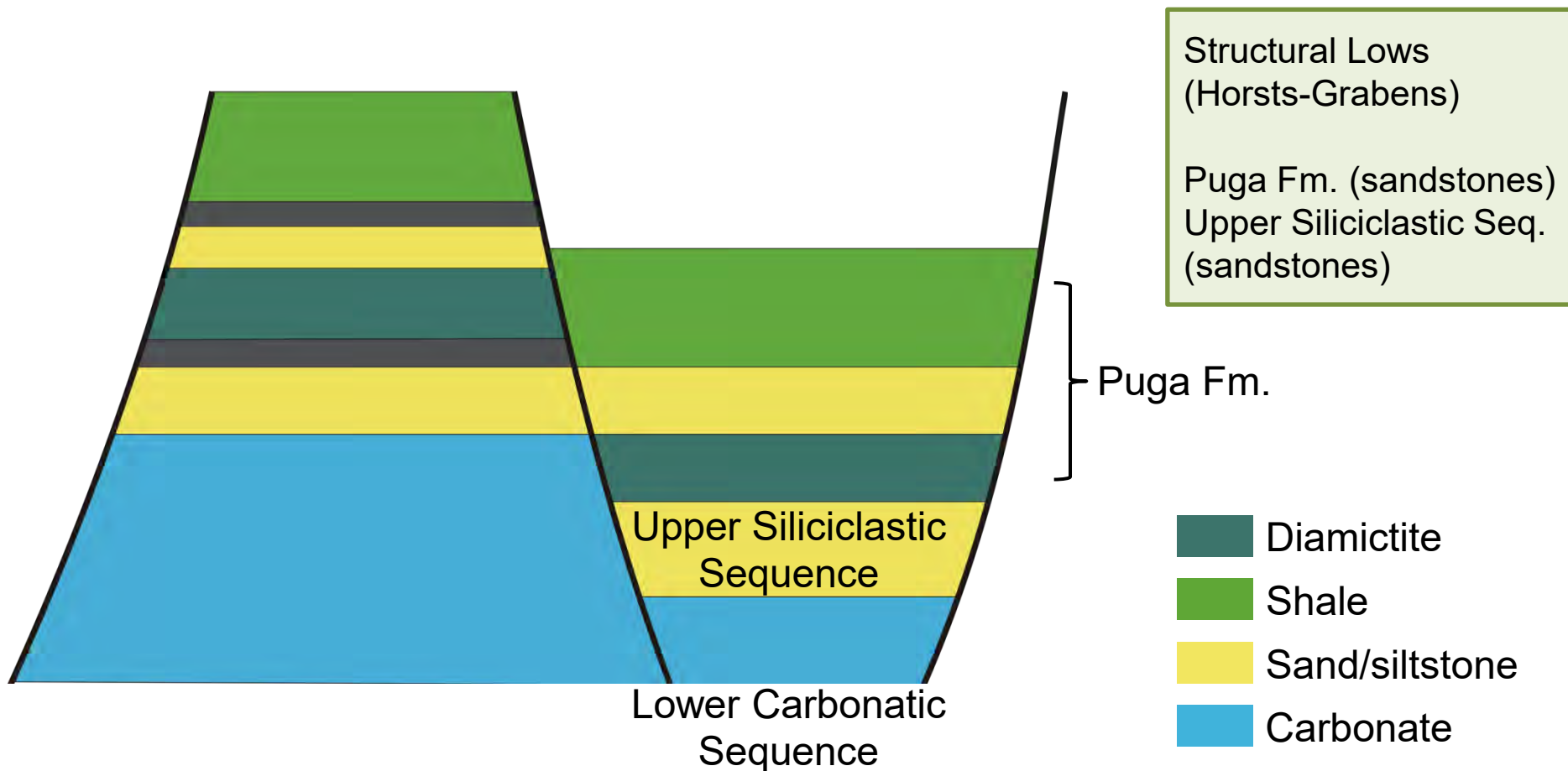
# Traps



# Traps



# Traps



## Plays

Neoproterozoic sandstones (Raizama Fm.)

Neoproterozoic carbonates (Araras Gr.)

Neoproterozoic sandstones (Puga Fm.)

Neoproterozoic sandstones (Upper Siliciclastic Seq.)

Location

Infraestruture and Operational Conditions

Exploration Overview

Tectonostratigraphic Evolution

Petroleum Systems

Plays

**Proterozoic Basins E&P**

Area on Offer

Final Remarks

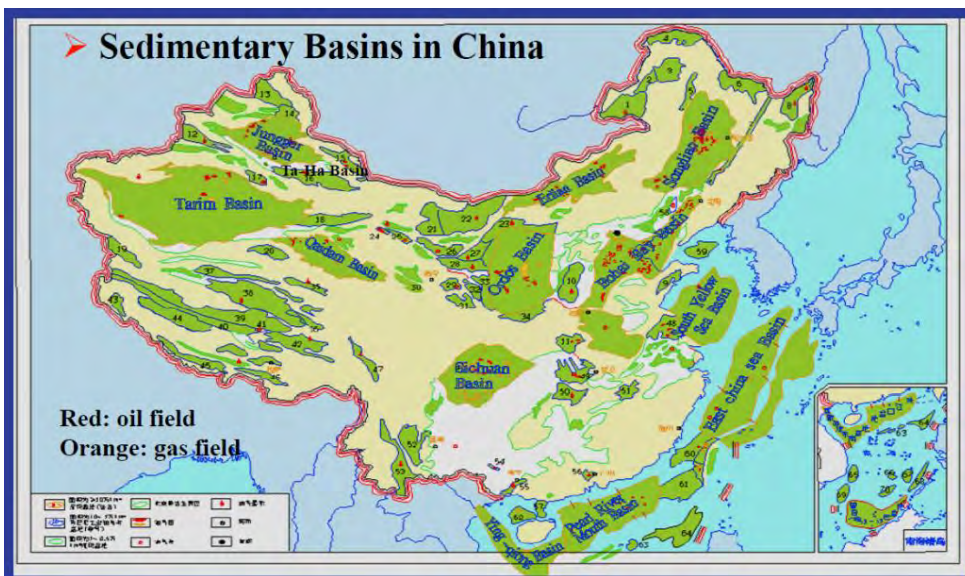
## Hydrocarbons discoveries reported in several basins

- Russia
- Oman
- China
- Australia

## Lena-Tunguska Petroleum Province Russia

- More than 20 discoveries
- Bigger volumes on the proterozoic section
- Structural and stratigraphic traps
- Mainly gas

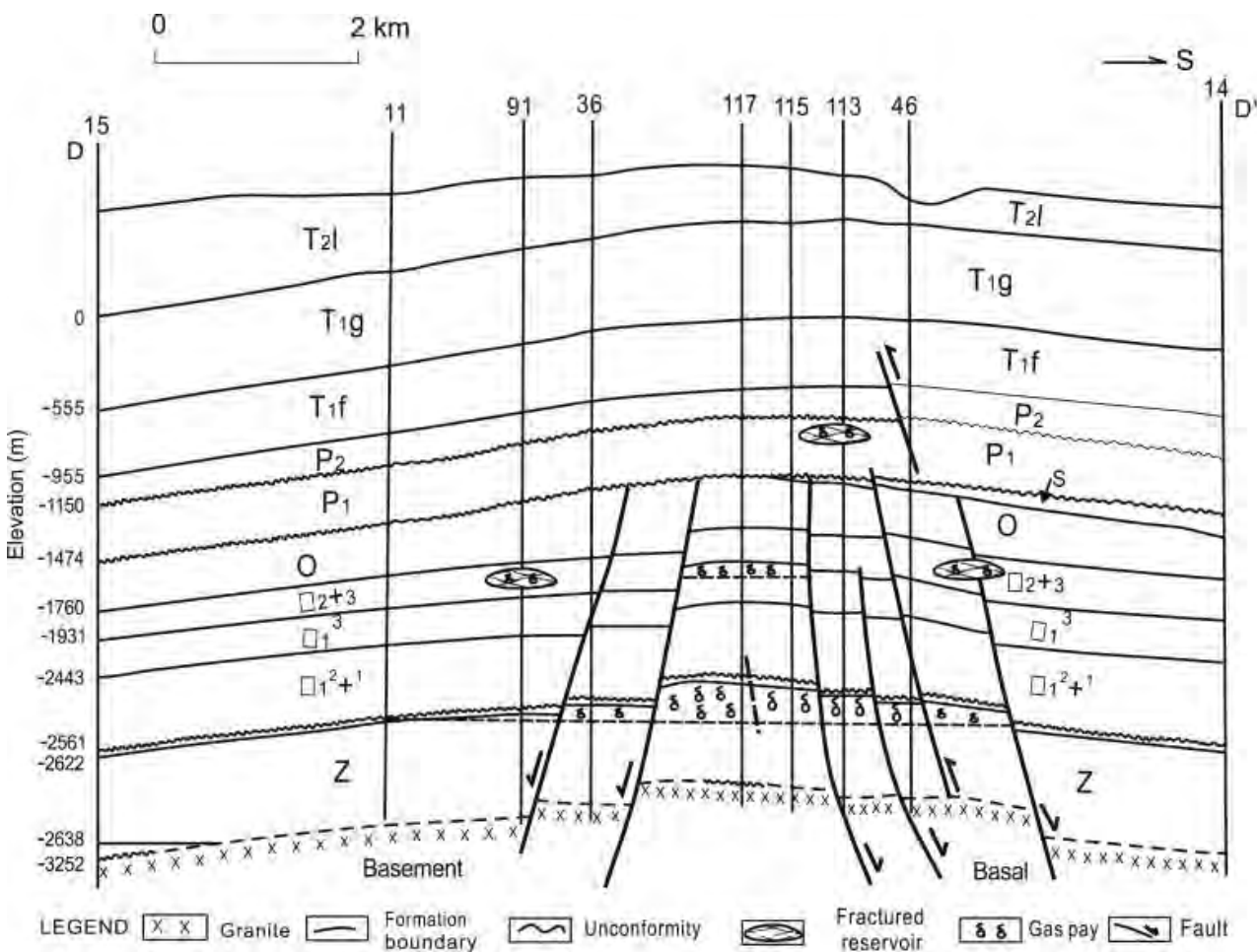
## Sichuan Basin - China



**Source rocks:** proterozoic carbonates

**Reservoir rock:**  
Proterozoic fractured dolomite  
Porosity: 3.5-4.5%  
Permeability: 0.1-2.0 mD

# Proterozoic Basins E&P



**Sichuan Basin  
China**

**Weiyan Gas Field**

Anticline  
800 m of thickness  
895 km<sup>2</sup> of area

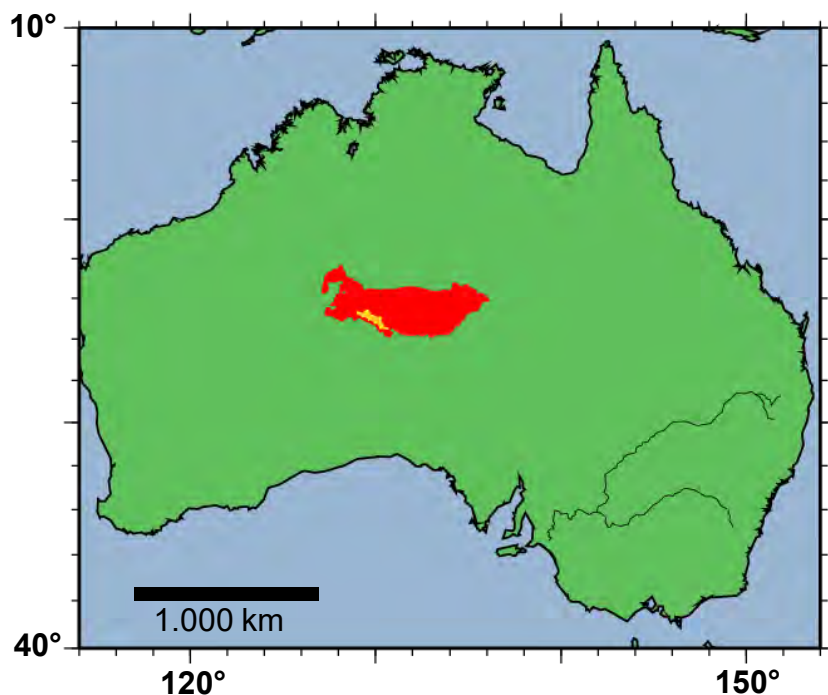
Guoqi Wei *et al.*, 2008

# Proterozoic Basins E&P

## Amadeus Basin Australia

1 Magee well – 2,342 m  
(63.1 Mscfd)

Unidentified source rock on the  
well – migration from deeper areas  
of the basin

