



Brazil Round 9 Exploration Opportunities in Brazil

Highlights

Newton R. Monteiro

London – 26th September 2007



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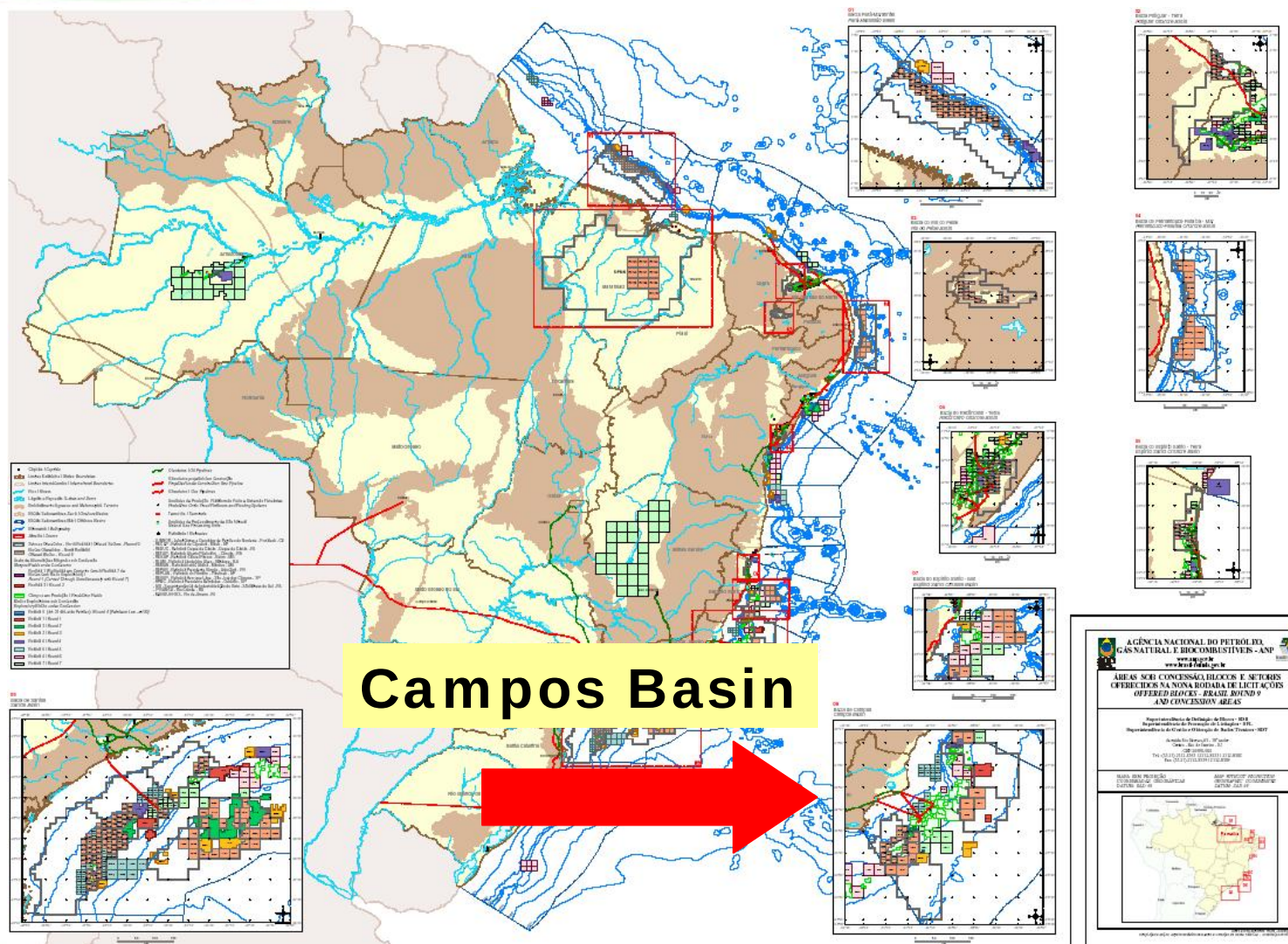
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Brazil Round 9 Blocks for E&P Activities

- **The High Potential Basins / Blocks**
- **A New Frontier Basin / Blocks**

Highlights

Brazil Round 9 Offered Areas





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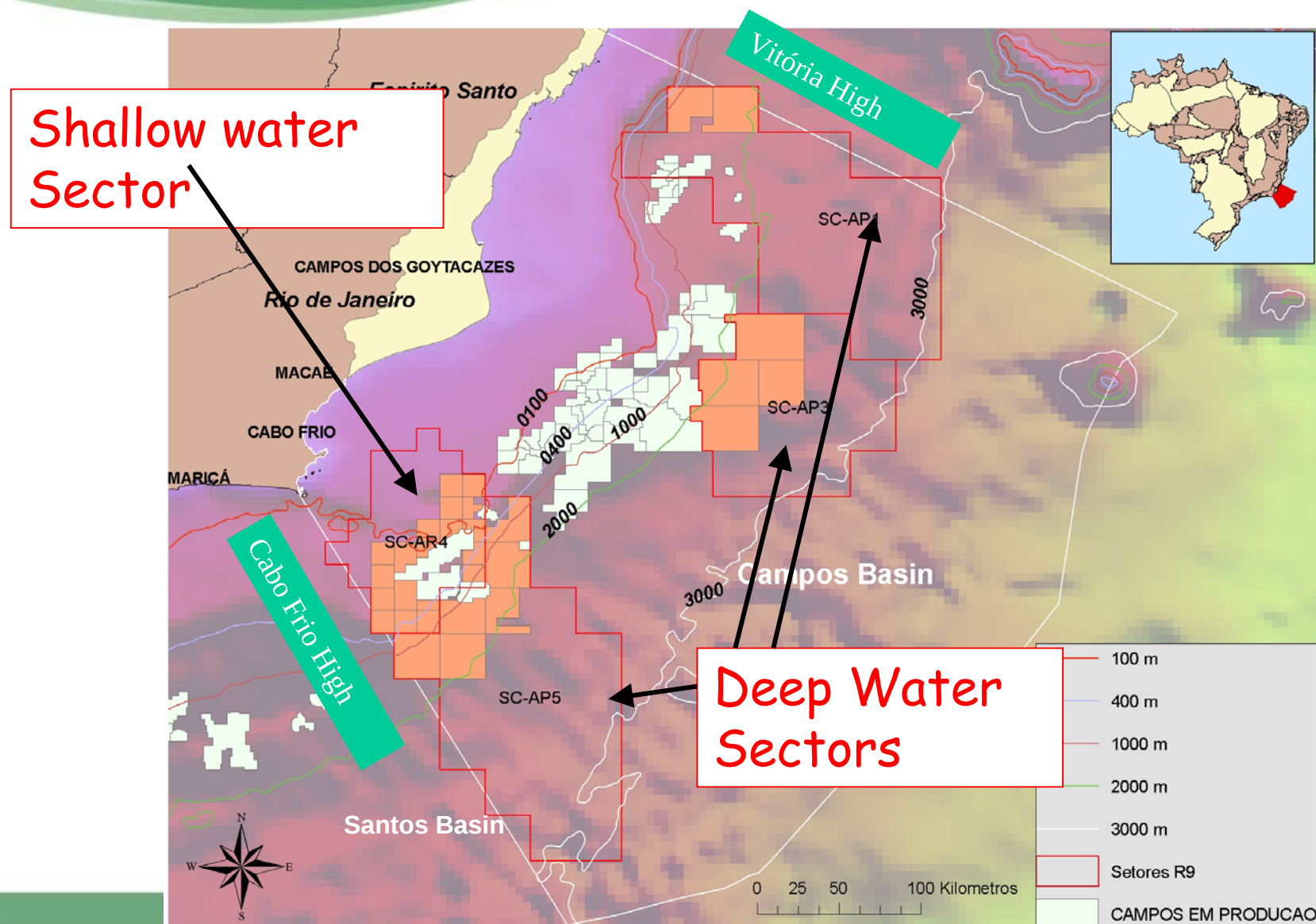


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Campos Basin

- Brazil's most productive Basin
- Still far from be a Mature Basin
- Shallow and Deep Water E&P Opportunities

Location, Geological Limits and Bathymetry





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Location, Geological Limits and Bathymetry

- 95,507 km² to 3,000m water depth, or 154,076 km² until 200 nautical miles

Vitória High

SC-AP1

Offered Blocks: 31

Area: 11,611 km²

SC-AP3

Reserves and Production	Oil (B bbl)	Total Gas (B SCF)
OOIP and OGIP	72.6	2,860.0
Accumulated production	5.8	320.13
Proven reserve	10.7	462.81