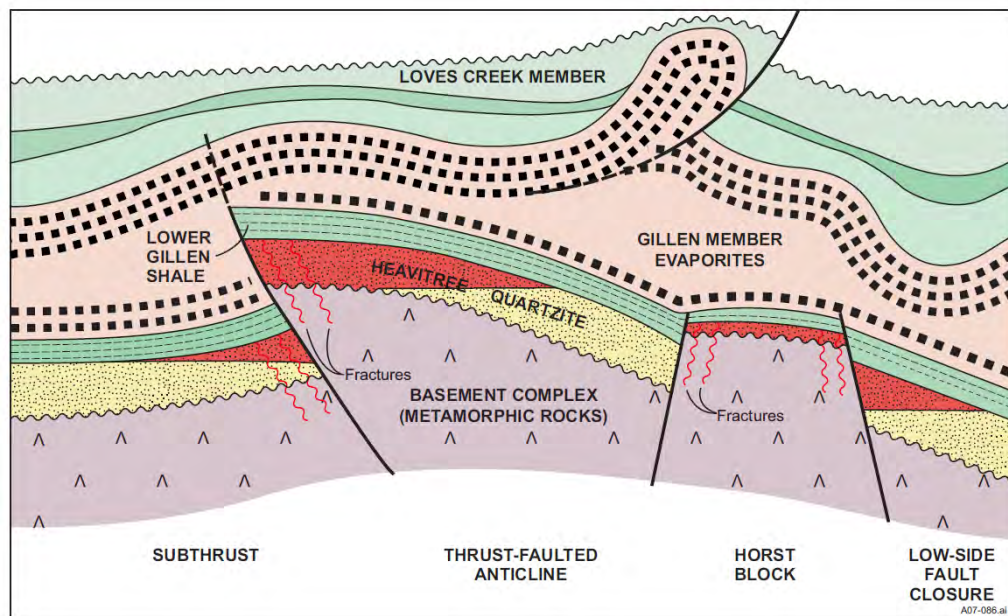


Heine, 2008

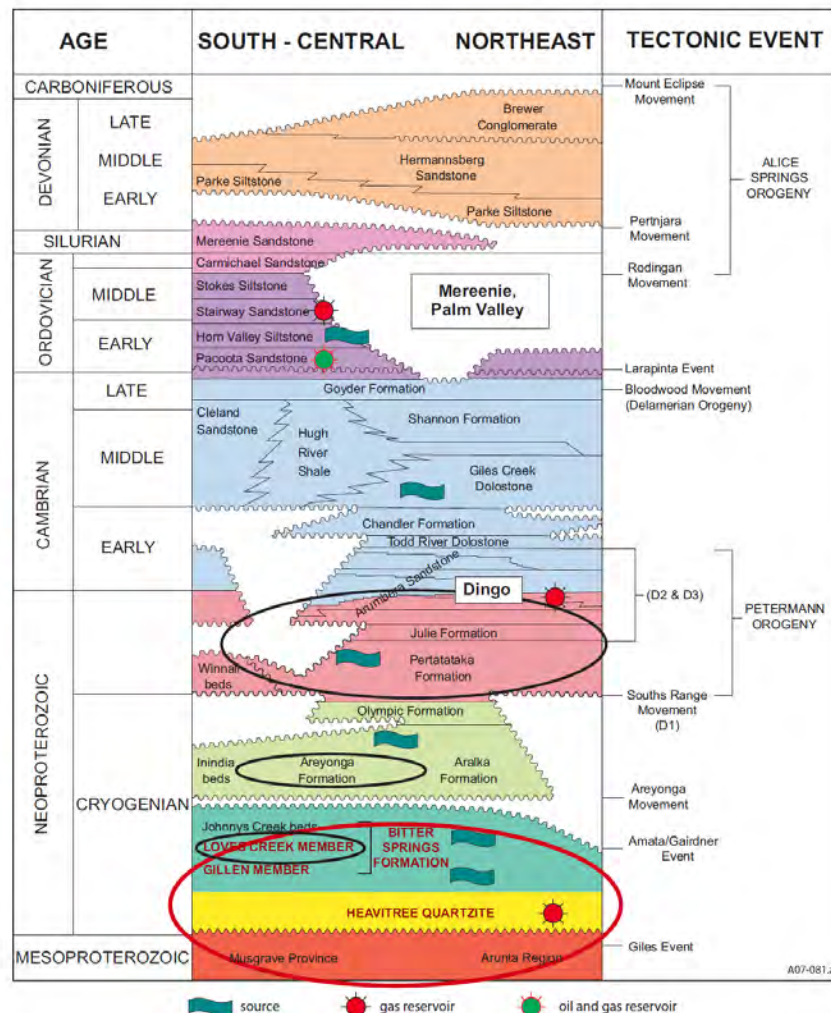
Wakelin-King, 1994

# Proterozoic Basins E&P

## Amadeus Basin Australia



Young & Ambrose, 2007



Location

Infraestruture and Operational Conditions

Exploration Overview

Tectonostratigraphic Evolution

Petroleum Systems

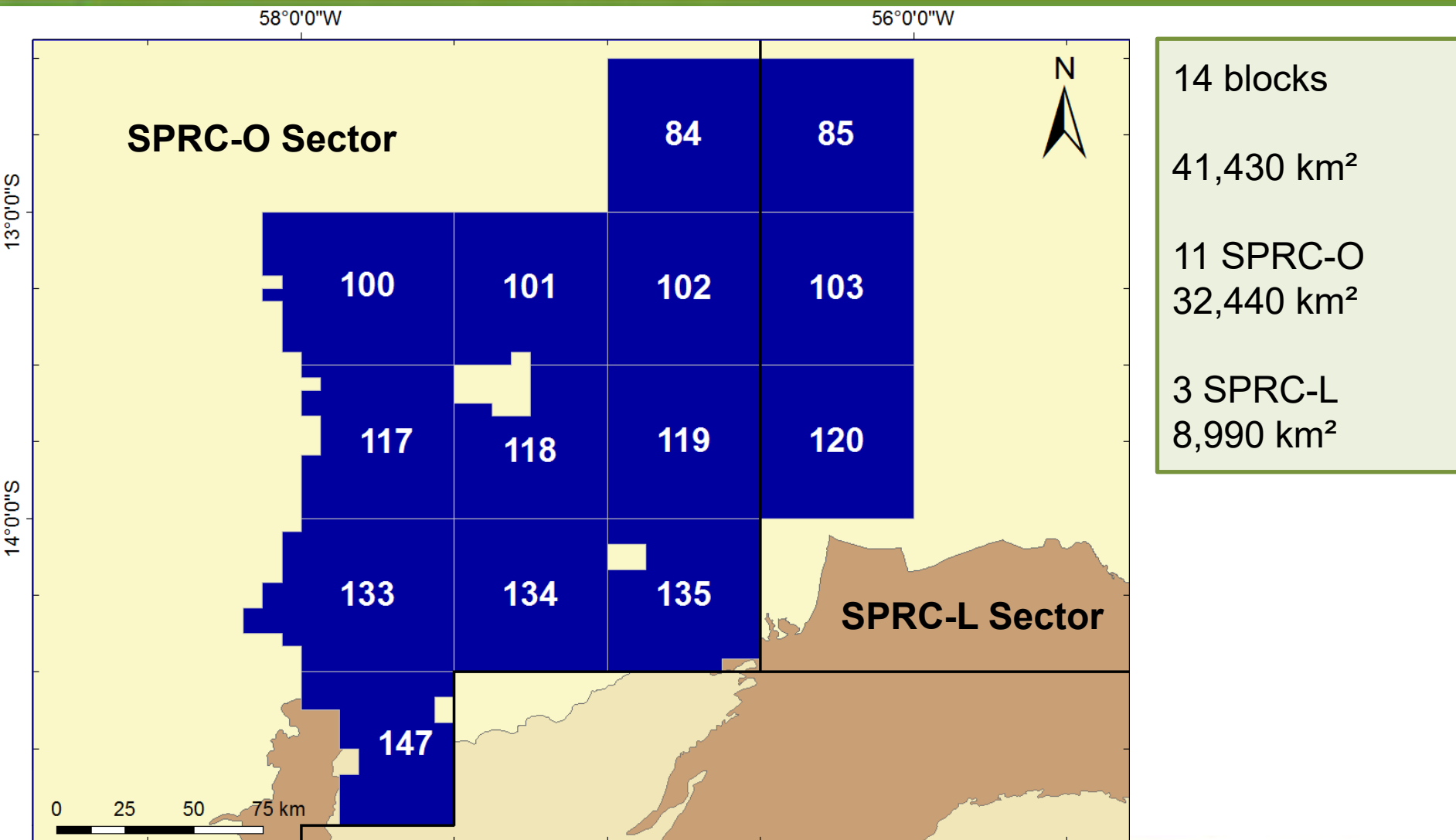
Plays

Proterozoic Basins E&P

**Area on Offer**

Final Remarks

# Area on Offer



# Leads

**Line 0295-0001**

0 30 km

135

119

120

103

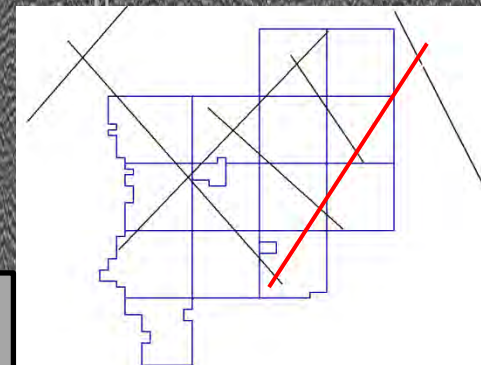
1.000 ms

2.000

3.000

4.000

— Paleozoic Base	— Araras Gr.	— Raizama Fm.	— L.C.S. Base
— Sepotuba Fm.	— Puga Fm.	— Serra Azul Fm.	— Basement



# Leads

**Line 0295-0001**

0 30 km

135

119

120

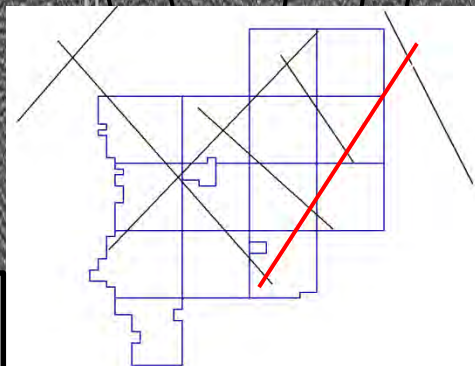
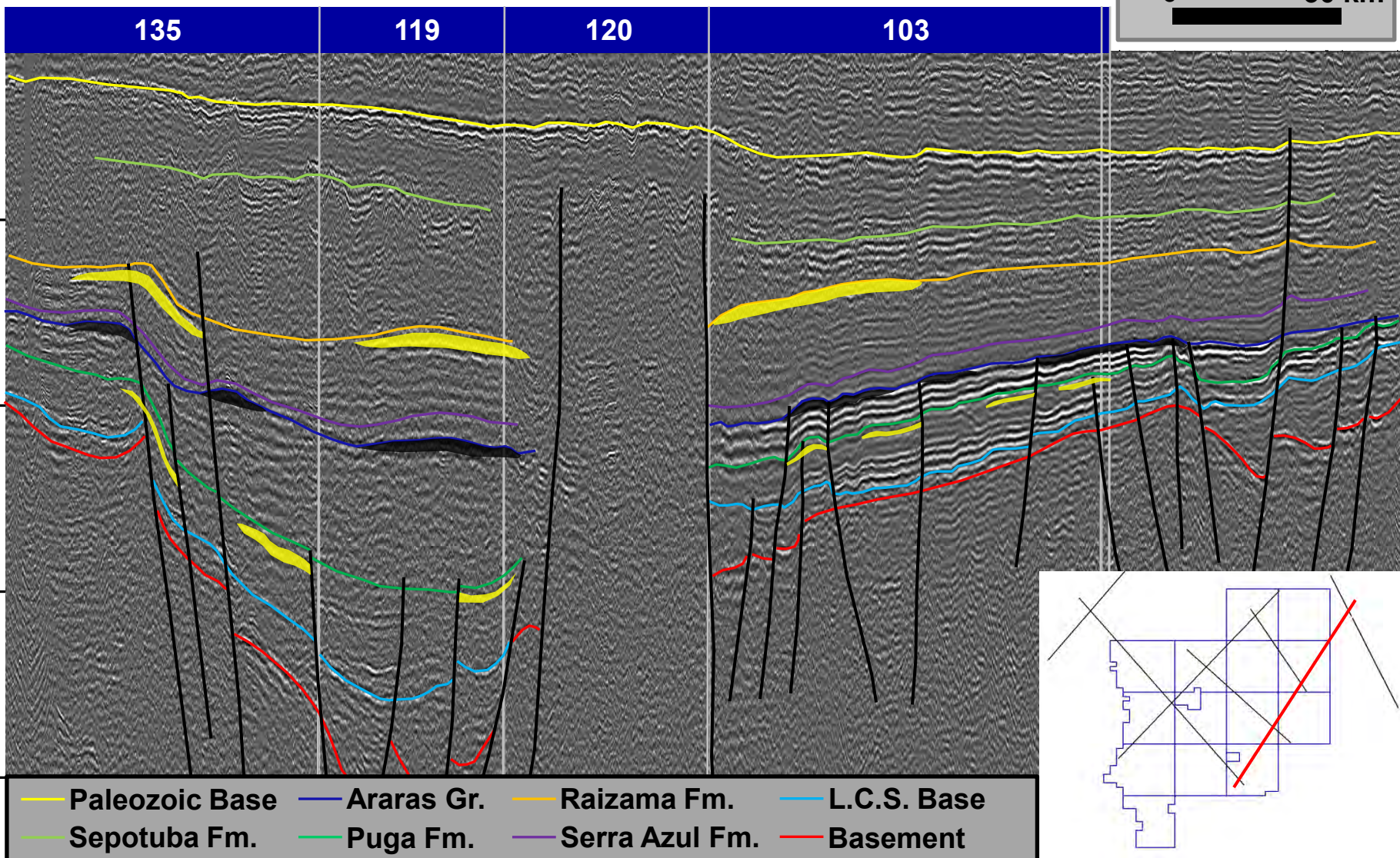
103