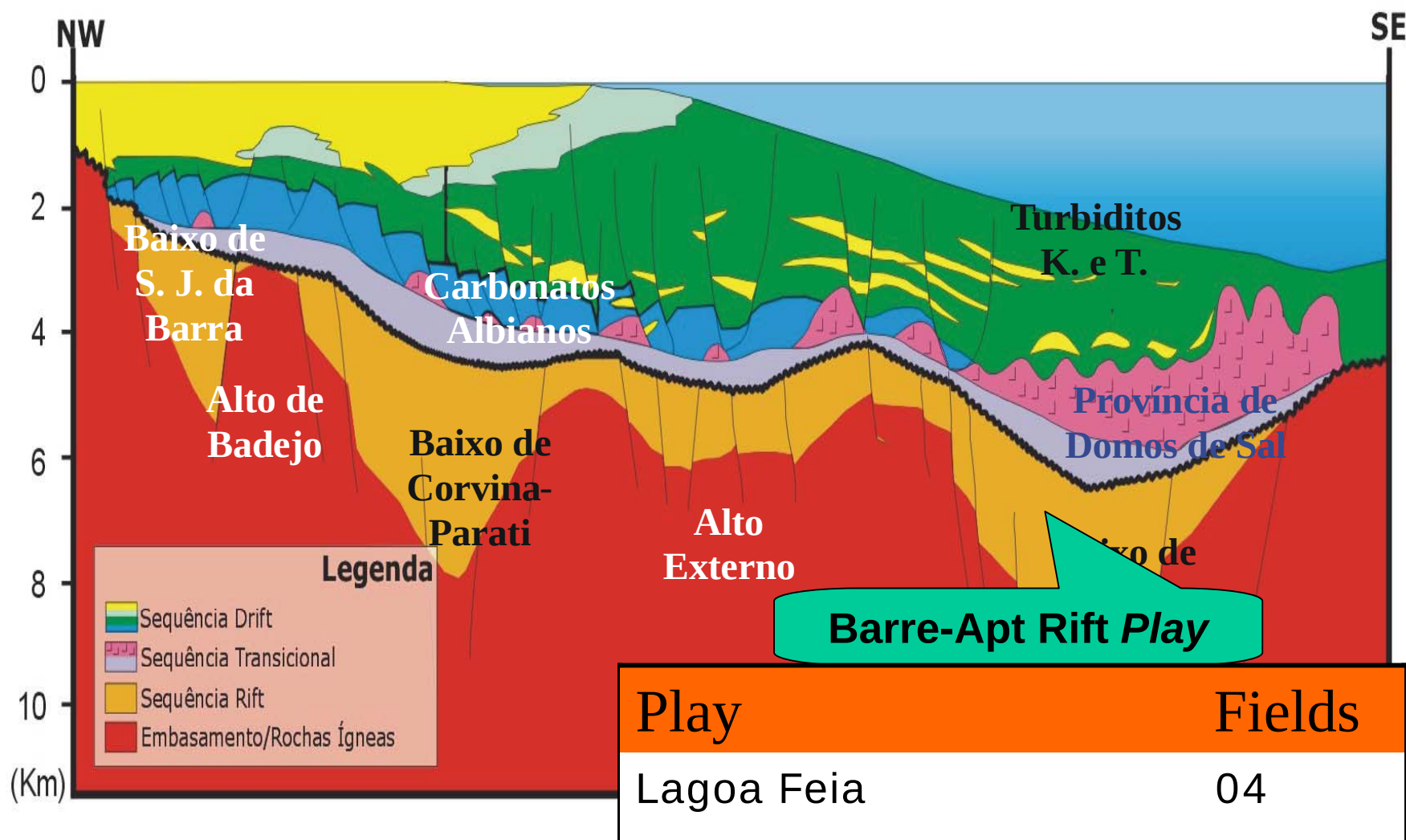


0 25 50 100 Kilometros

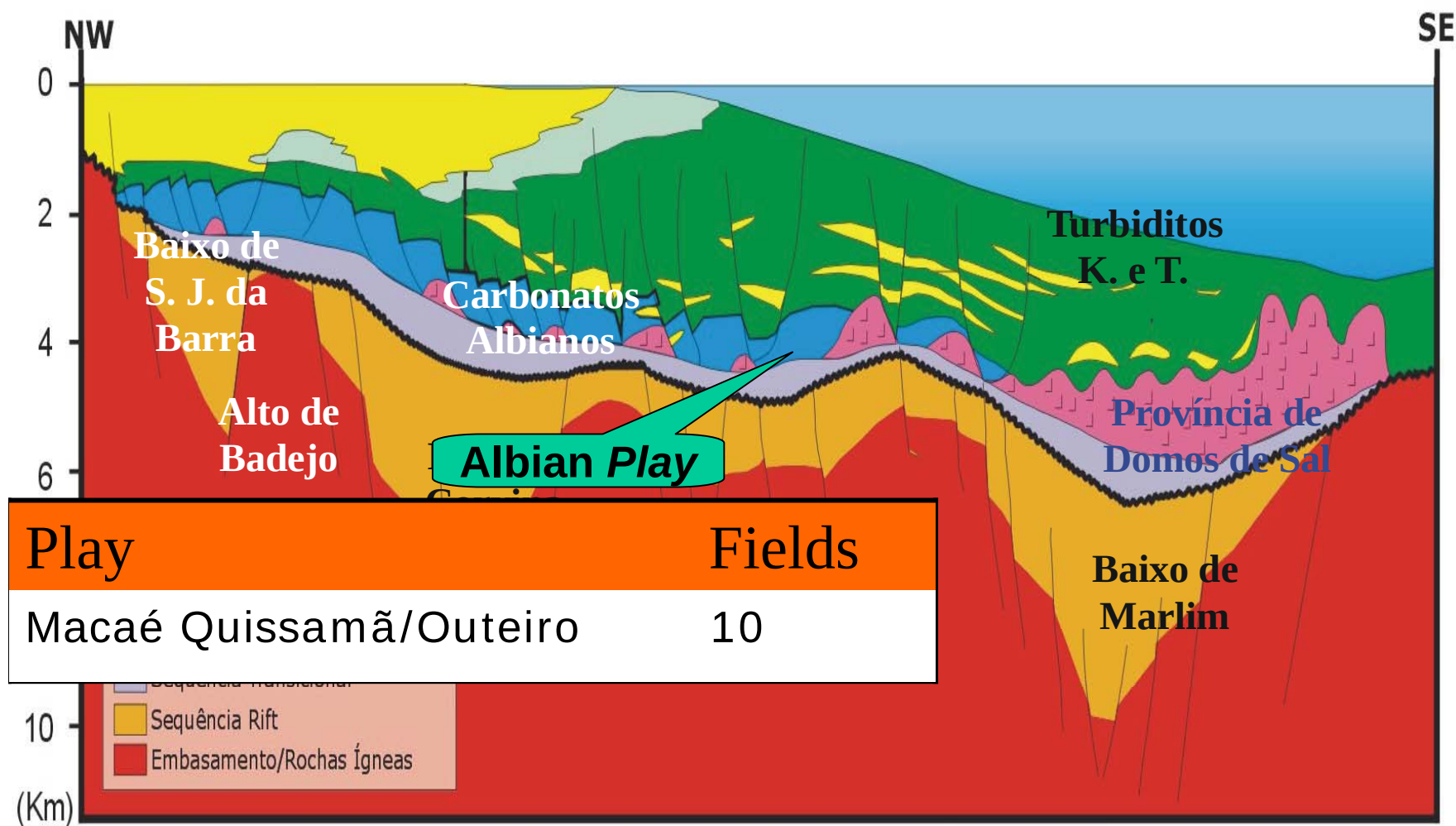
Setores R9

CAMPOS EM PRODUCAO

Main Plays



Main Plays



(modificado de Rangel et al., 1998 / Modified from Rangel et al., 1998)



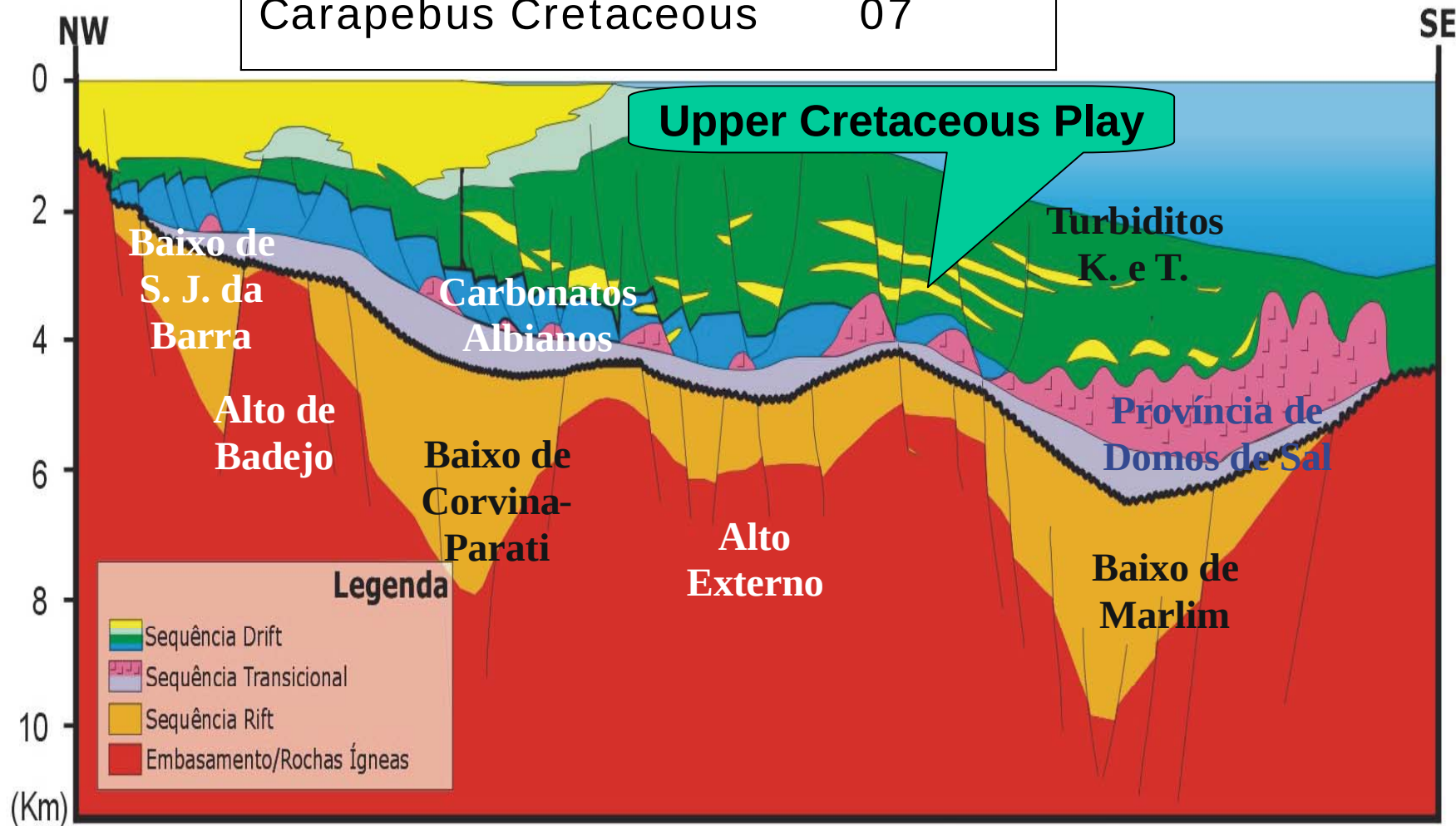
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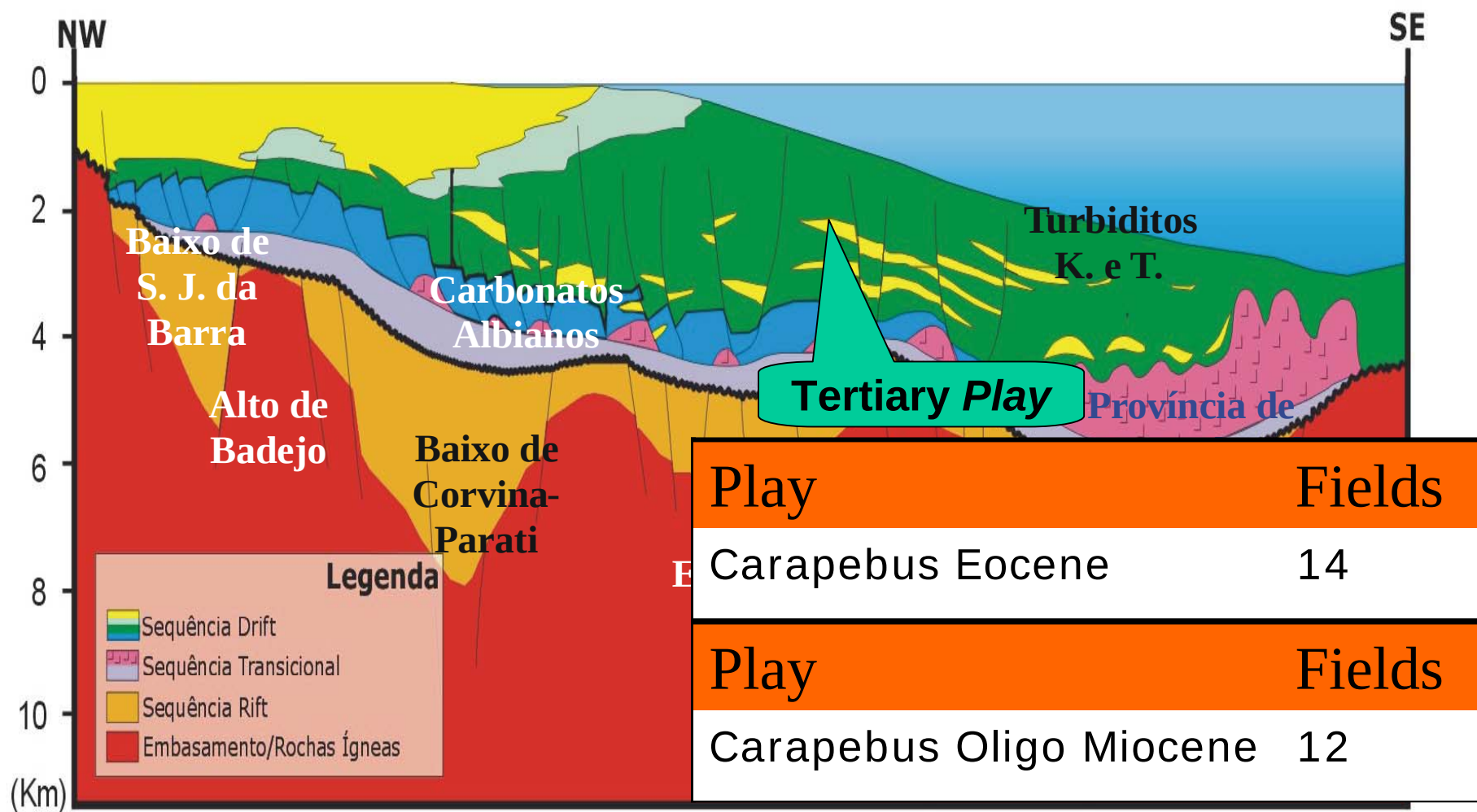
Main Plays

Play	Fields
Carapebus Cretaceous	07



(modificado de Rangel et al., 1998 / Modified from Rangel et al., 1998)

Main Plays



(modificado de Rangel et al., 1998 / Modified from Rangel et al., 1998)

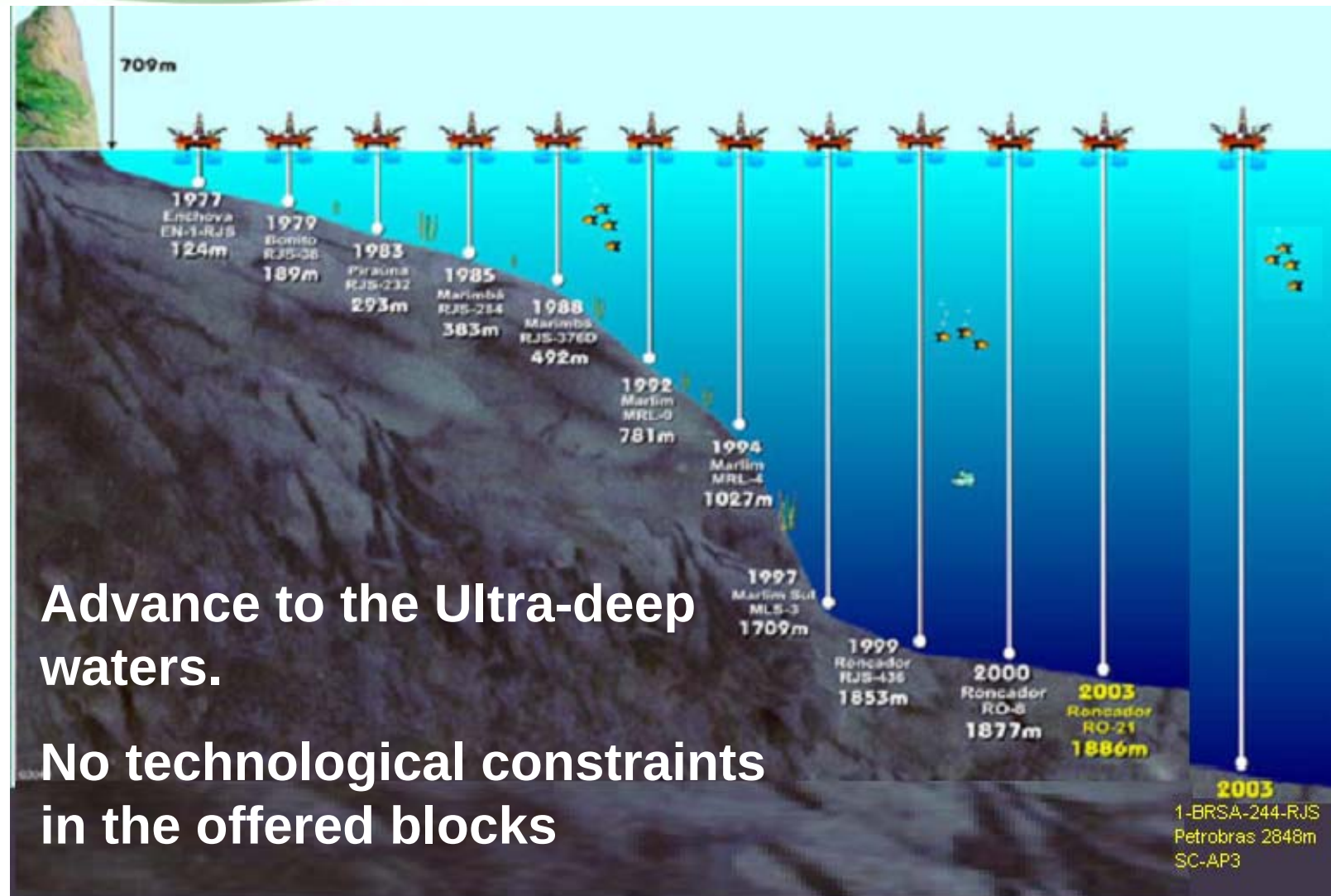


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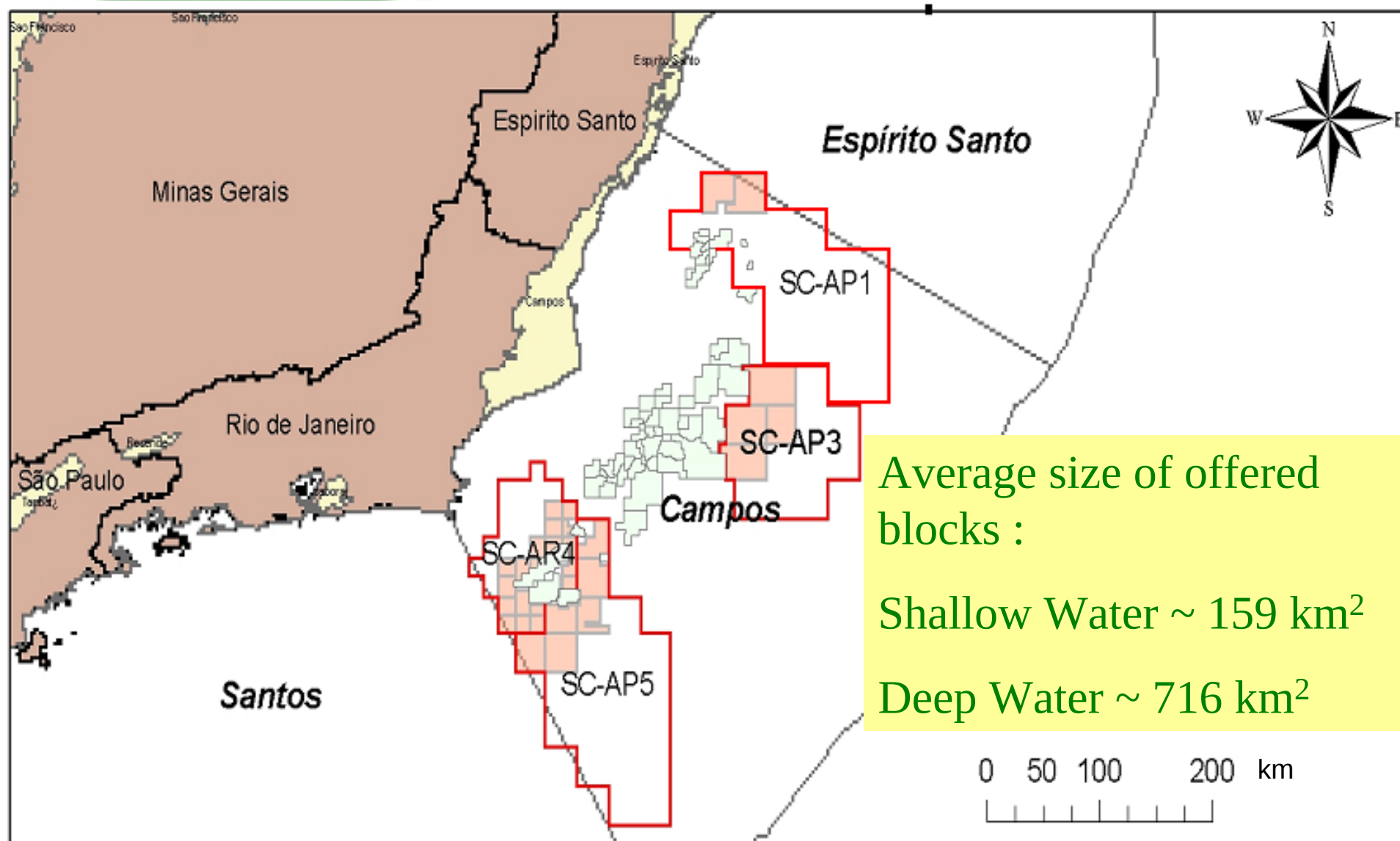


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Technological Limits



Round 9 - Areas



Average size of offered blocks :

Shallow Water ~ 159 km²

Deep Water ~ 716 km²



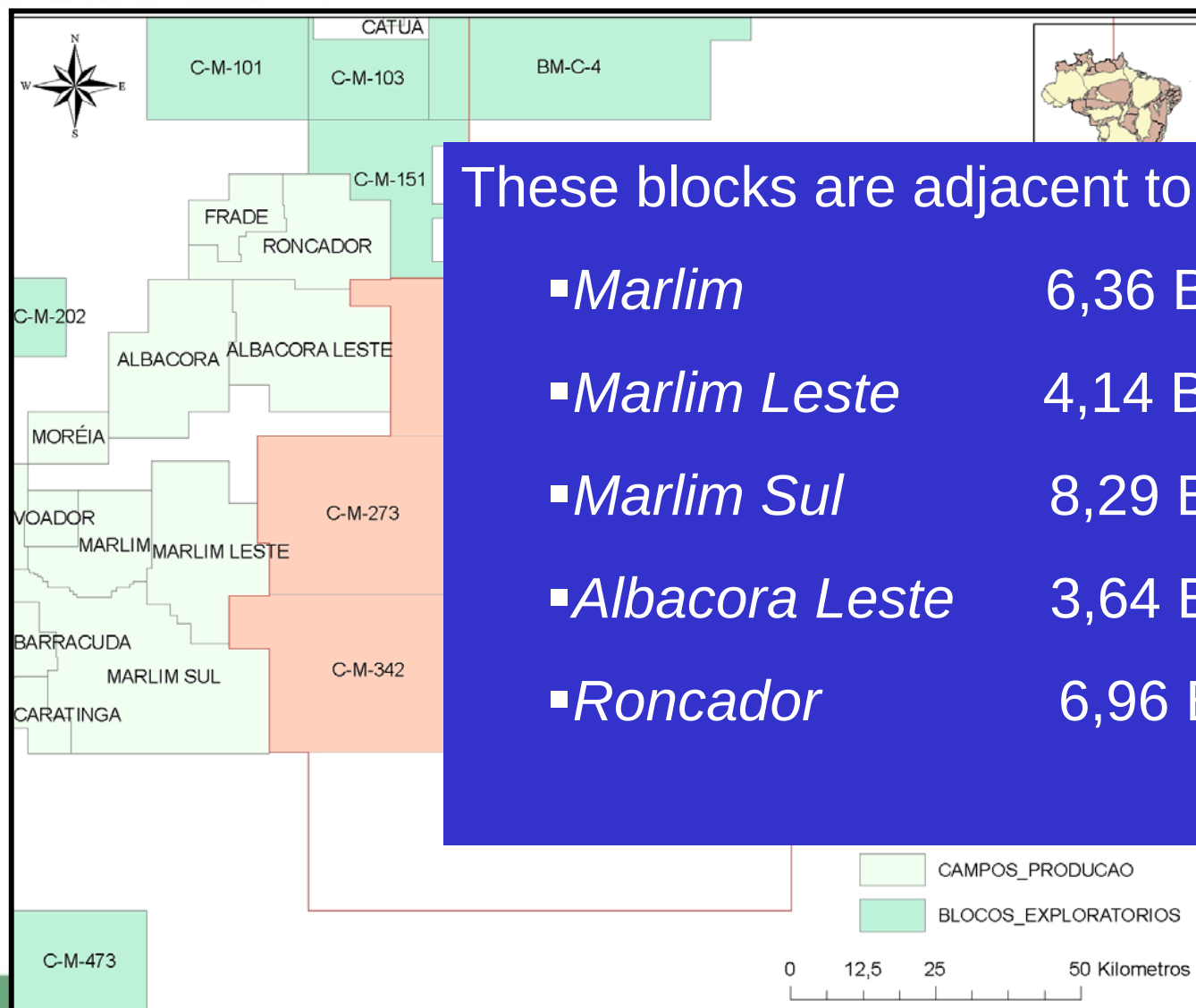
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Potential Reserves

In the offered blocks ANP estimates potential reserves of more than **650 MM bbl**, assuming the Campos Basin 15% historical success chance.