1.000 ms

2.000

3.000

4.000





**anp**  
National Agency  
of Petroleum,  
Natural Gas and Biofuels

**Brasil**  
**12<sup>th</sup> Round**  
Oil & Gas Bidding Rounds

# Leads

**Line 0295-0001**

0 30 km

135

119

120

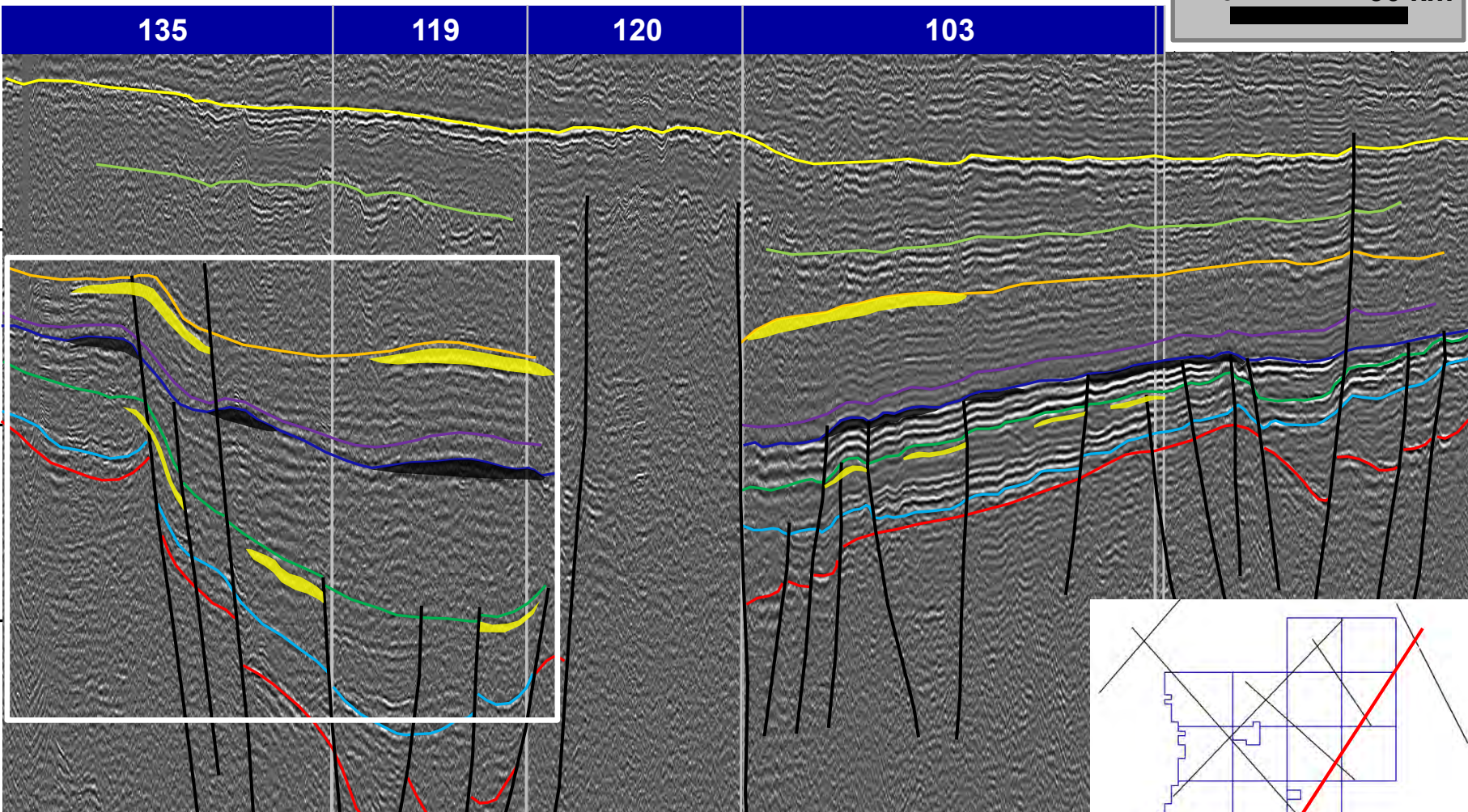
103

1.000 ms

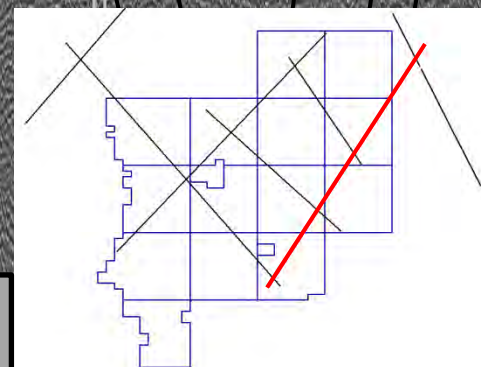
2.000

3.000

4.000



— Paleozoic Base	— Araras Gr.	— Raizama Fm.	— L.C.S. Base
— Sepotuba Fm.	— Puga Fm.	— Serra Azul Fm.	— Basement



# Leads

**Line 0295-0001**

135

119

120

103

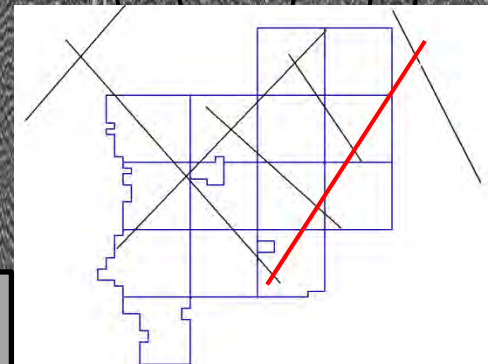
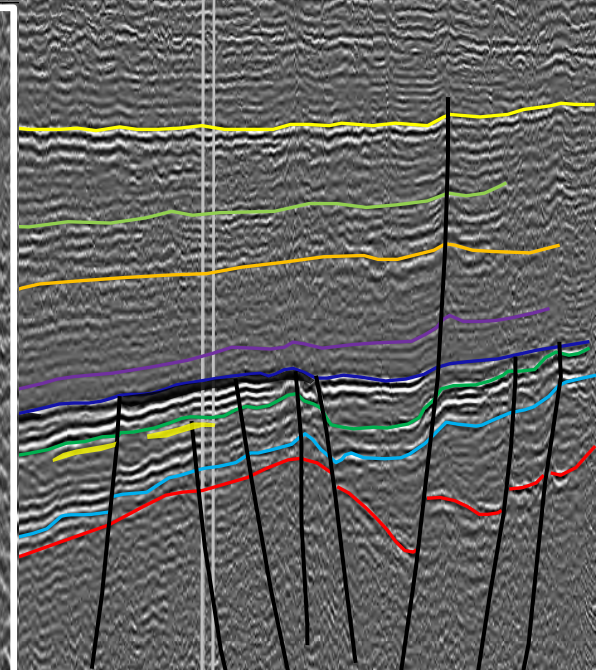
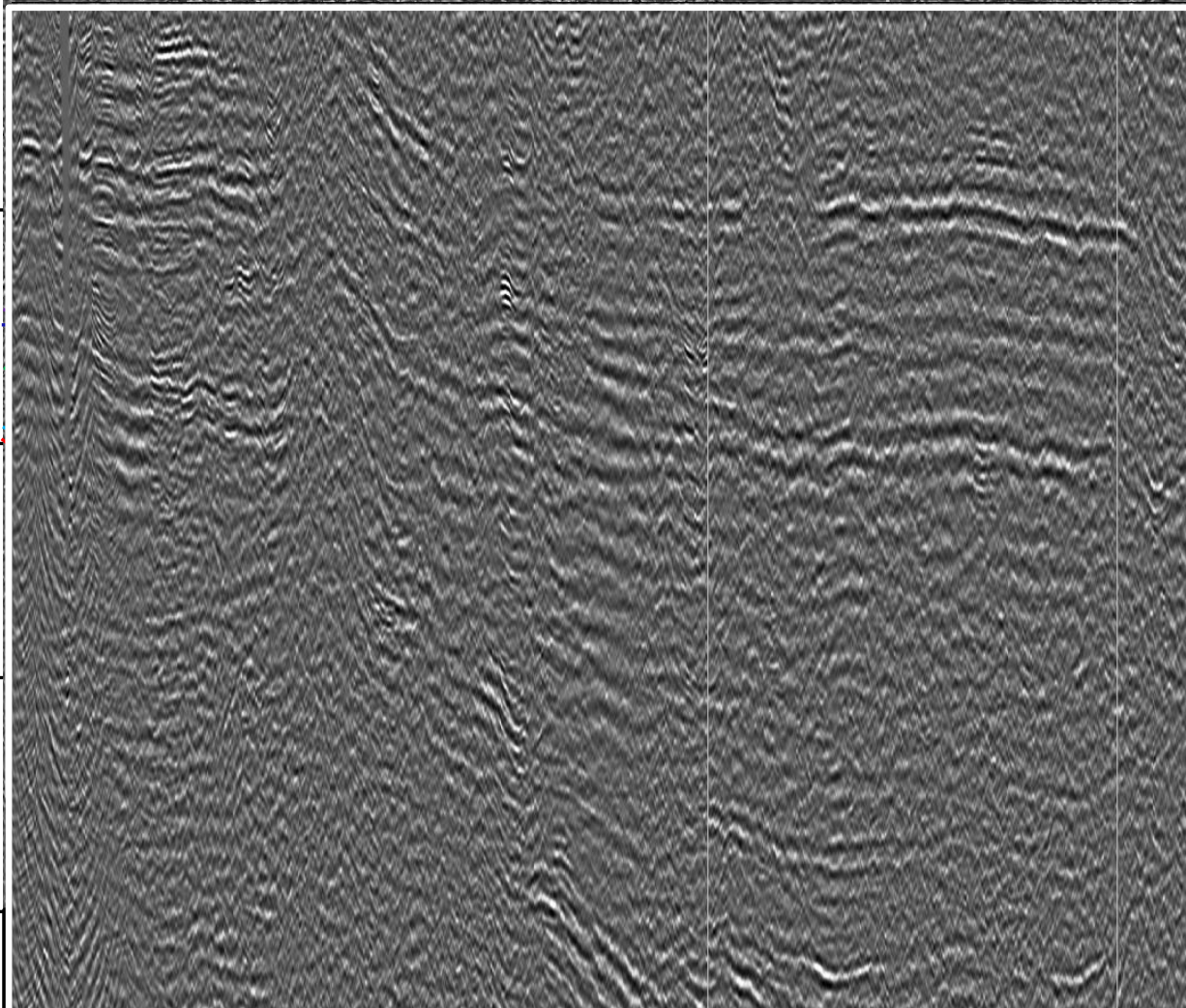
0 30 km