These blocks are adjacent to giant fields :

- *Marlim* 6,36 B bbl OOIP;
- *Marlim Leste* 4,14 B bbl OOIP;
- *Marlim Sul* 8,29 B bbl OOIP;
- *Albacora Leste* 3,64 B bbl OOIP;
- *Roncador* 6,96 B bbl OOIP.

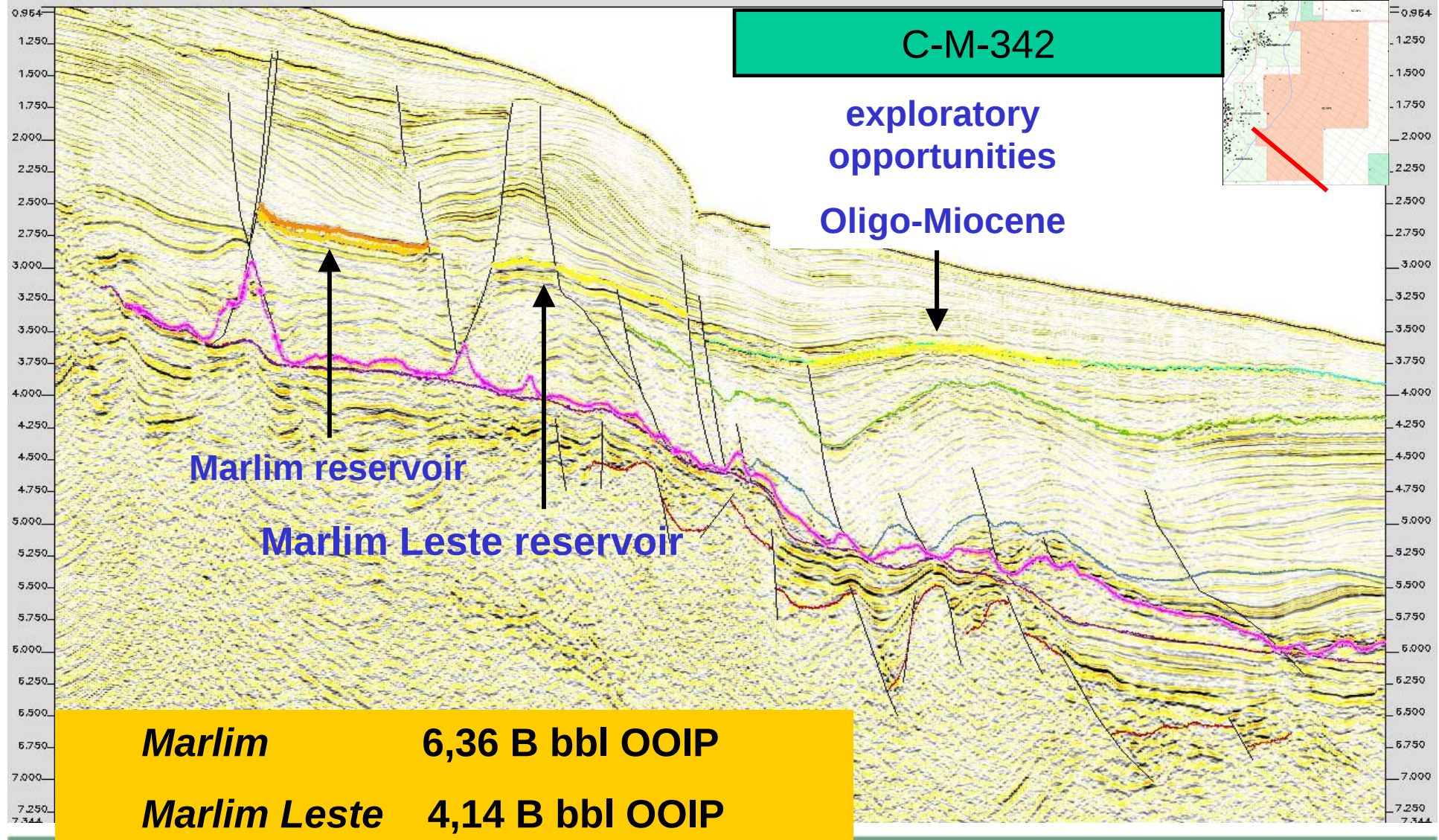


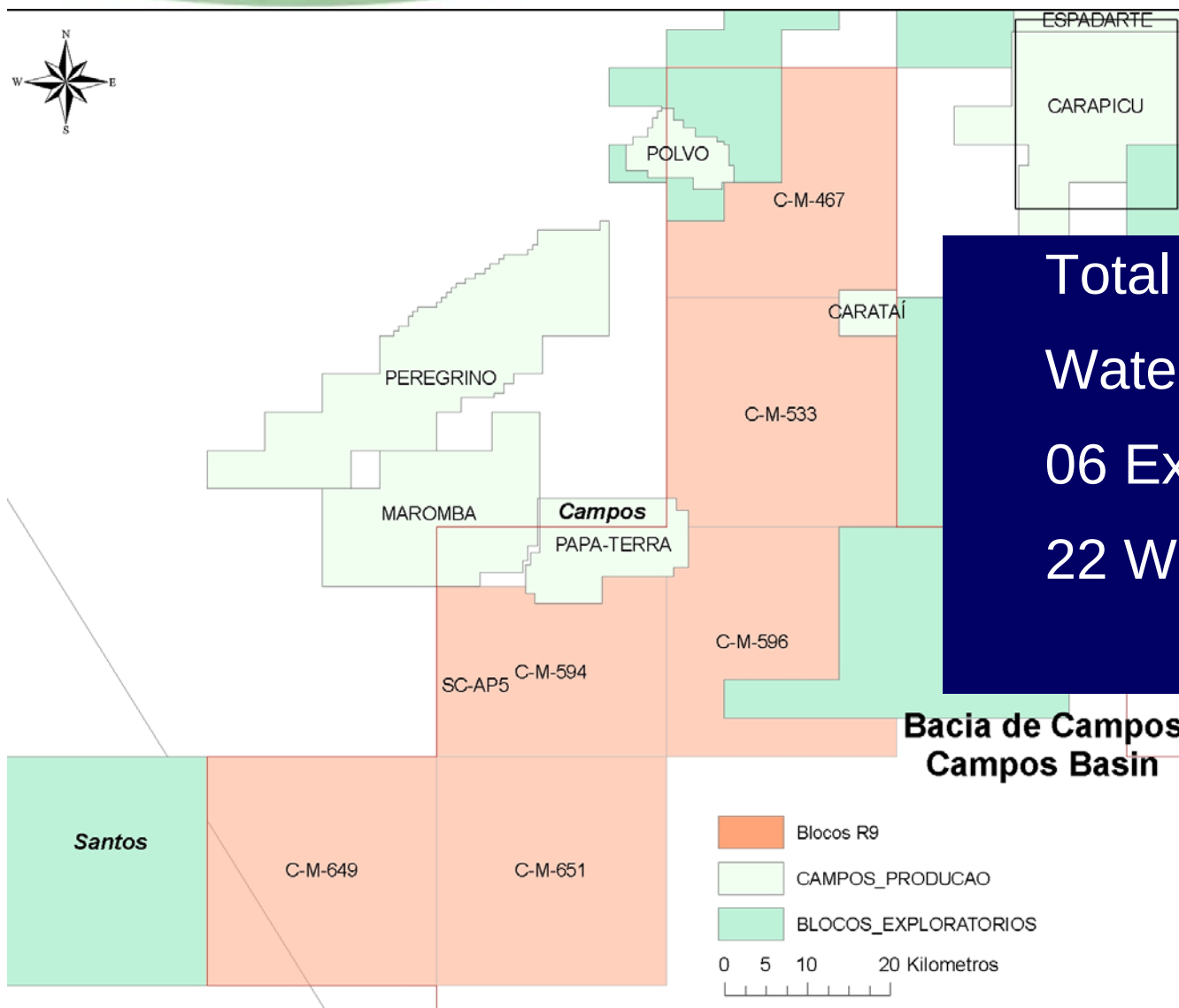
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Exploratory Opportunities





Total Area: 3,580 km²

Water Depth : > 1,000 m

06 Exploratory Blocks

22 Wells

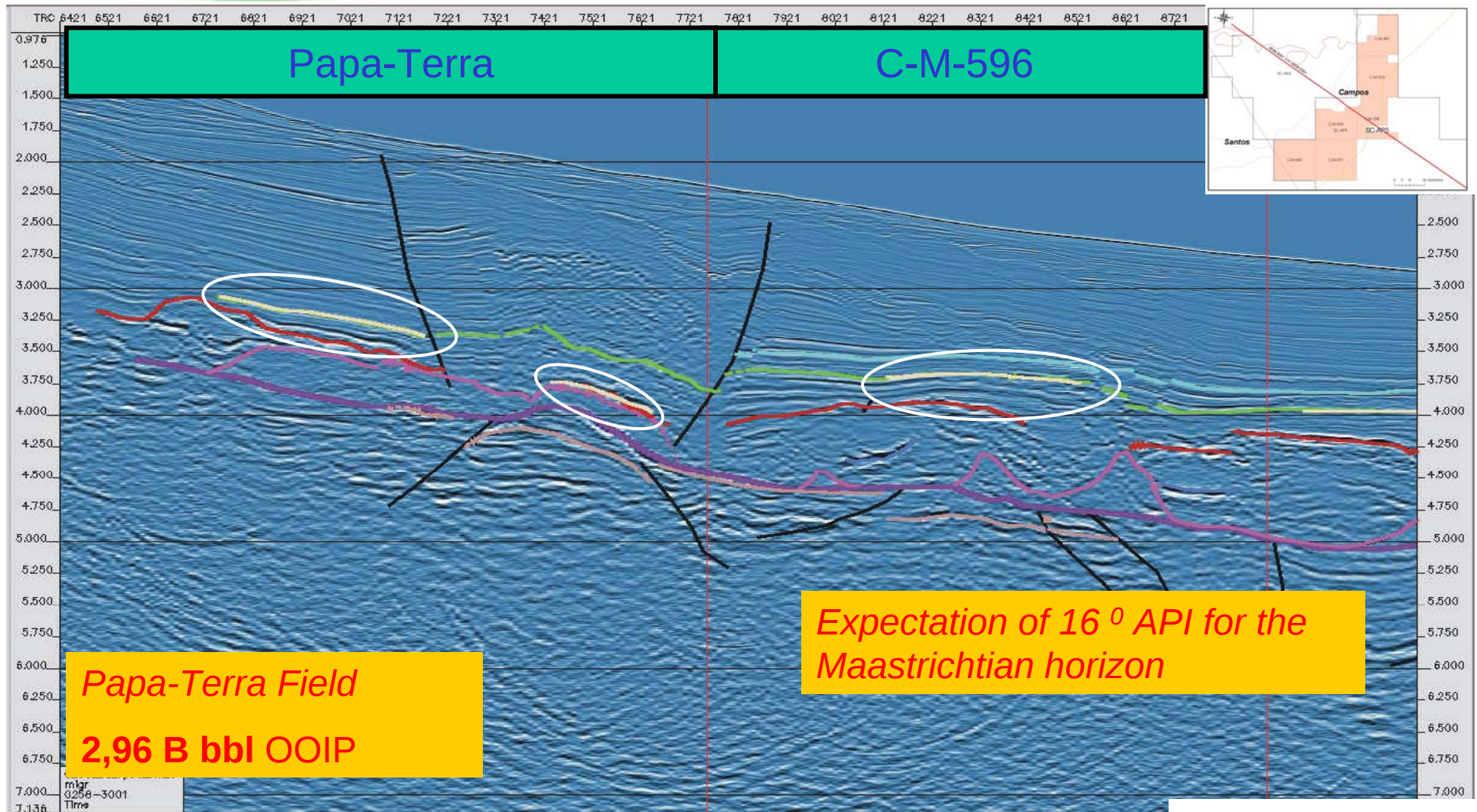


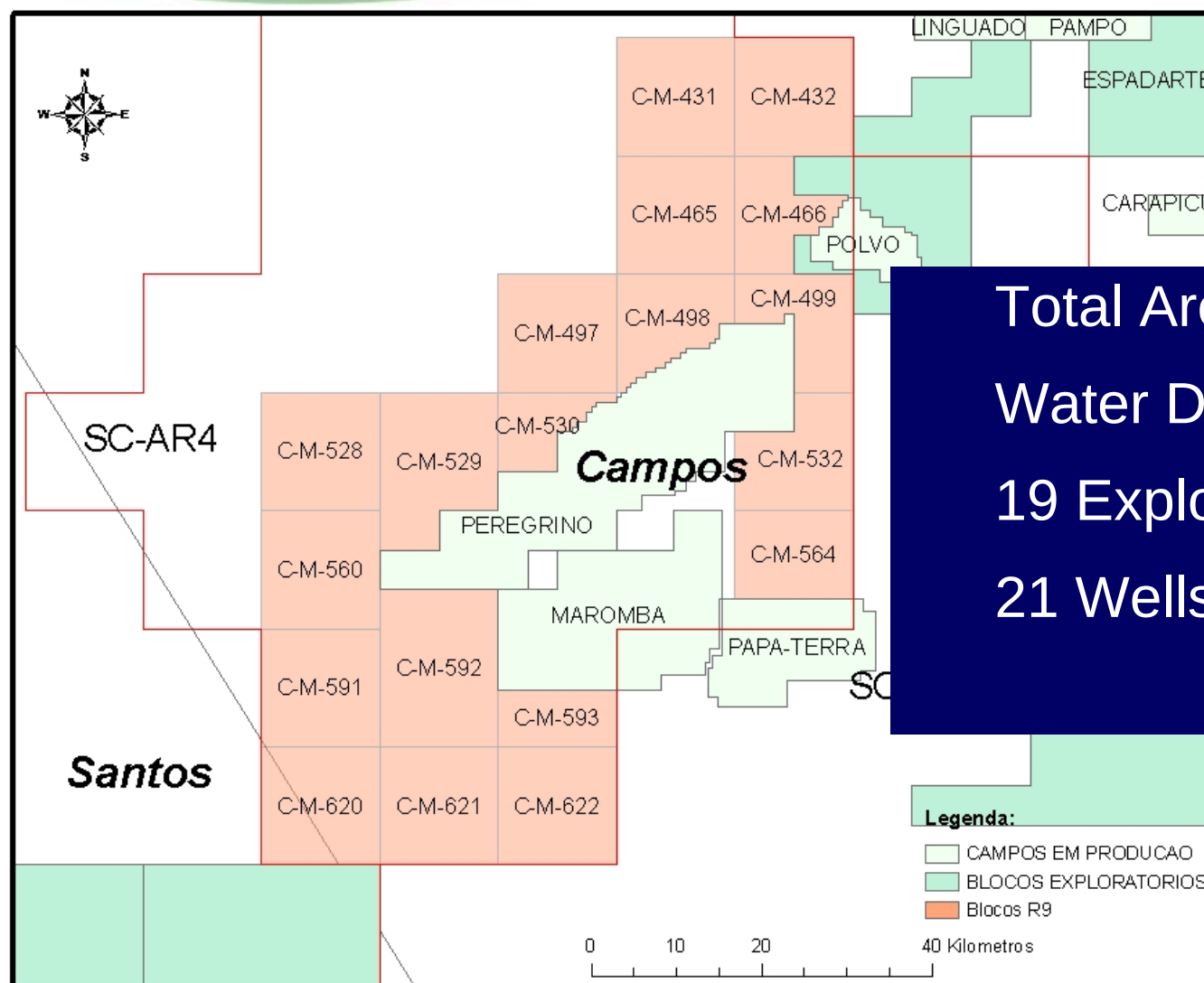
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Exploratory Opportunities