1.000 ms

2.000

3.000

4.000



se  
t

# Leads

Line 0295-0001

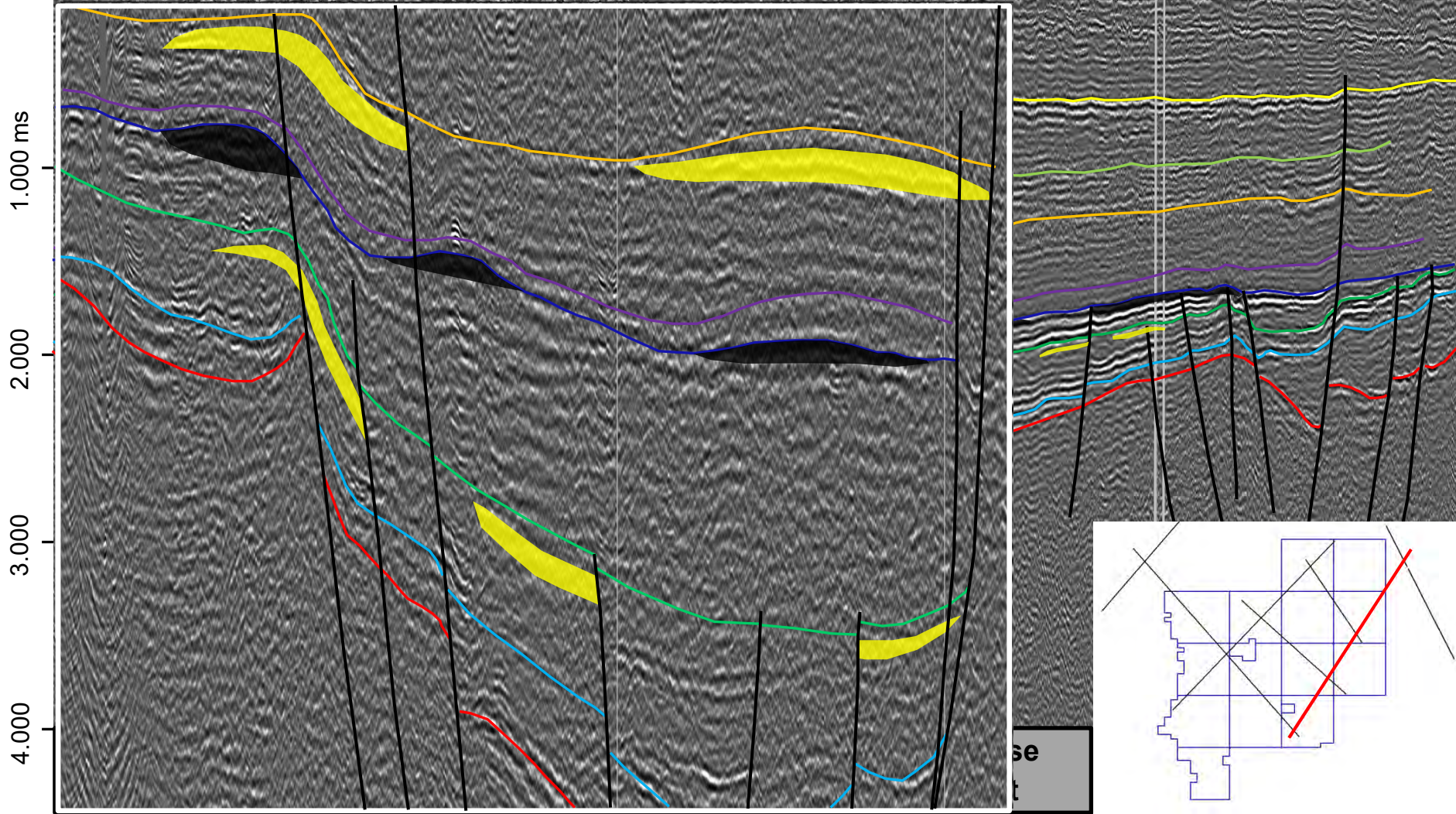
135

119

120

103

0 30 km



# Leads

**Line 0295-0001**

0 30 km

135

119

120

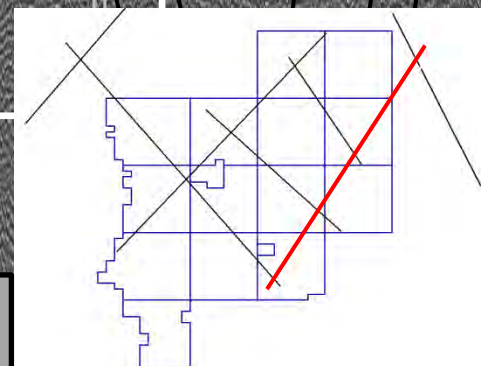
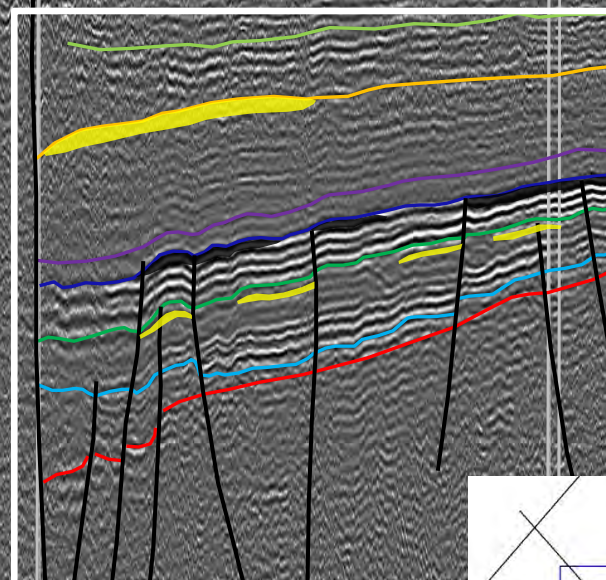
103









1.000 ms

2.000

3.000

4.000



 Paleozoic Base	 Araras Gr.	 Raizama Fm.	 L.C.S. Base
 Sepotuba Fm.	 Puga Fm.	 Serra Azul Fm.	 Basement