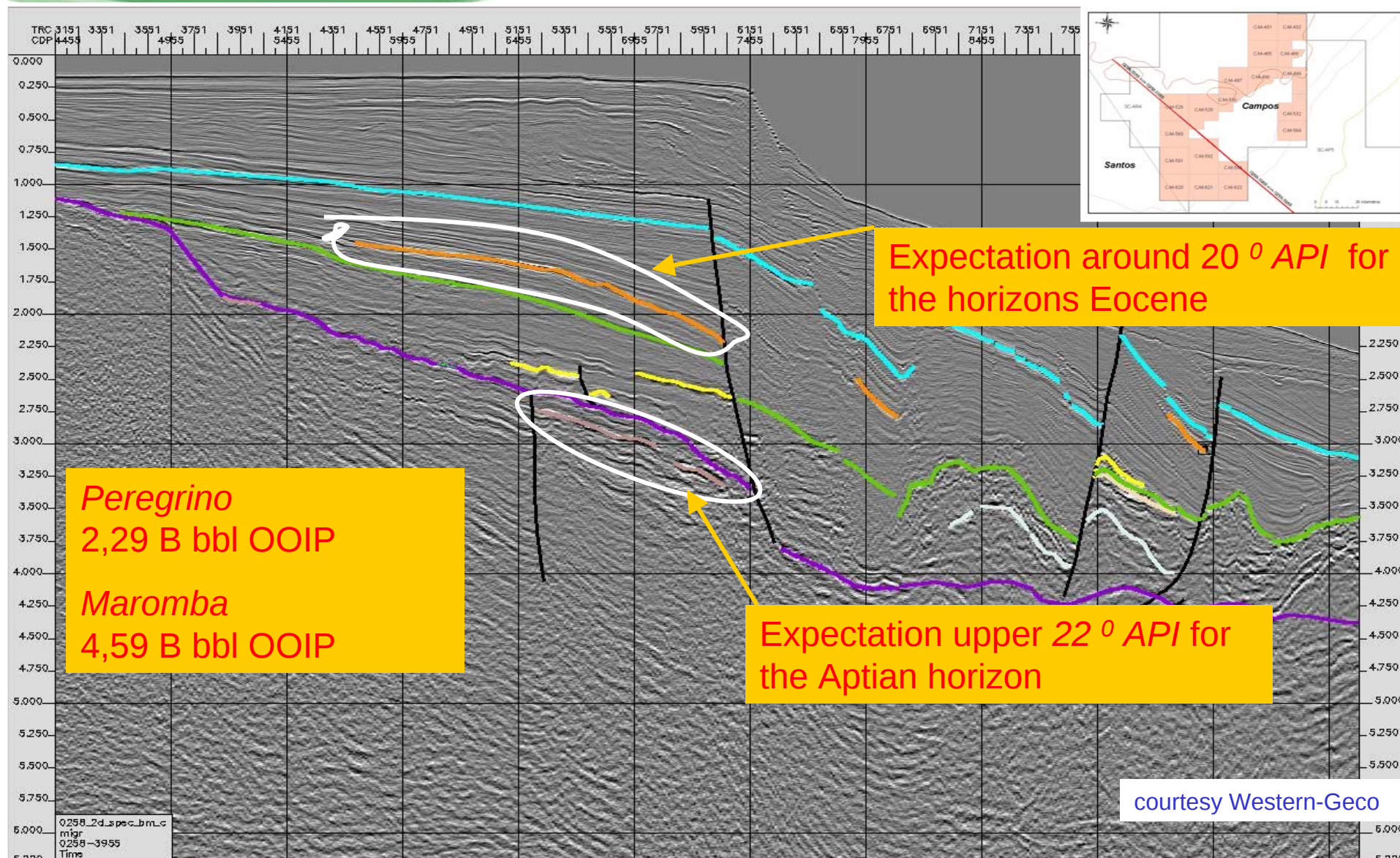


Total Area: 3,014 km²

Water Depth: 50 to 400 m

19 Exploratory Blocks

21 Wells





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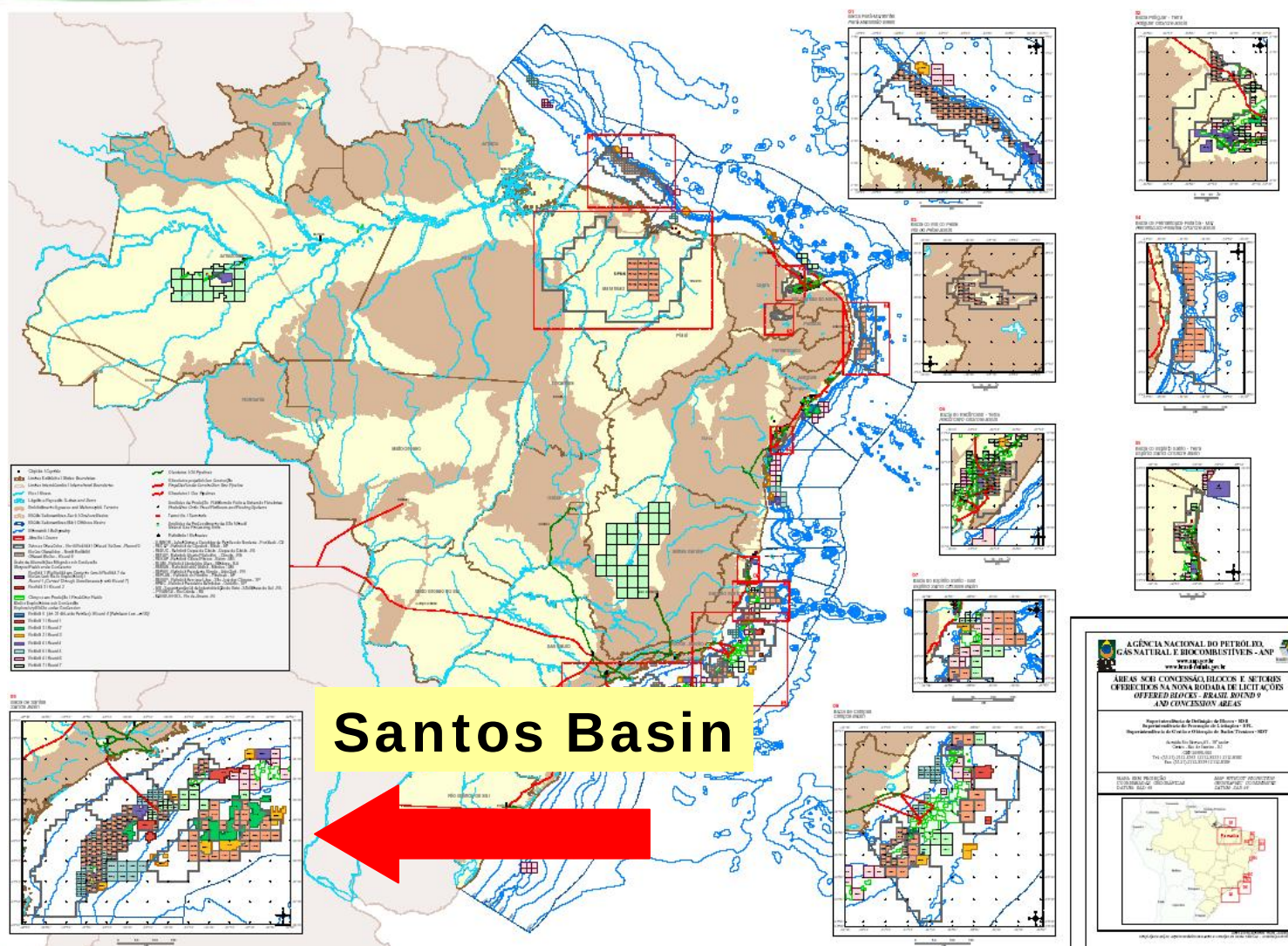
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Campos Basin

Bid and Contract Parameters

- Minimum Bonus (MMUSD): 2.1 @ 150
- Exploration Period (years) : 5 and 6

Brazil Round 9 Offered Areas





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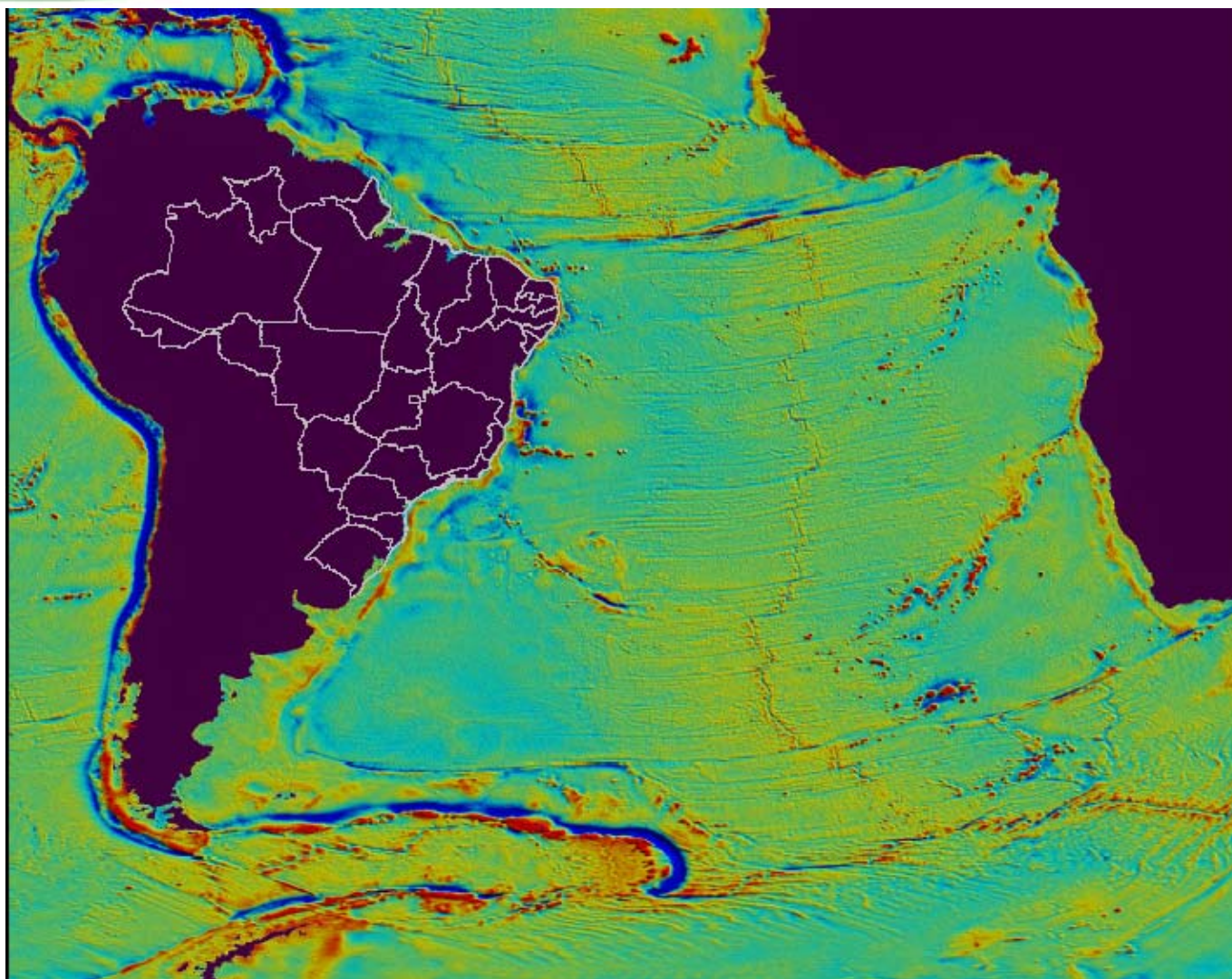


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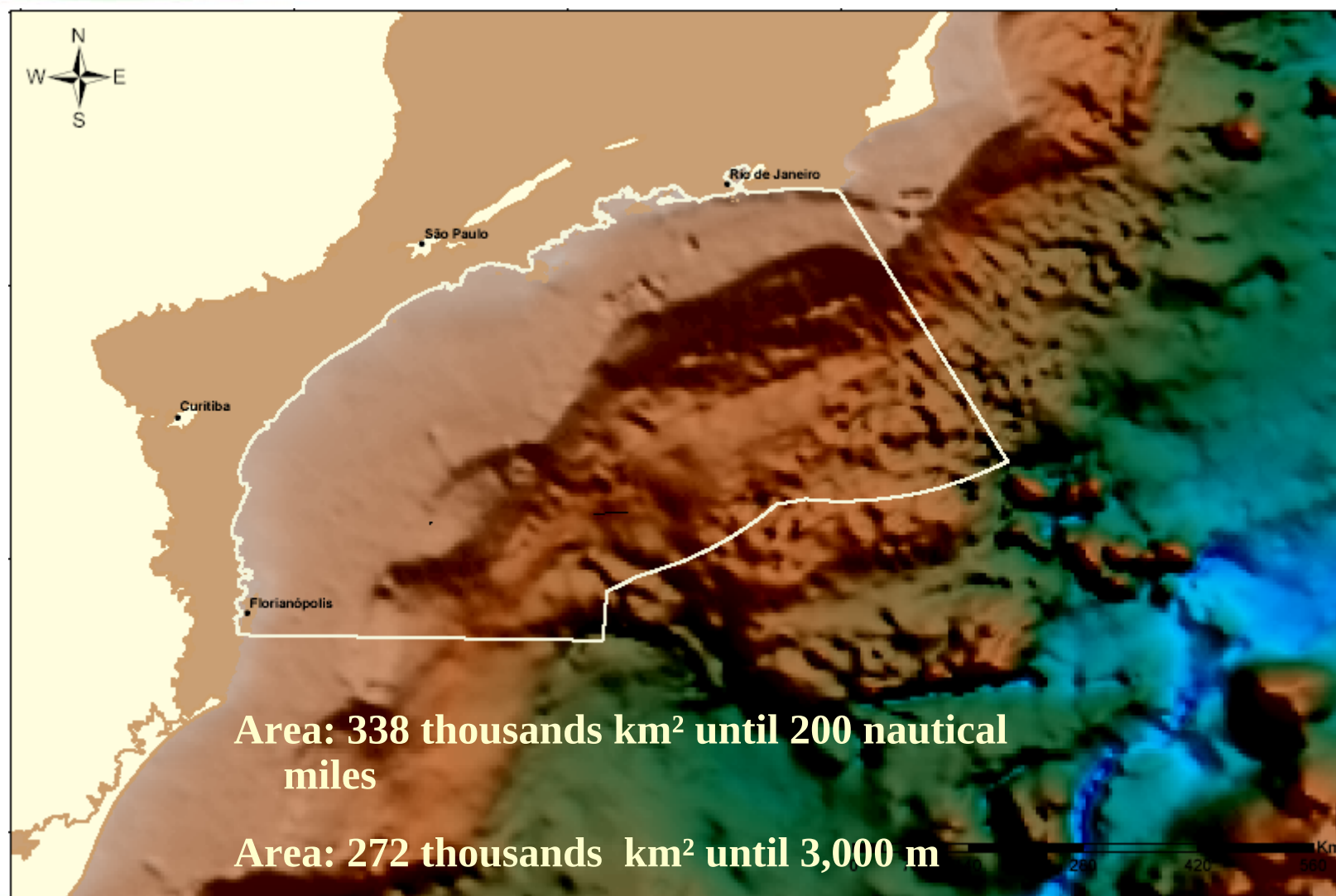
Santos Basin

- Brazil's most promising Basin
- Pre-Salt Play considered now the new "**El Dorado**"
- Gas & Light Oil opportunities in front of country's largest consumer market