# Leads

Line 0295-0001

135

119

120

103

0 30 km

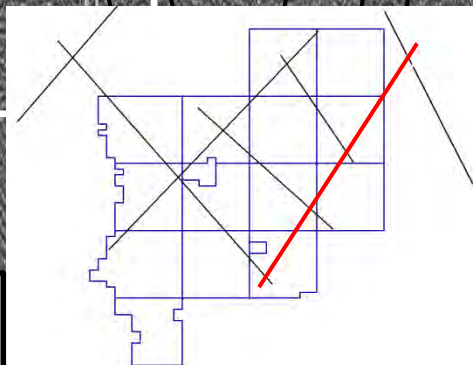
1.000 ms

2.000

3.000

4.000

C.S. Base  
asement



# Leads

Line 0295-0001

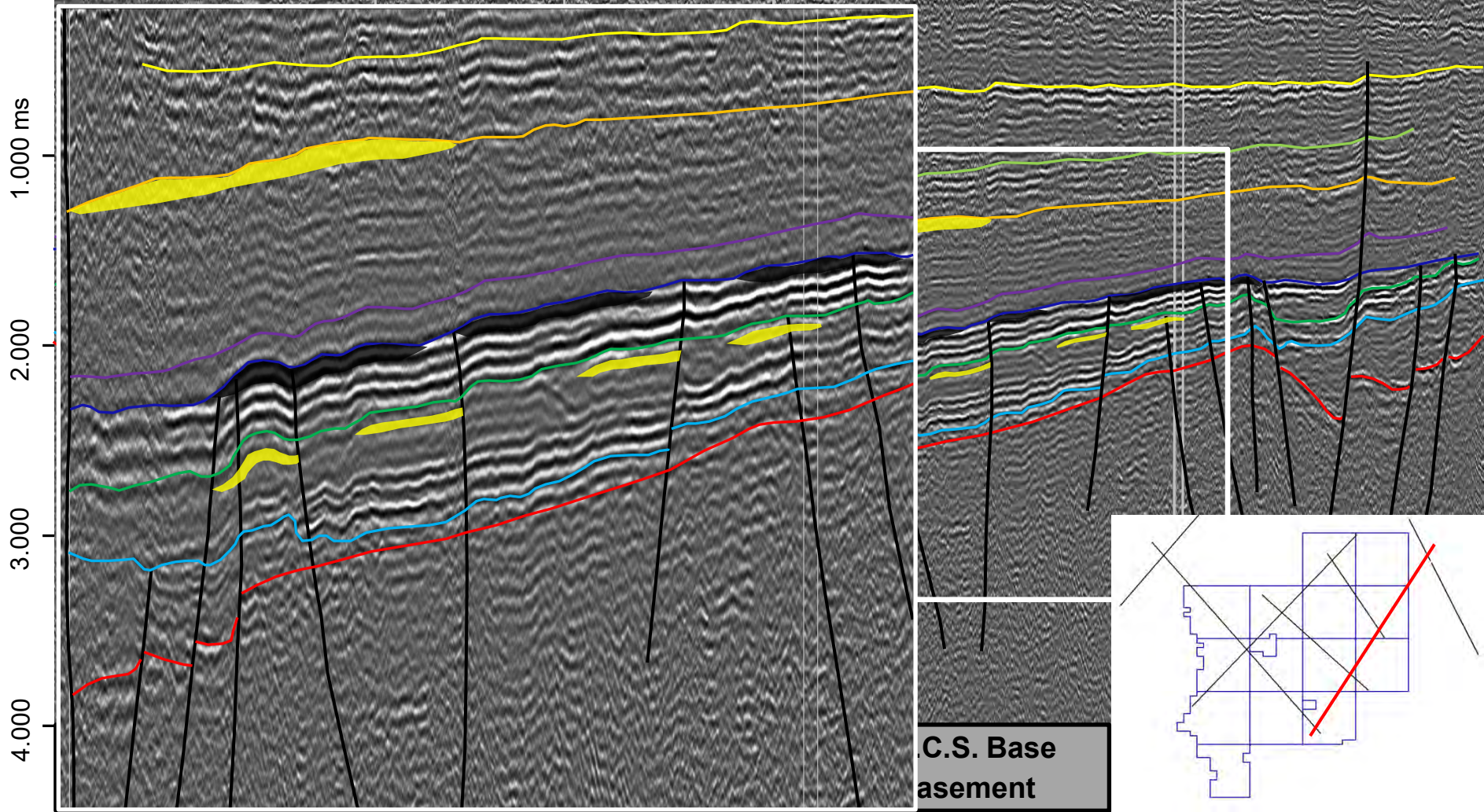
135

119

120

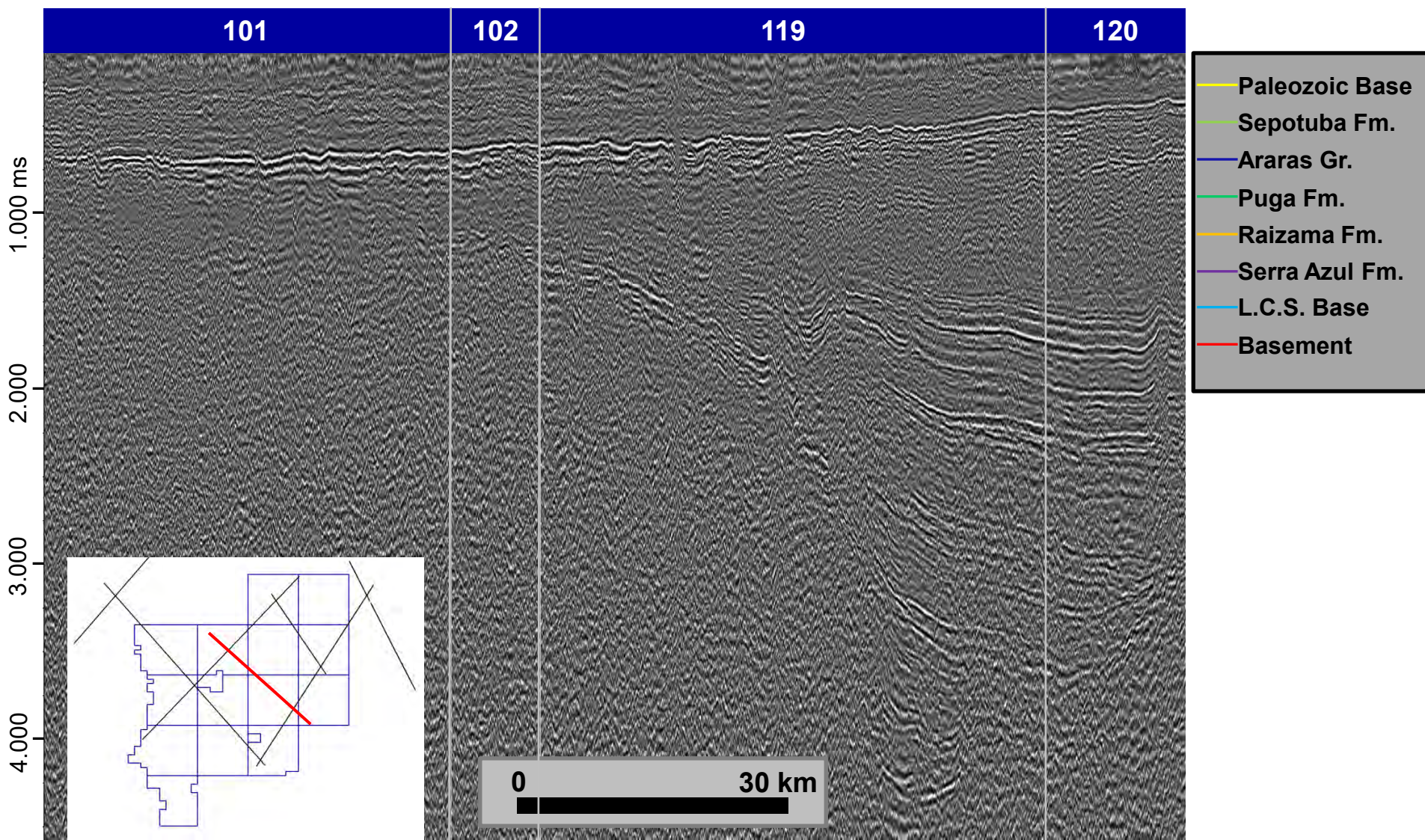
103

0 30 km



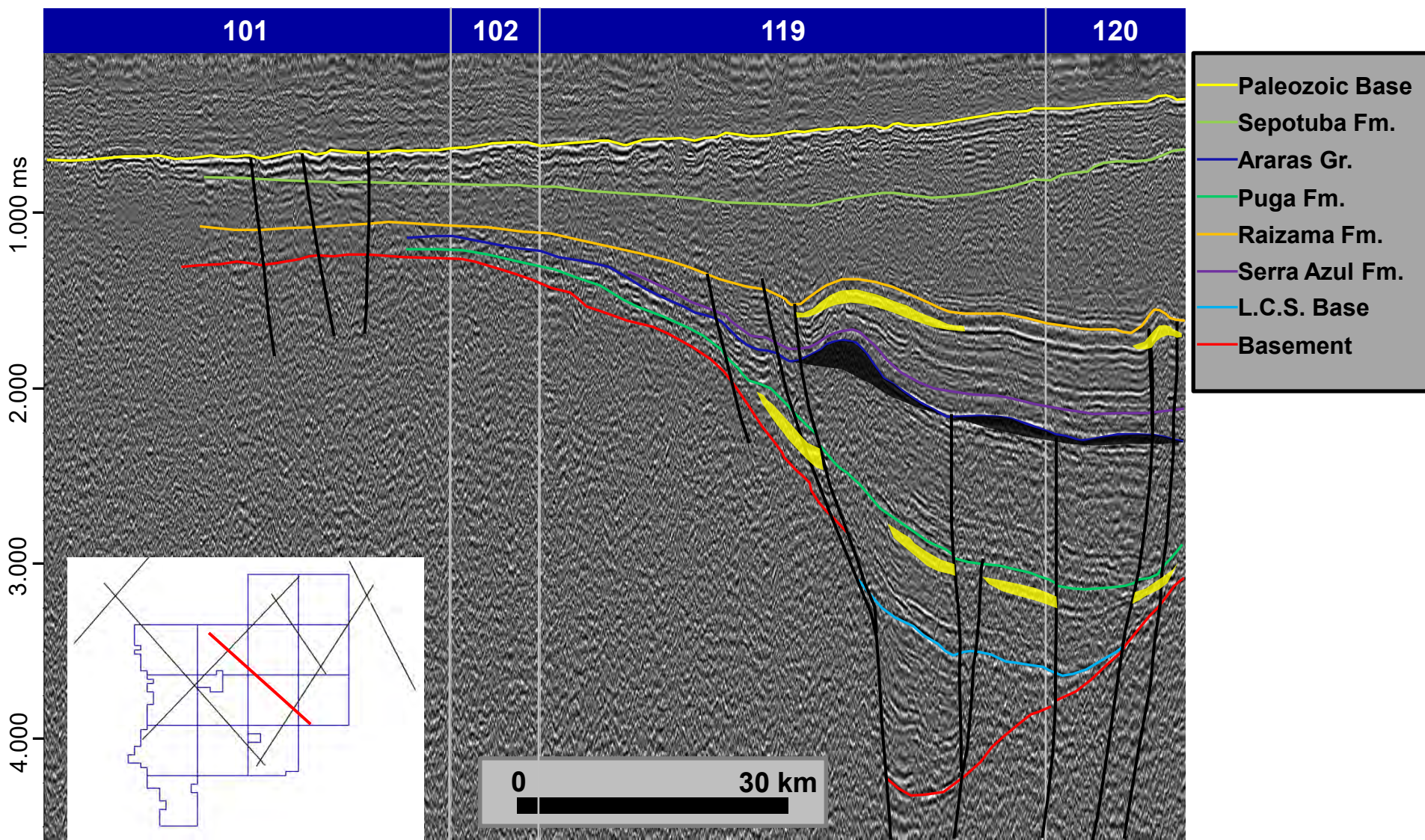
# Leads

**Line 0295-0006**



# Leads

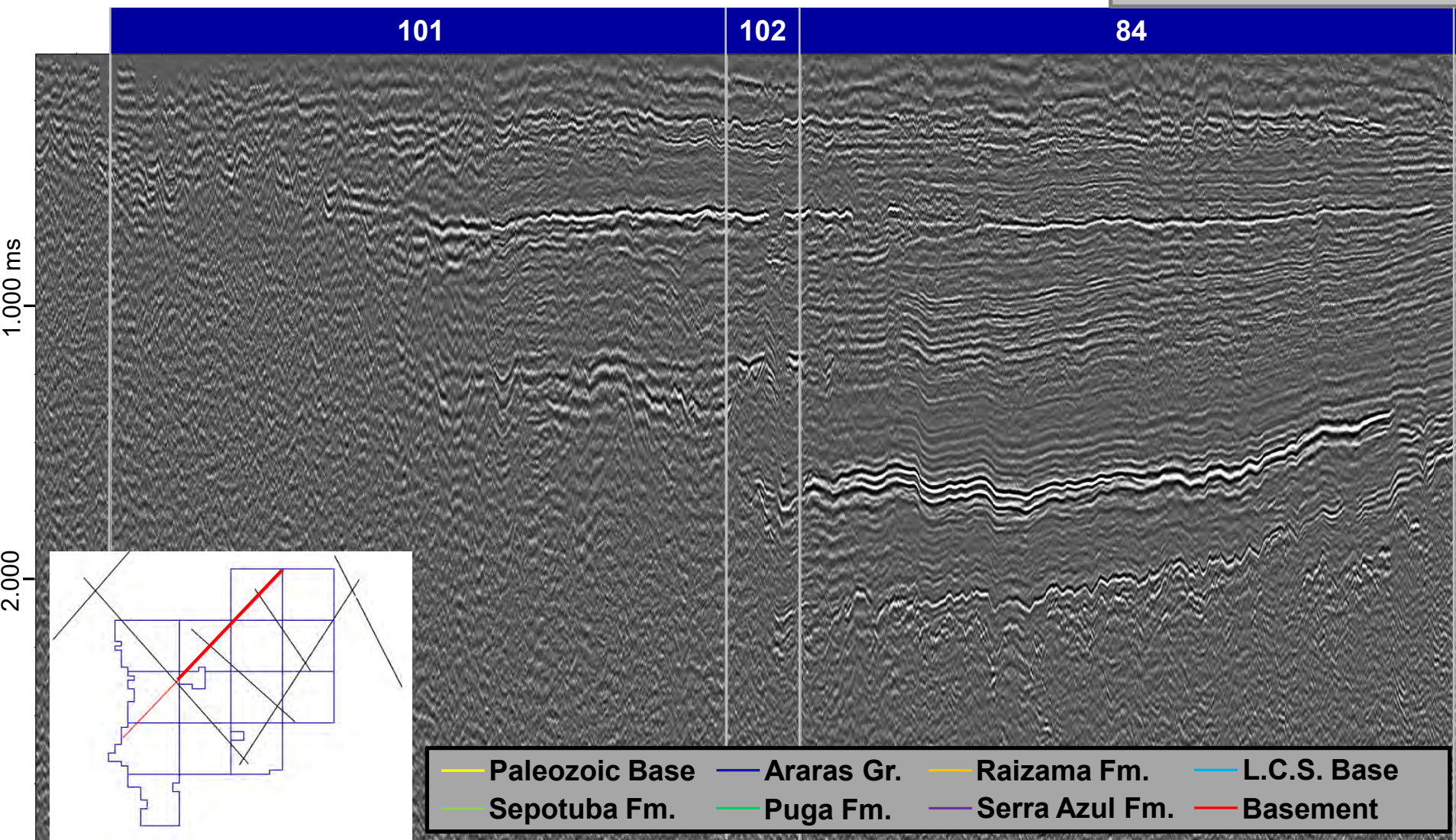
## Line 0295-0006



# Leads

**Line 0295-0002**

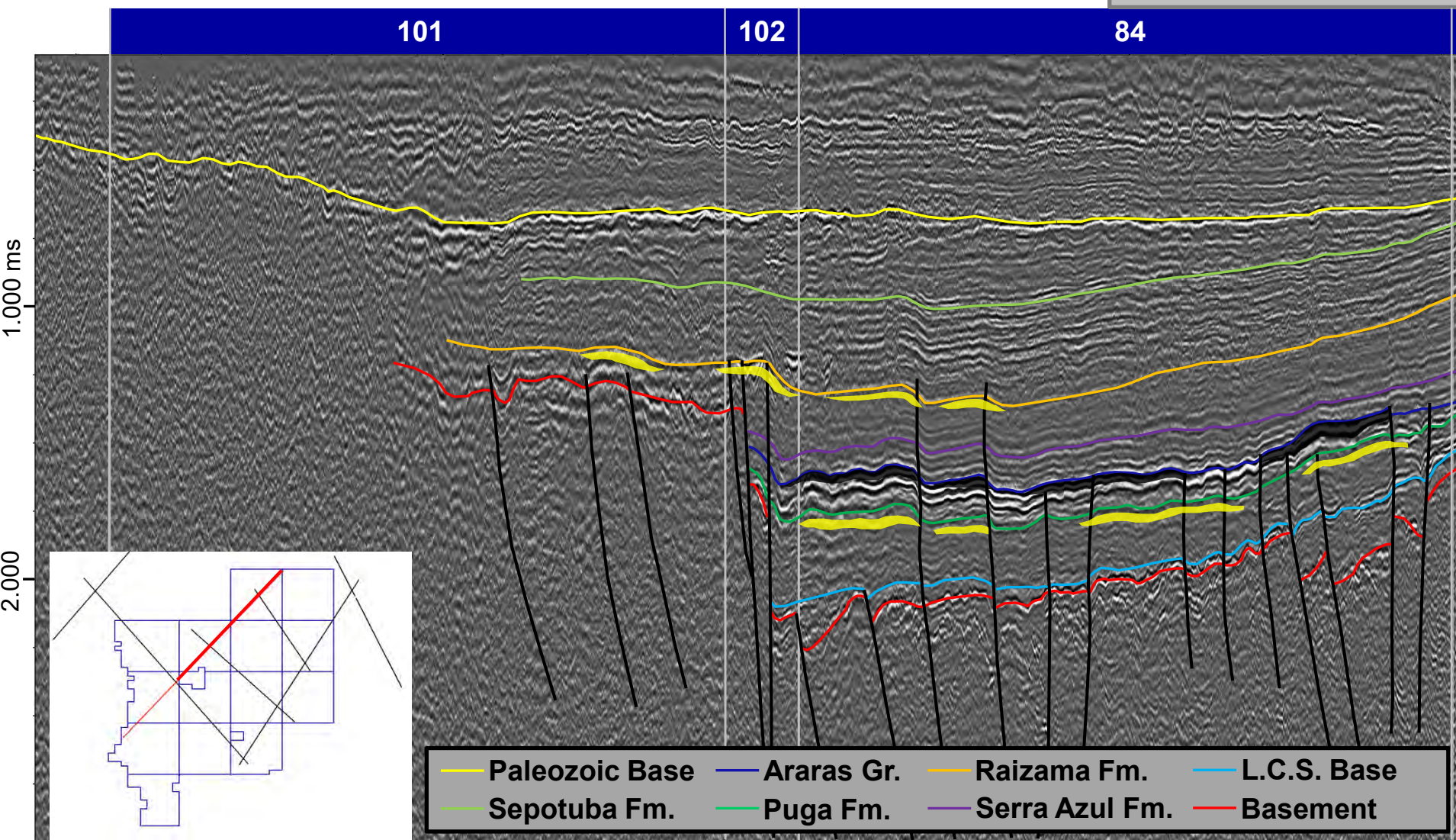
0 30 km



# Leads

**Line 0295-0002**

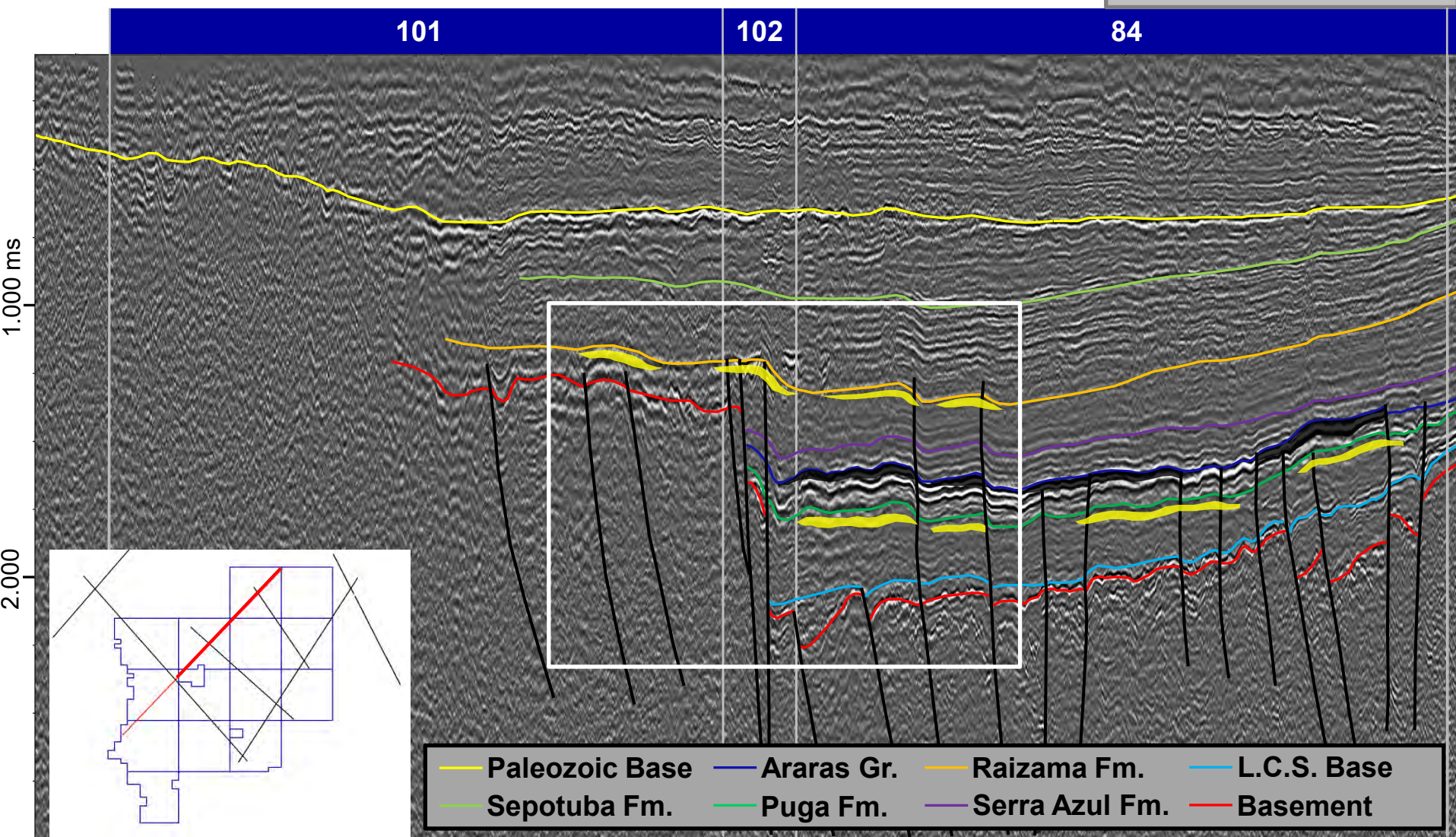
0 30 km



# Leads

Line 0295-0002

0 30 km



# Leads

Line 0295-0002

0 30 km

101

102

84

1.000 ms

2.000

ase  
nt

# Leads

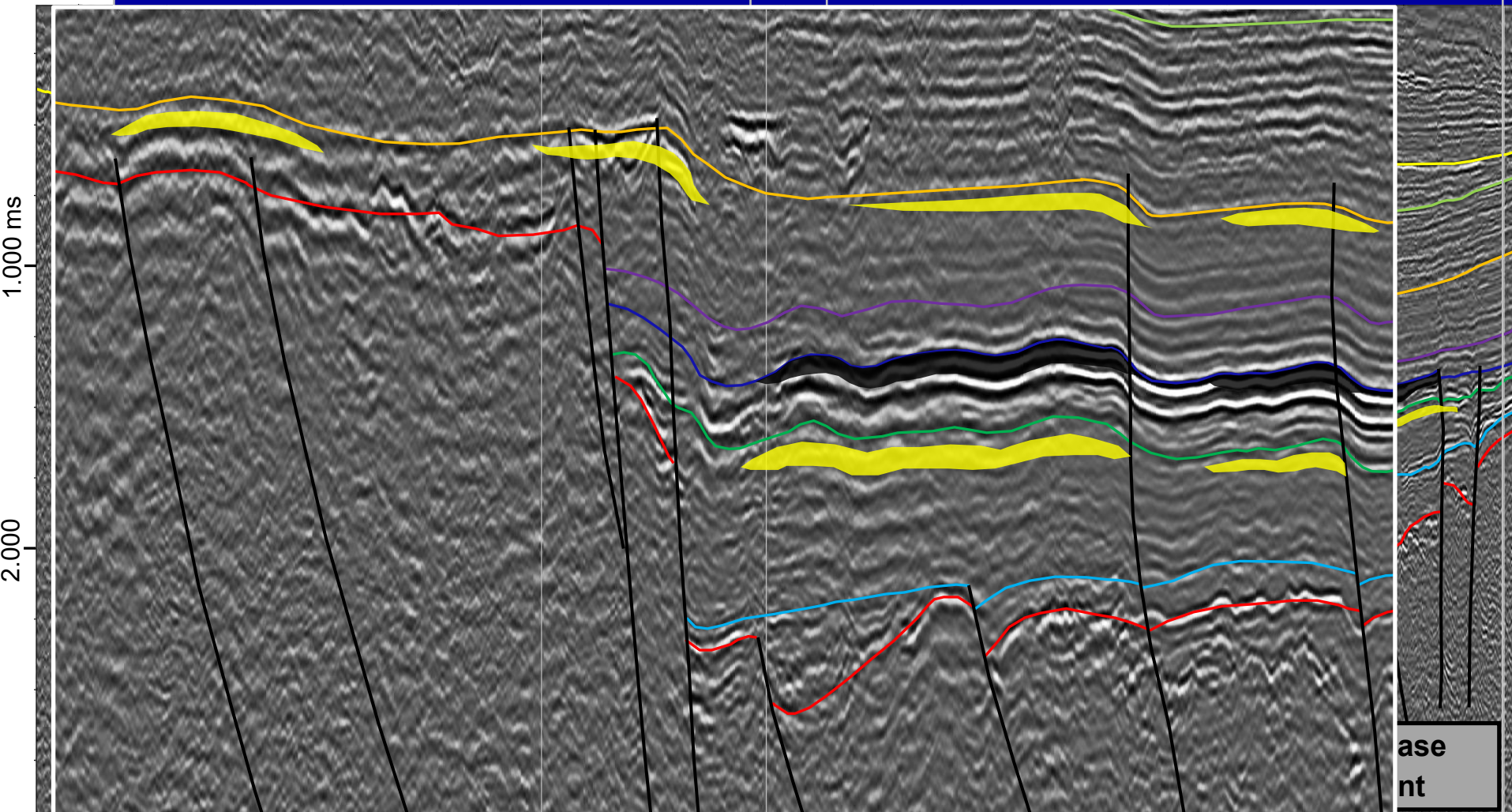
Line 0295-0002

0 30 km

101

102

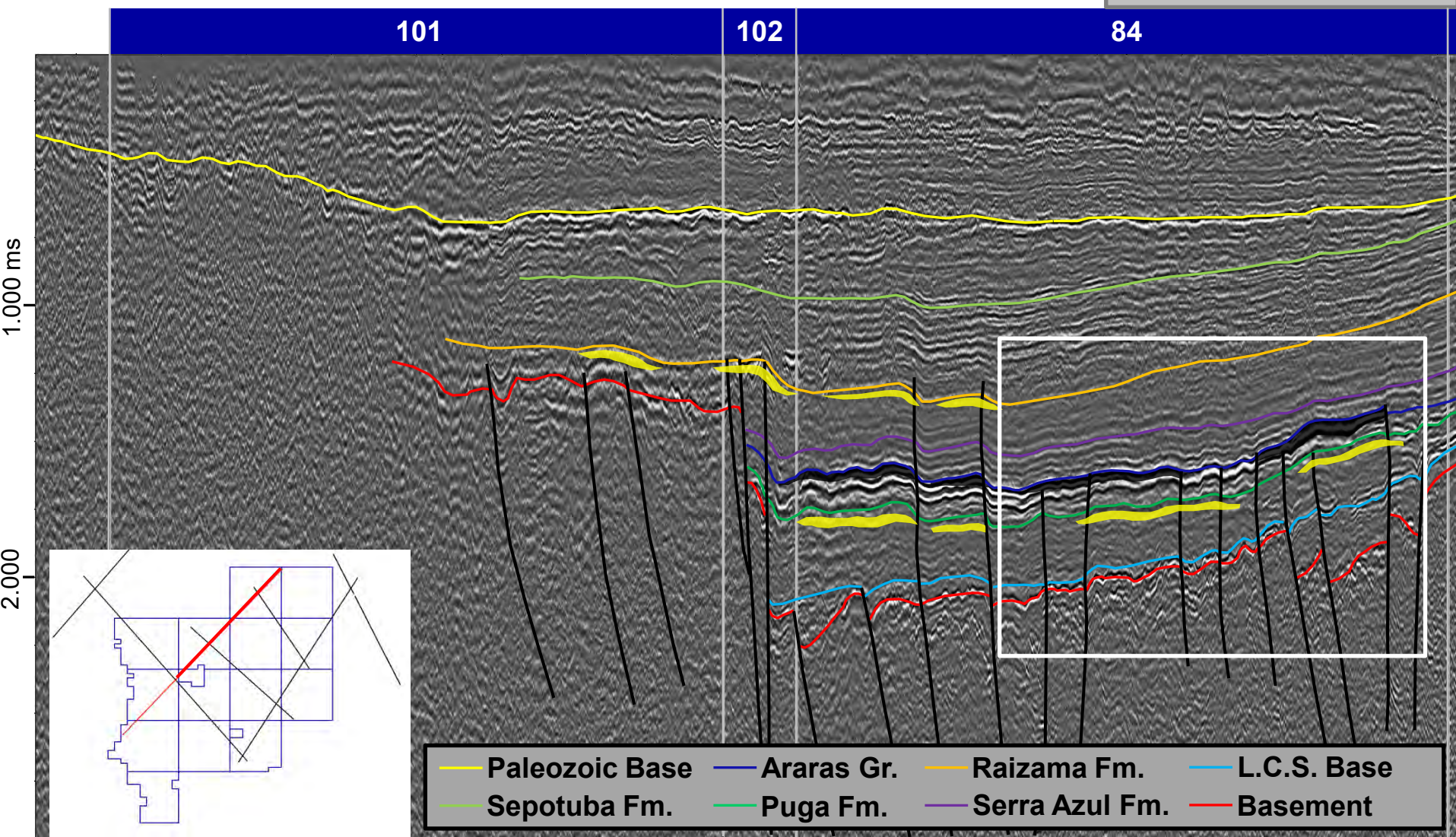
84



# Leads

Line 0295-0002

0 30 km



# Leads

**Line 0295-0002**

0 30 km

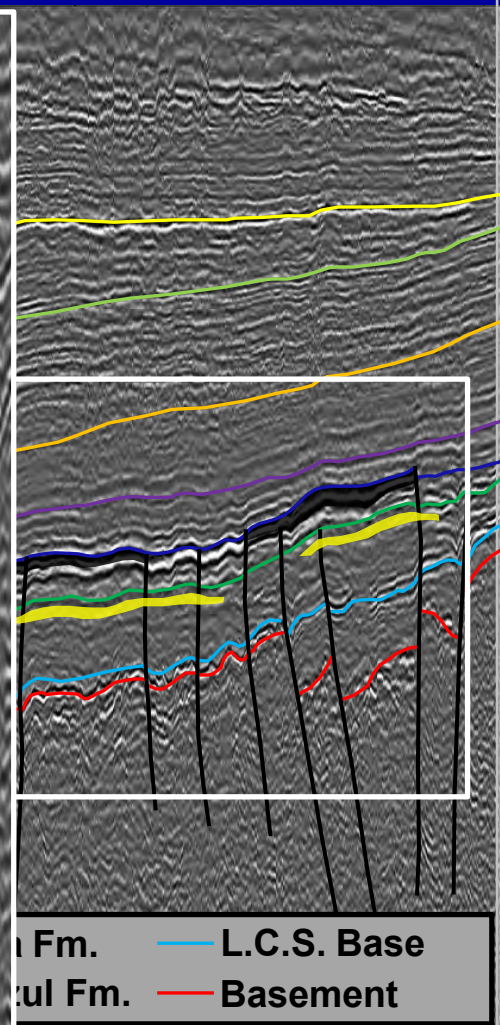
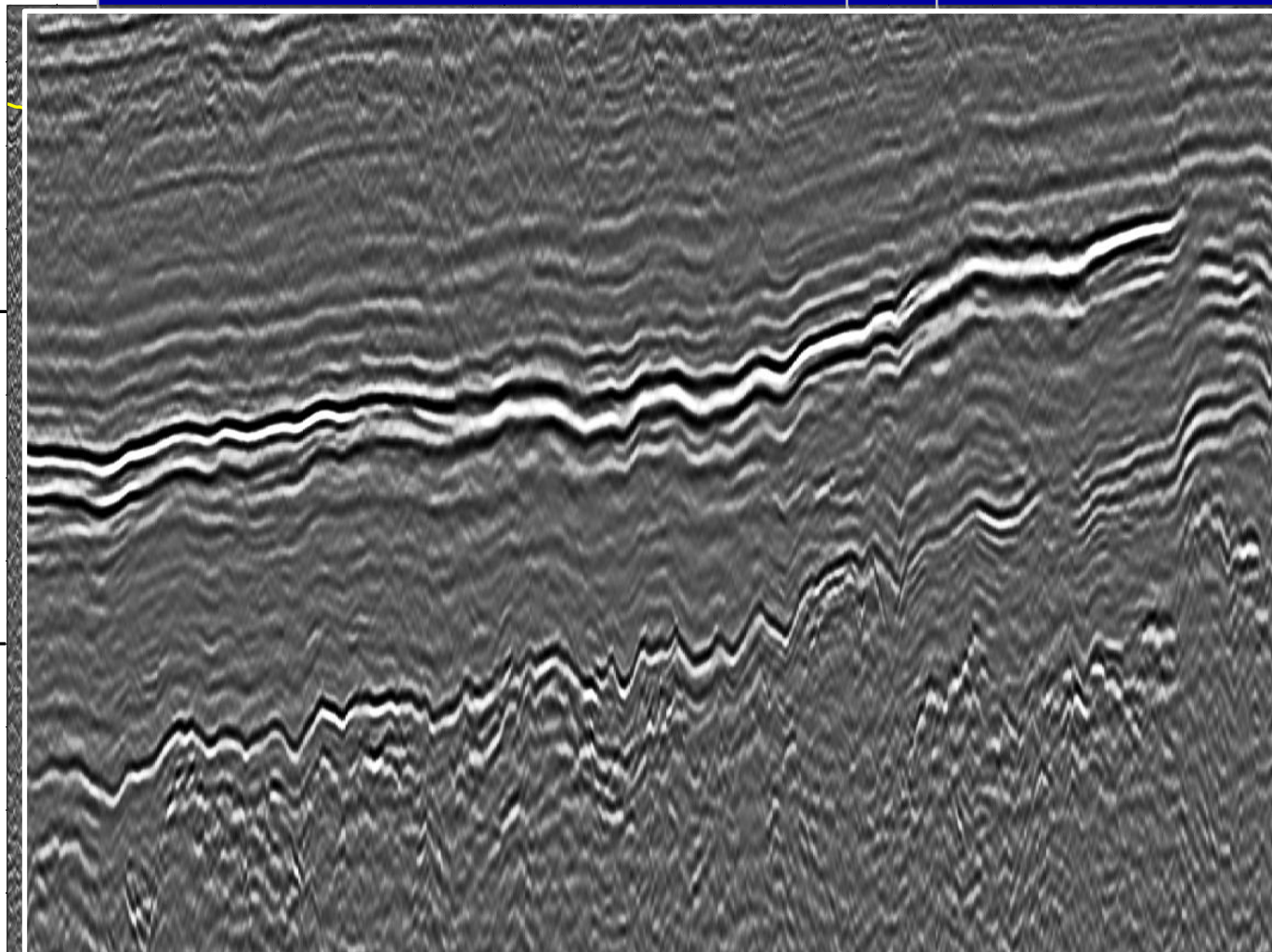
101