Situation and Geologic Boundaries



Basin Area and Bathymetry



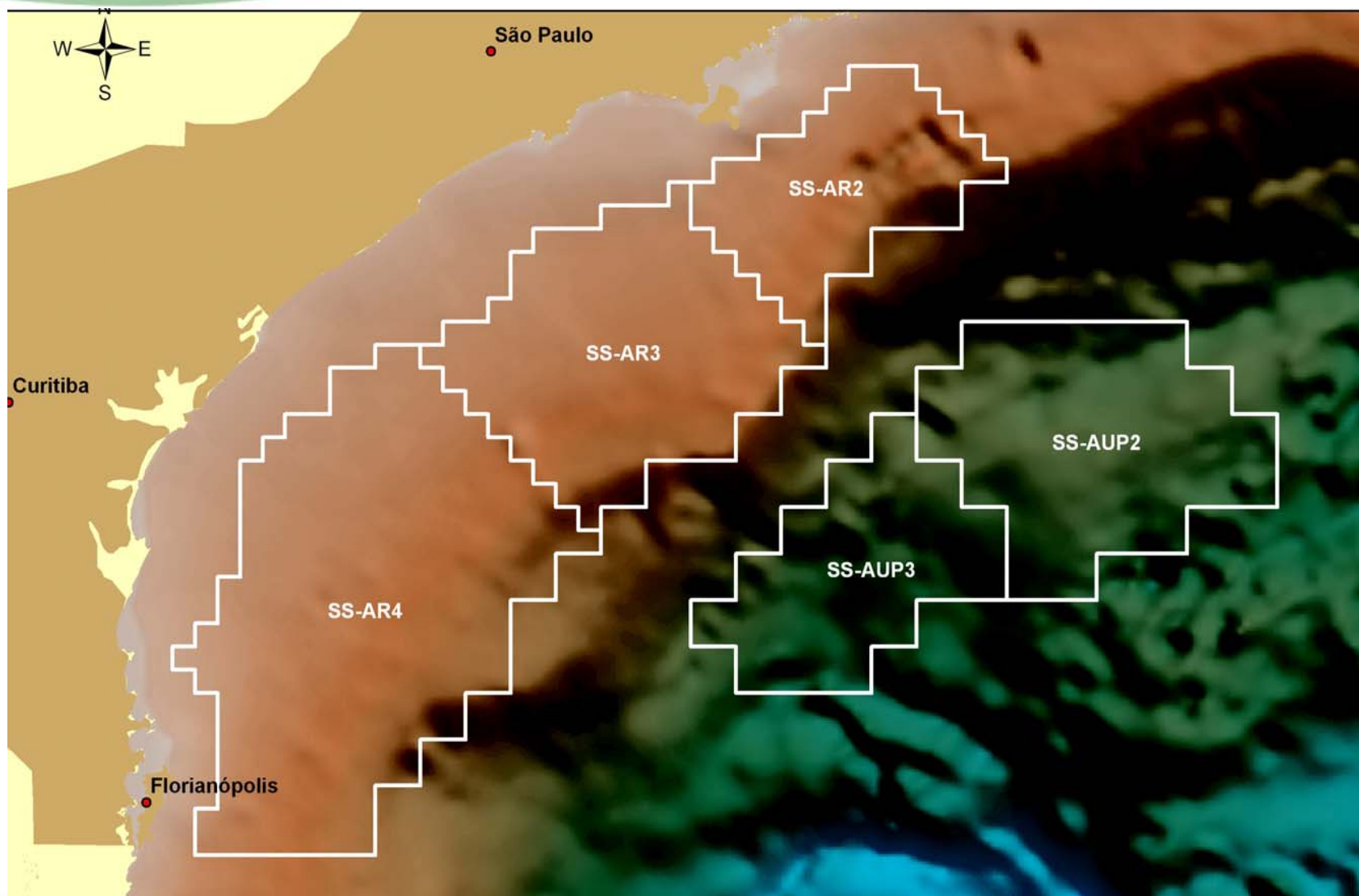


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Situation of Round 9 Sectors



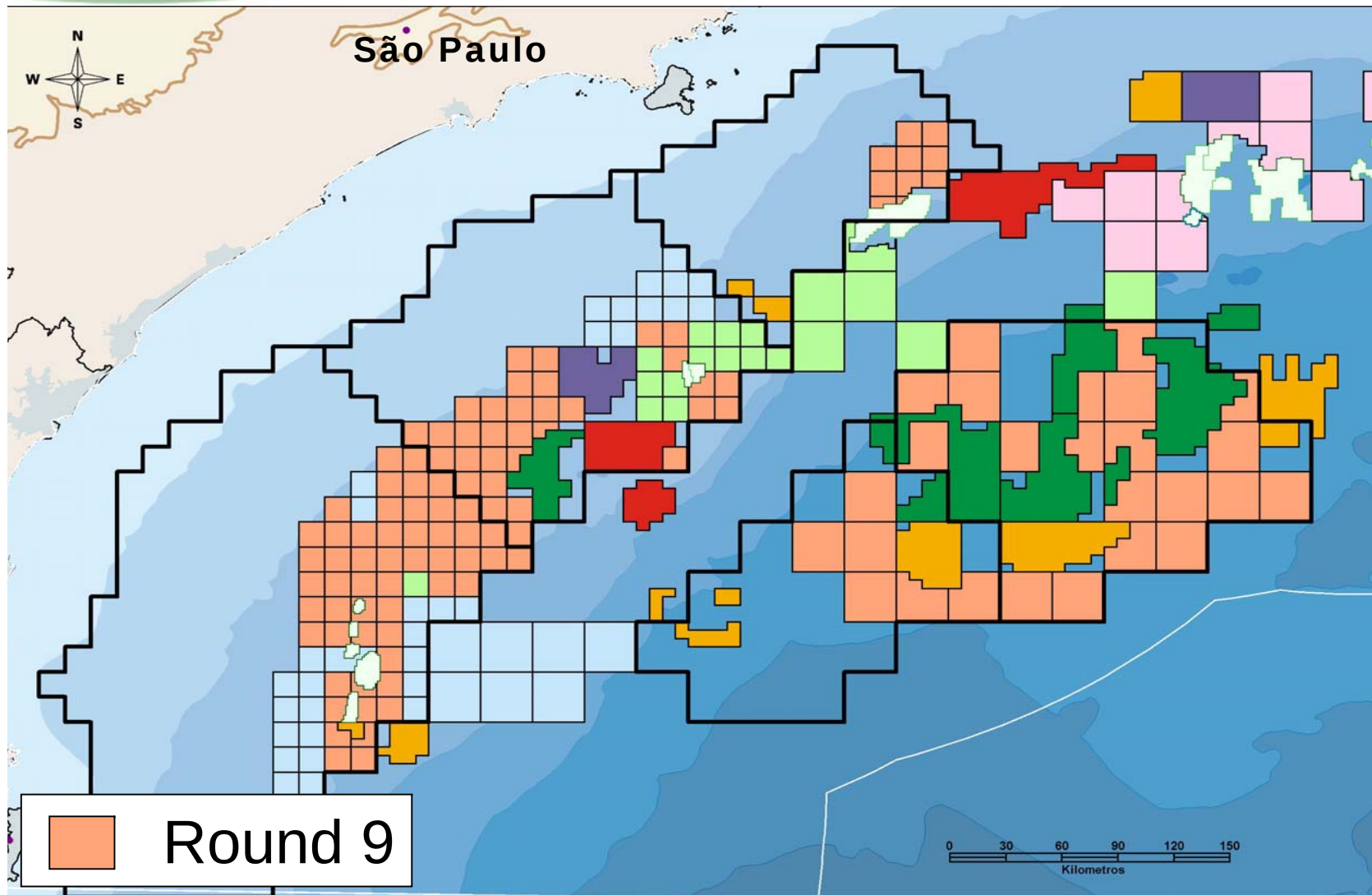


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Situation of Round 9 Sectors