102

84

1,000 ms

2,000



# Leads

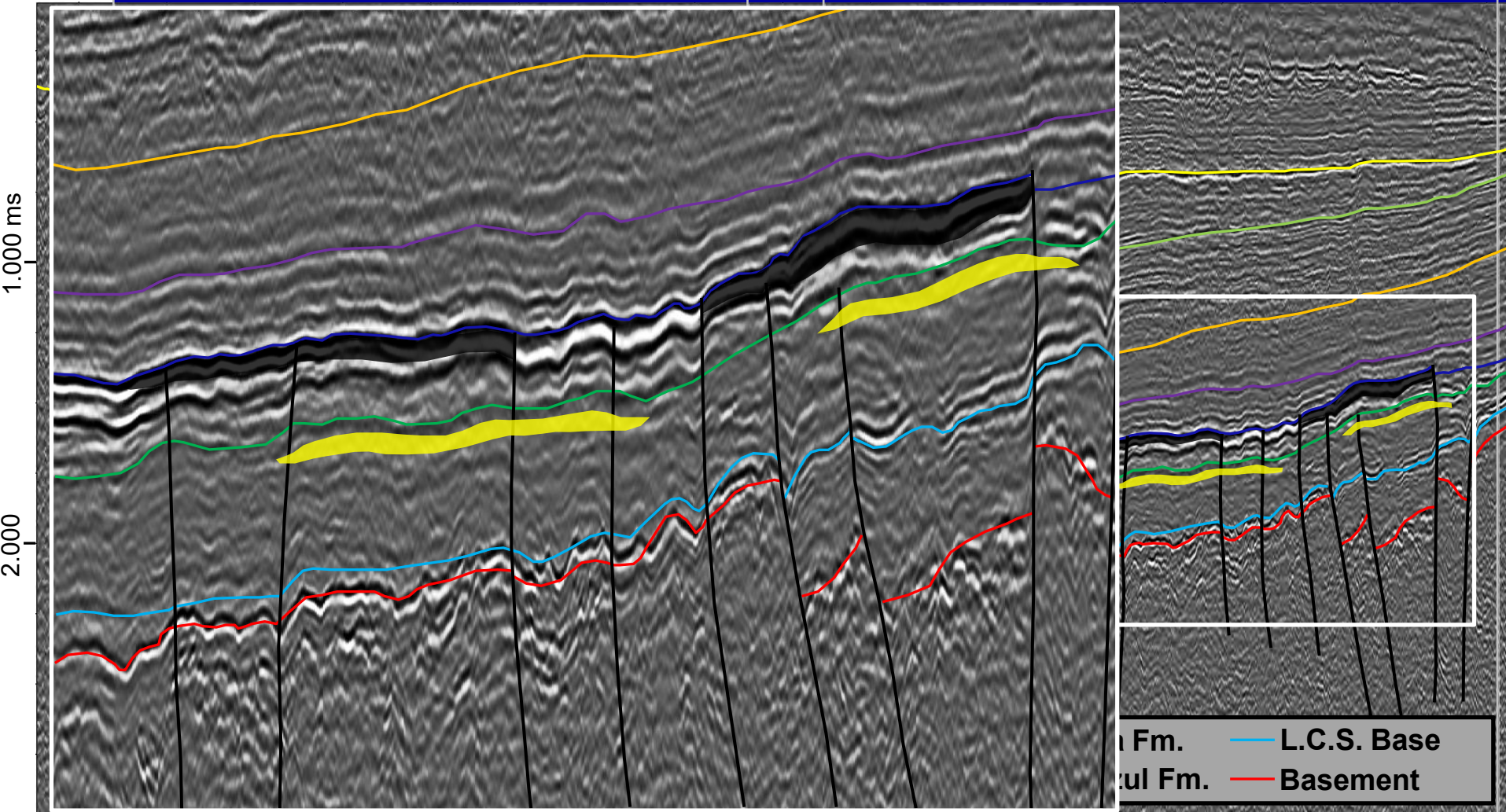
**Line 0295-0002**

0 30 km

101

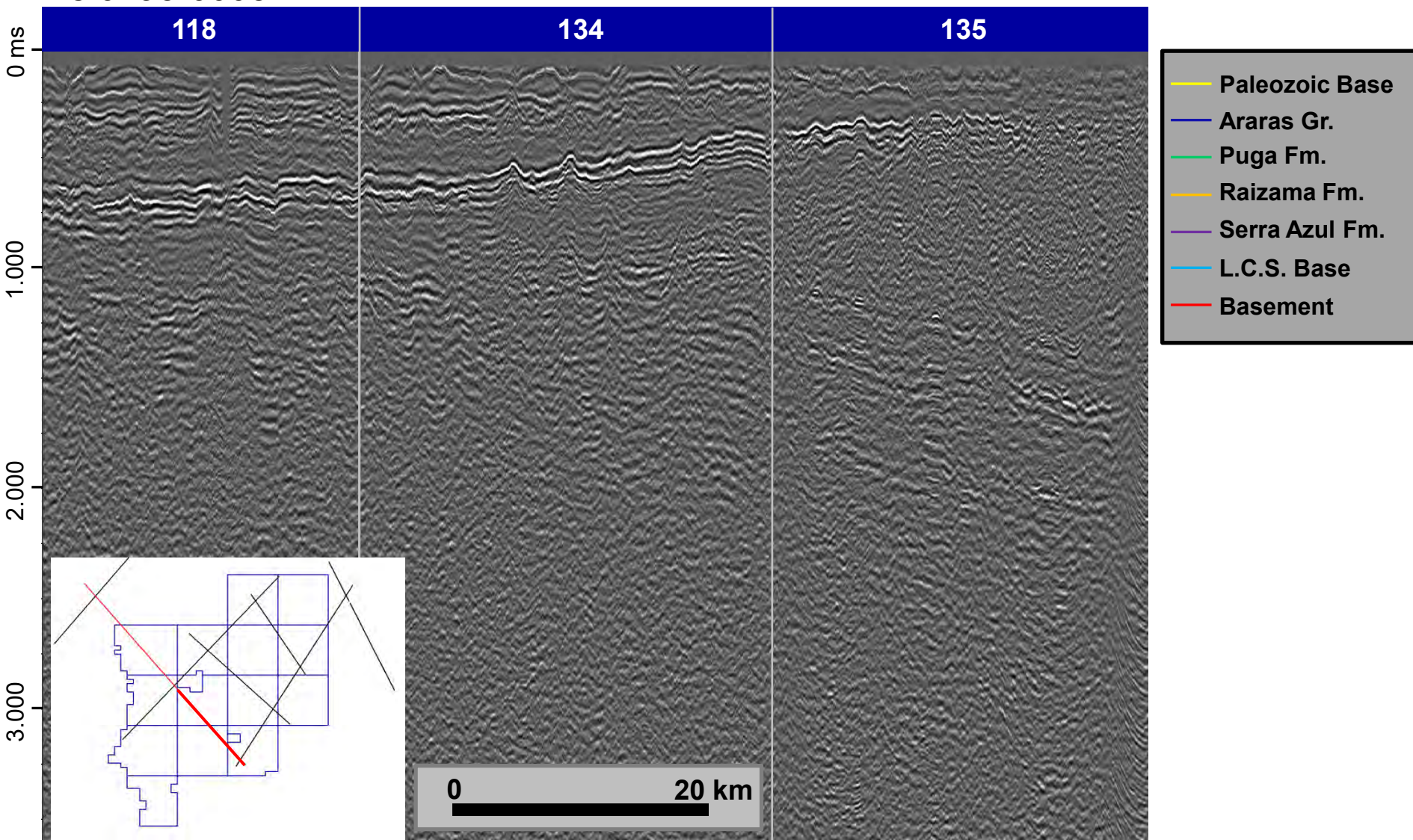
102

84



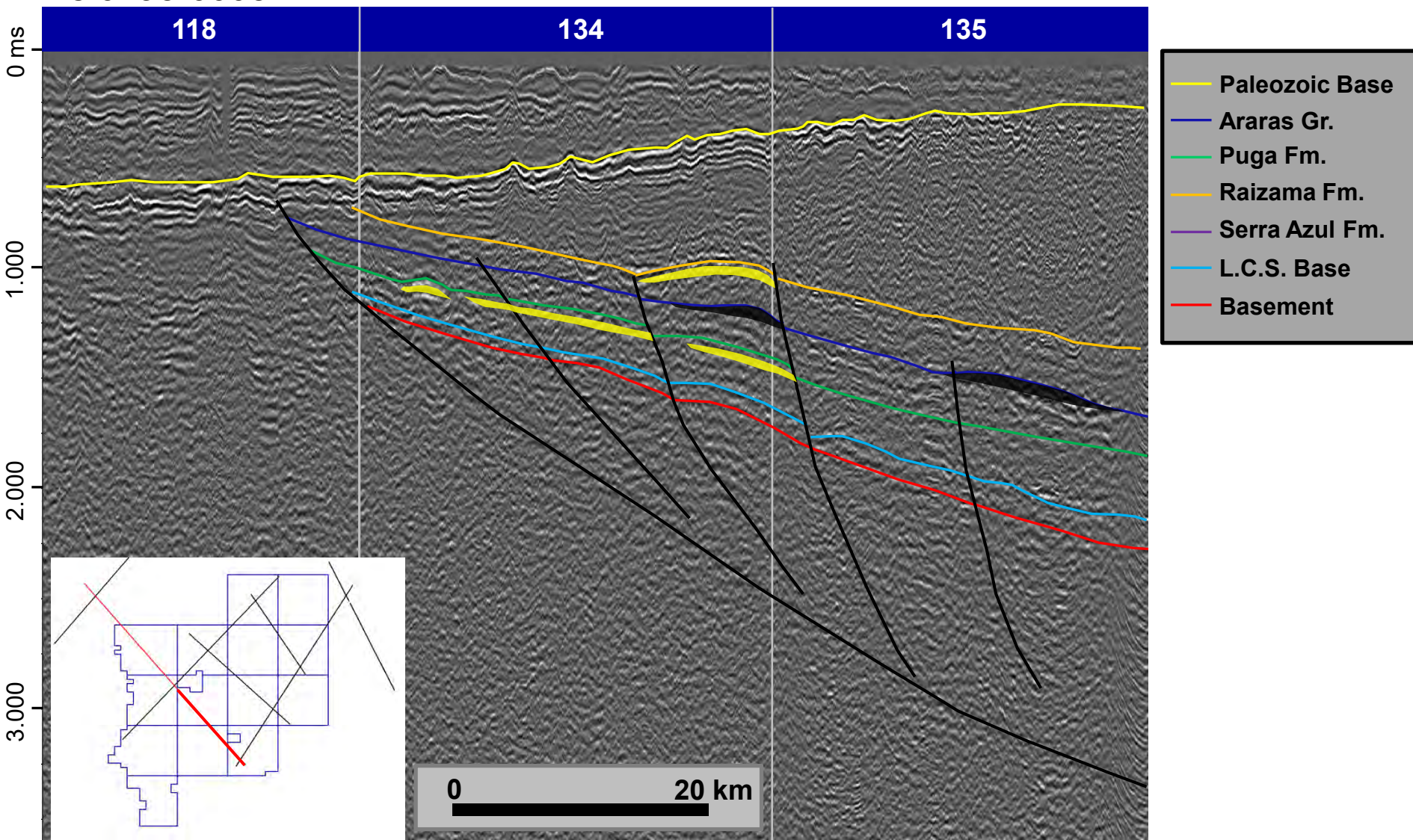
# Leads

**Line 0295-0005**



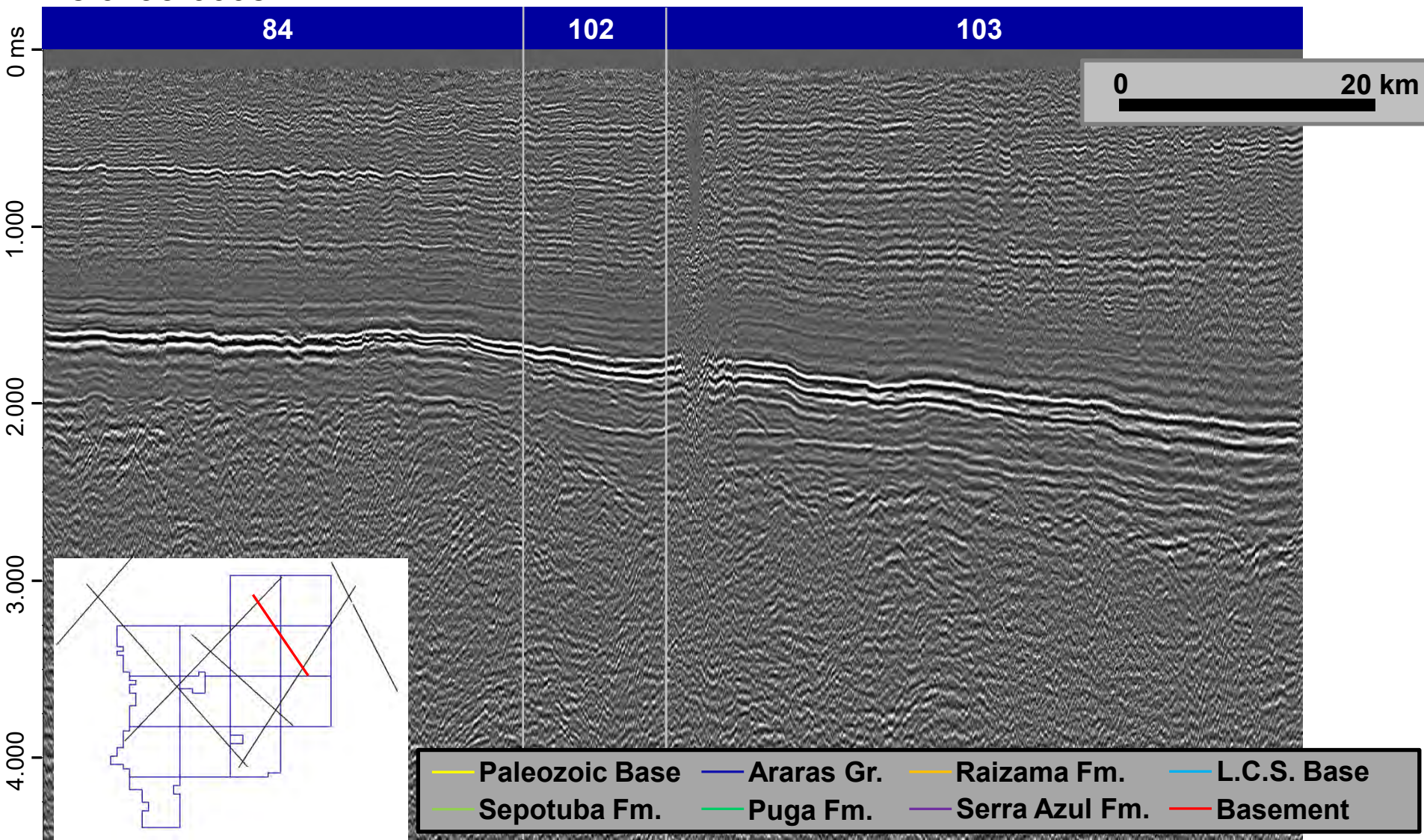
# Leads

## Line 0295-0005



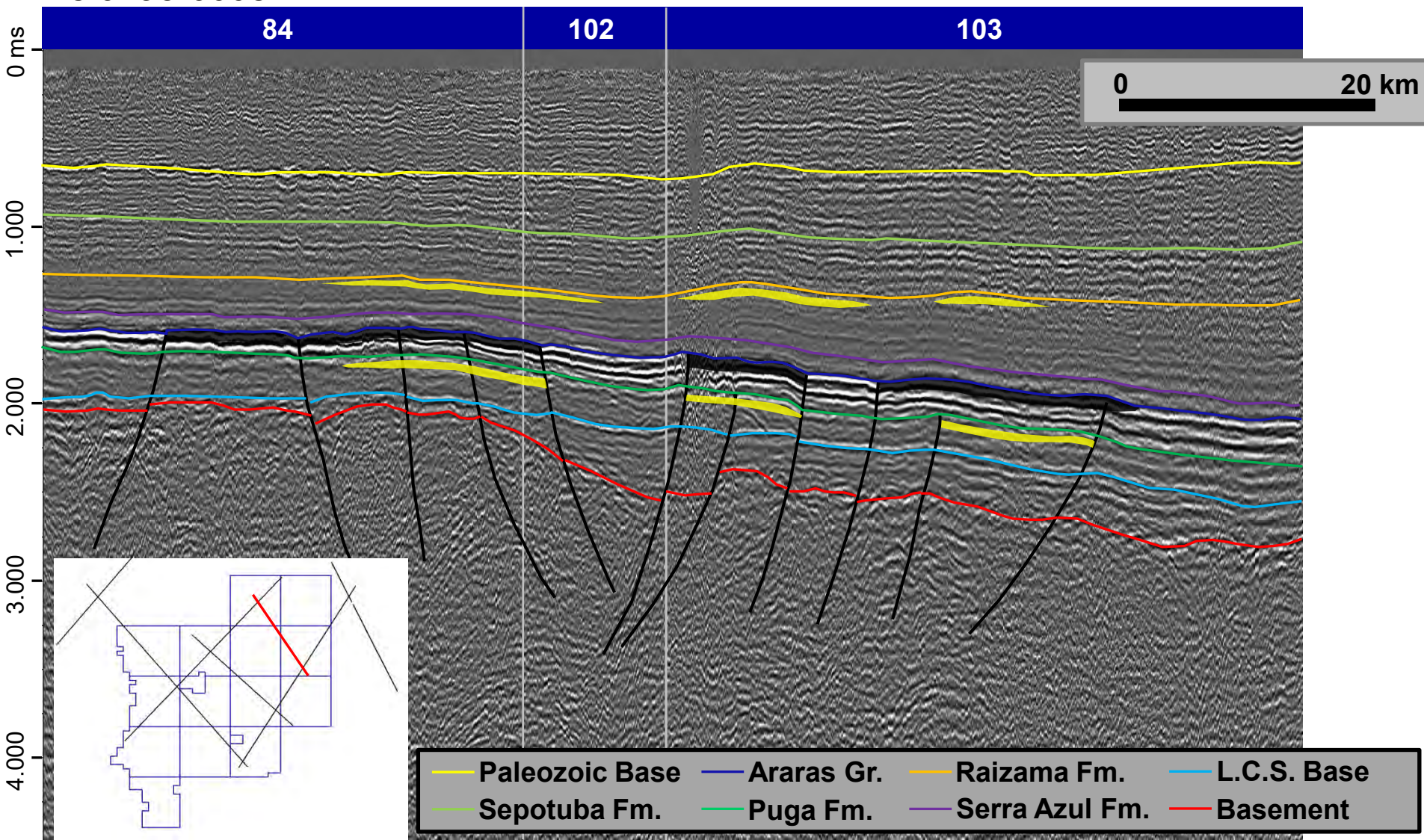
# Leads

**Line 0295-0008**



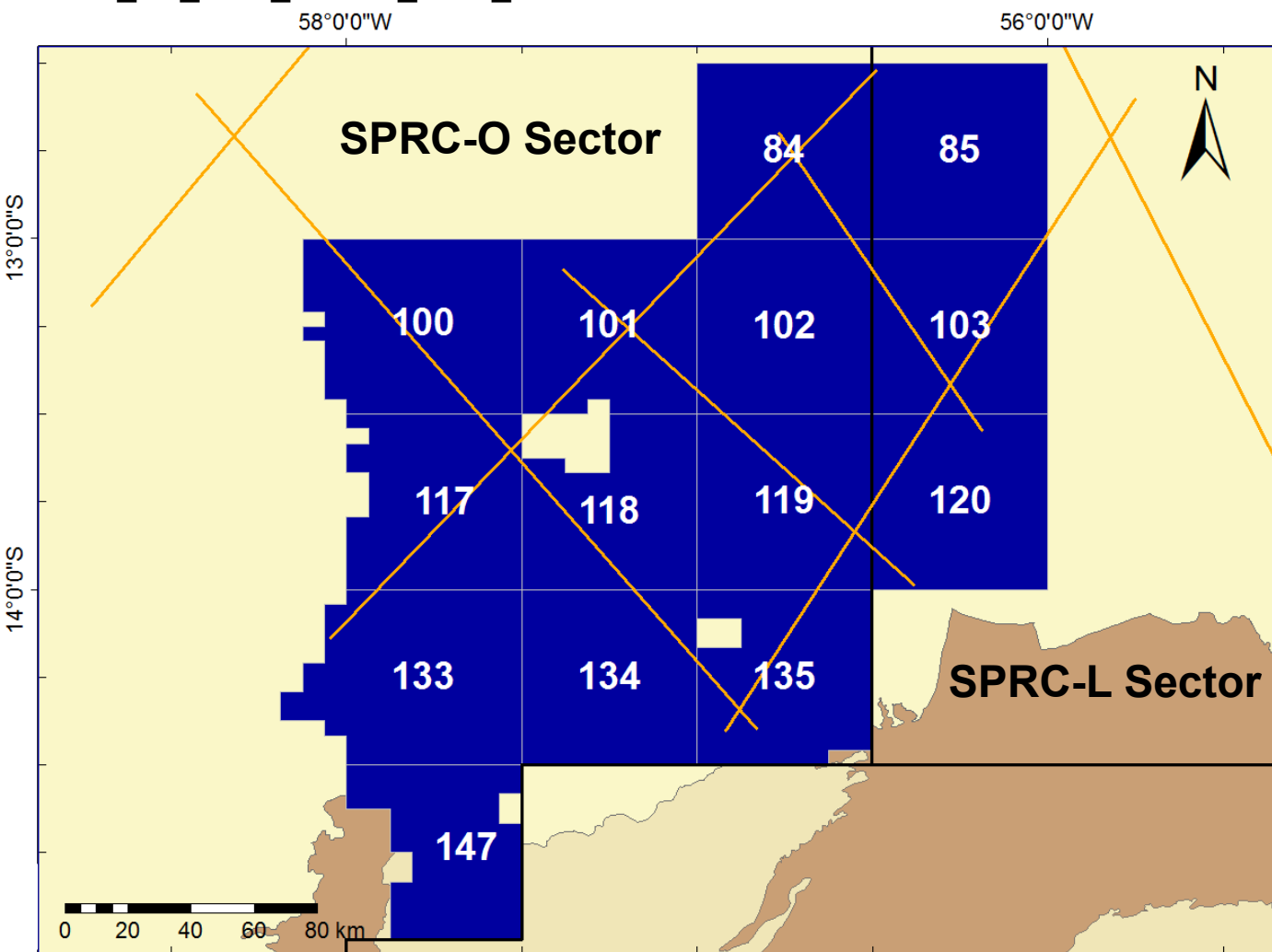
# Leads

**Line 0295-0008**



# Estimated Volume

0295\_2D\_ANP\_BACIA\_DOS\_PARECIS

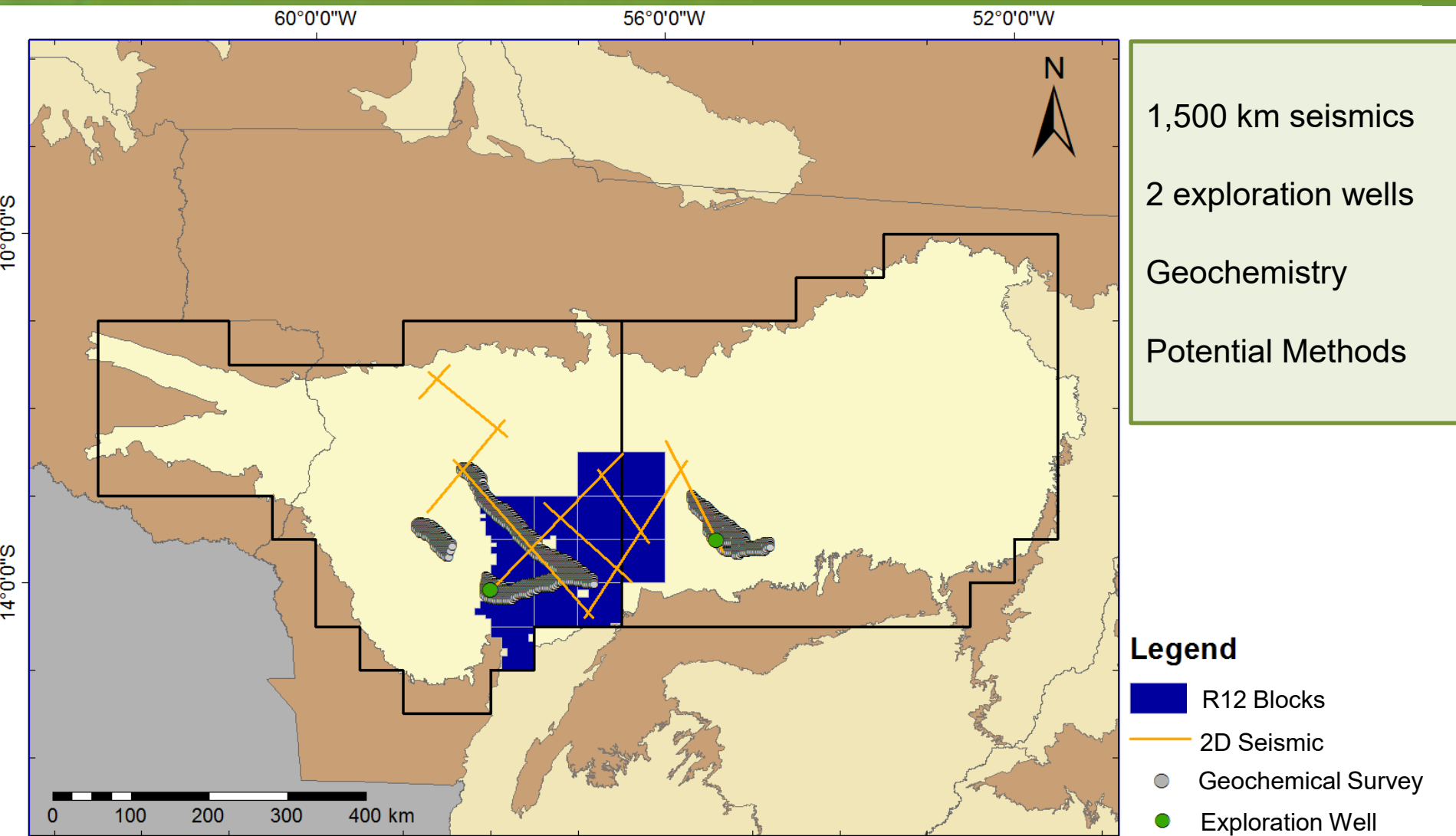


Preliminary  
*in situ* gas  
volume:

~3.5 – 7.0 TCF

(0.6 – 1.2 Bi boe)

# Data Package



# Contractual Aspects

Sector Name	SPRC-O	SPRC-L
Exploration Model	New Frontier	New Frontier
Number of Blocks	11	3
Area on Offer	~32,440 km <sup>2</sup>	~8,990 km <sup>2</sup>
Exploration Phase	6 years	6 years
Exploration Period	4 + 2 years	4 + 2 years
Technical Qualification of the Operator	C	C
Minimum Bonus	R\$ 254,646.79 to R\$ 734,720.02	R\$ 308,010.80 to R\$ 650,920.25
Exploration Objective	Neoproterozoic (Araras Gr.)	Neoproterozoic (Araras Gr.)
Stratigraphic Objective	Neoproterozoic (Puga Fm.)	Neoproterozoic (Puga Fm.)

Location

Infraestruture and Operational Conditions

Exploration Overview

Tectonostratigraphic Evolution

Petroleum Systems

Plays

Proterozoic Basins E&P

Area on Offer

**Final Remarks**

# Final Remarks

- Neoproterozoic Age
- New Frontier Basin
- Gas indications
- Active Petroleum System
- Several leads mapped in regional seismic lines
- Preliminary estimates of *in situ* resources up to 7 TCF (1,2 billion boe)

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