Operator Companies

Operators

Petrobras

Repsol

BG

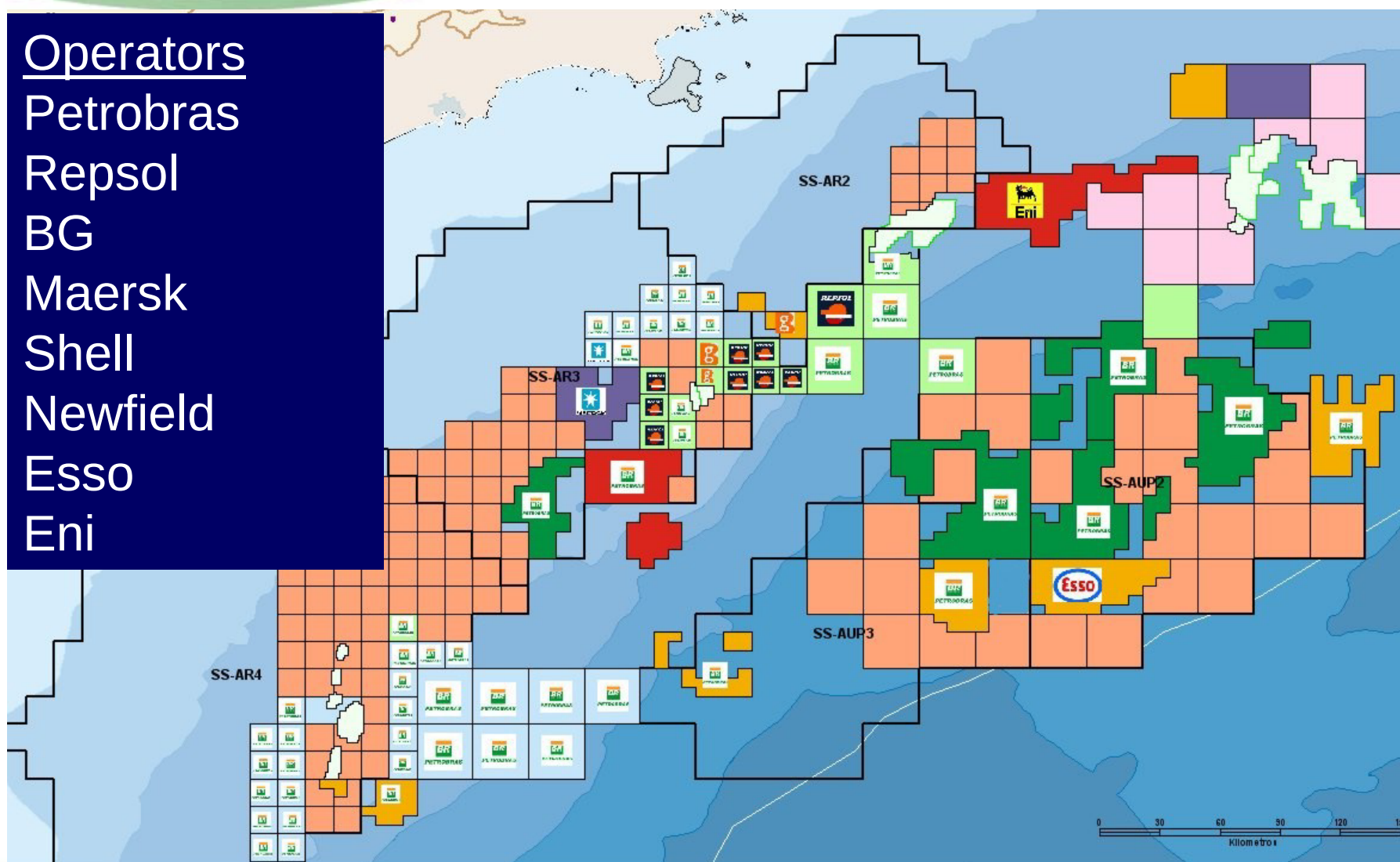
Maersk

Shell

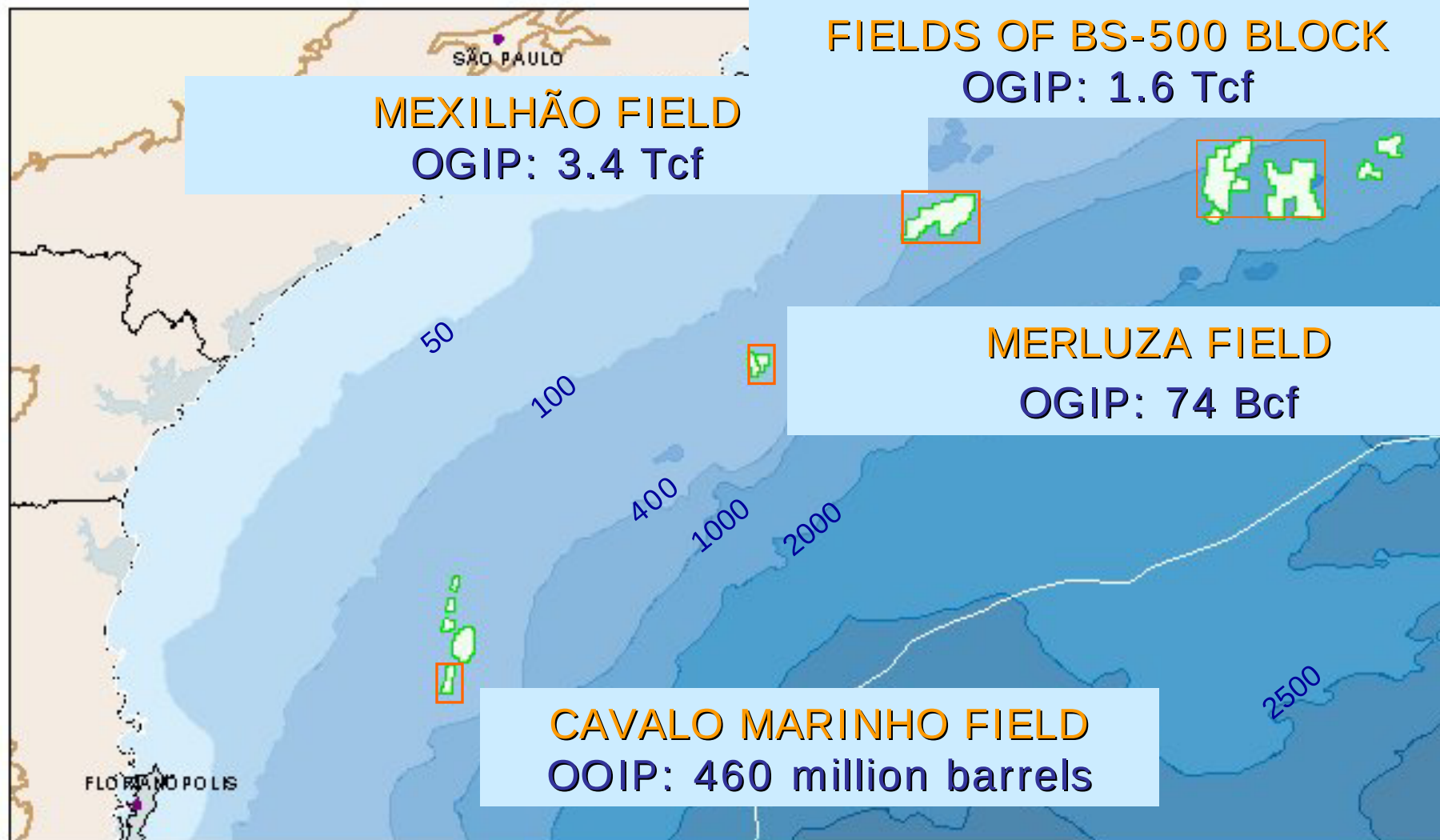
Newfield

Esso

Eni



Oil & Gas Fields



Recent Discoveries

<i>FIELD NAME</i>	<i>DATE</i>		<i>MAIN PRODUCER HORIZONS</i>	<i>OOIP/OGIP</i>
CAVALO MARINHO	Ago-03		Fm, Guarujá (Early albian)	460 MM bbl
LAGOSTA	Set-04		Mb, Ilha Bela - Fm, Itajaí-Açu (Upper Cretaceous)	173 Bcf
URUGUÁ	Dez-05		Mb, Ilha Bela - Fm, Itajaí-Açu (Upper Cretaceous)	1 Tcf
TAMBAÚ	Dez-05		Fm, Itanhaém (Late albian)	1.6 Tcf
ATLANTA	Fev-07		Fm, Marambaia (Tertiary)	-
OLIVA	Fev-07		Fm, Marambaia (Tertiary)	754 MM bbl
TAMBUATÁ	Fev-07		Mb, Ilha Bela - Fm, Itajaí-Açu (Upper Cretaceous)	1.6 B bbl
CARAPIÁ	Fev-07		Mb, Ilha Bela - Fm, Itajaí-Açu (Upper Cretaceous)	65 MM bbl
PIRAPITANGA	Fev-07		Fm, Florianópolis (Middle Albion)	2.5 Tcf

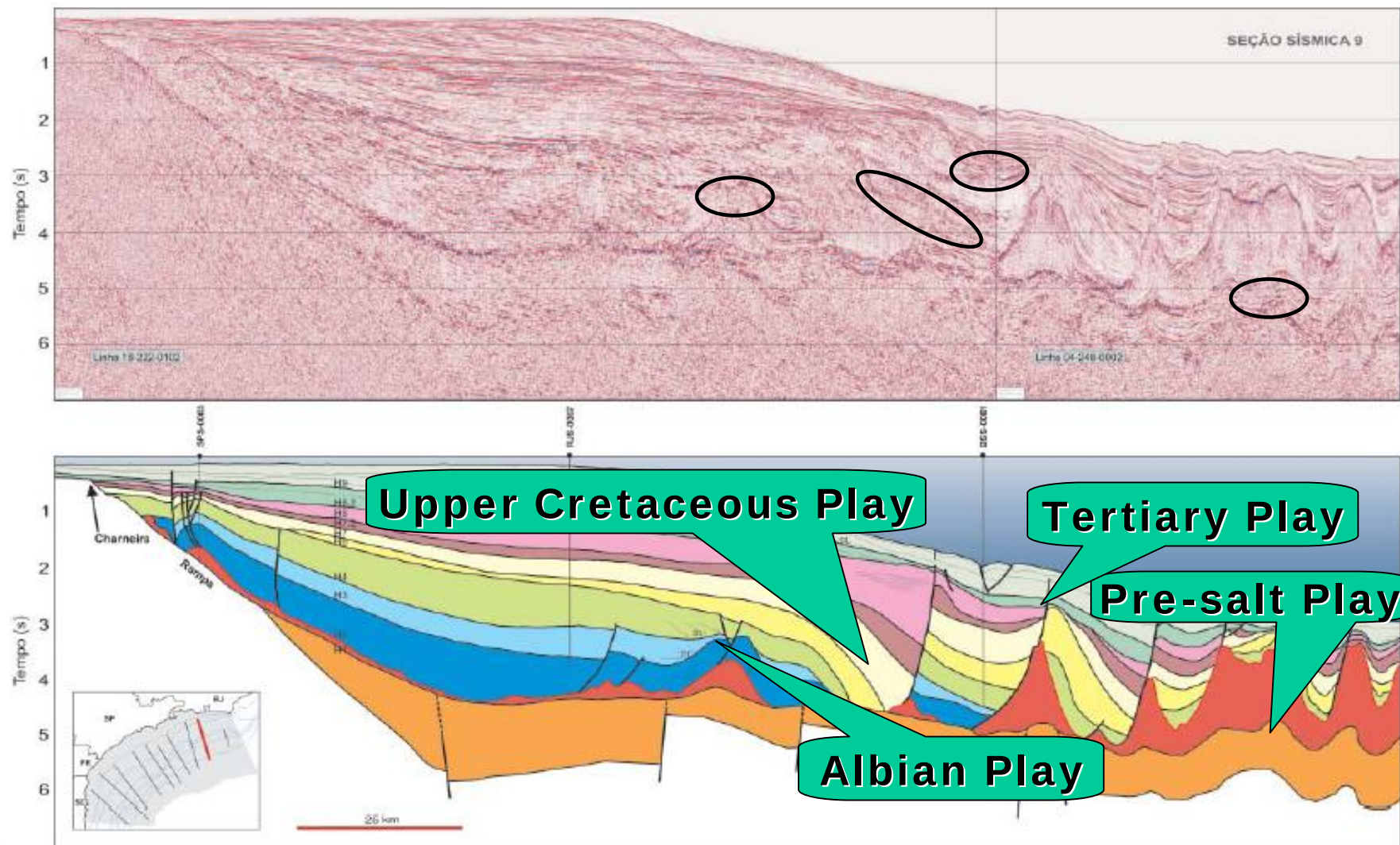


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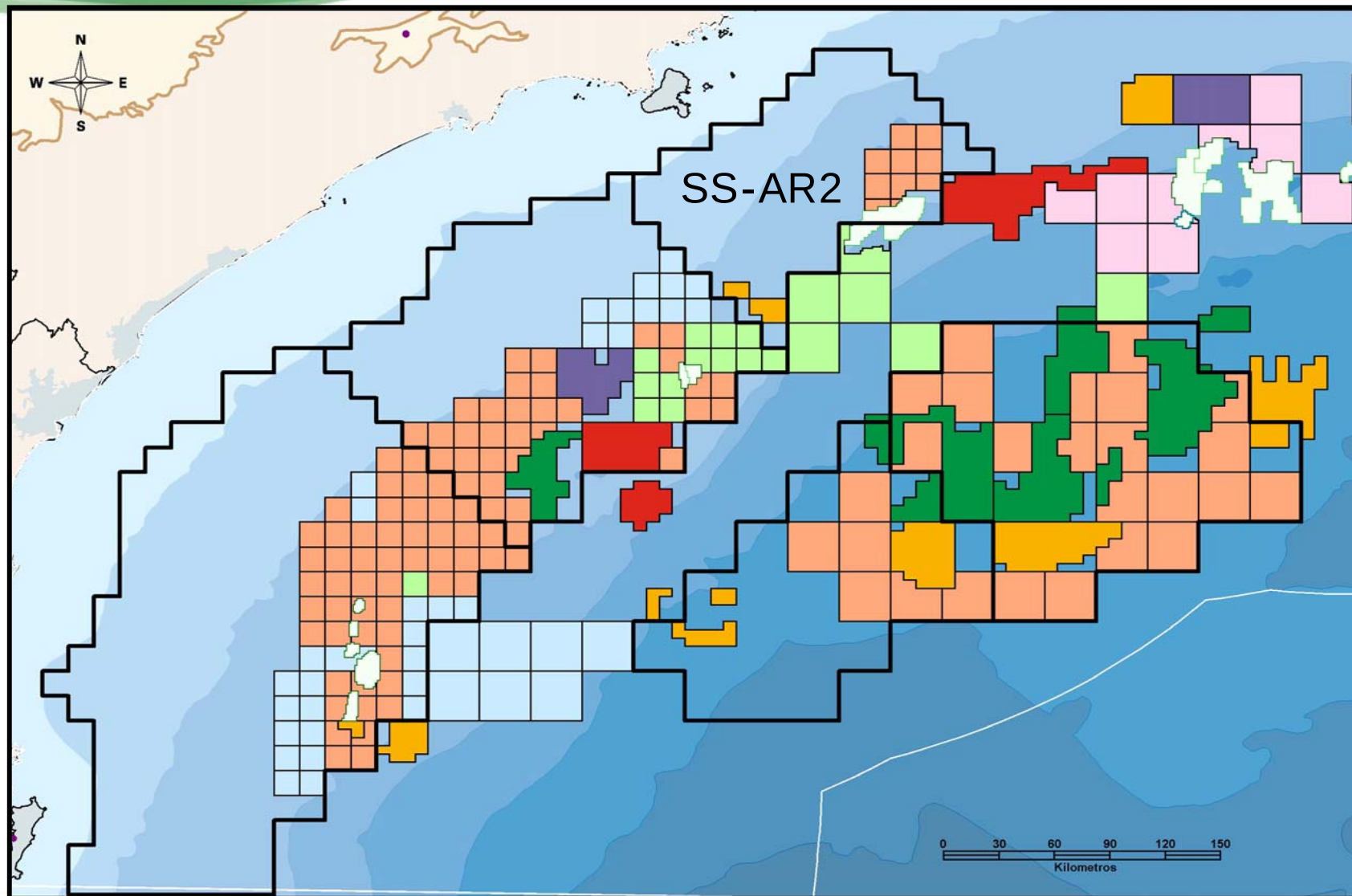
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Main Plays



Sector SS-AR2

Blocks Offered



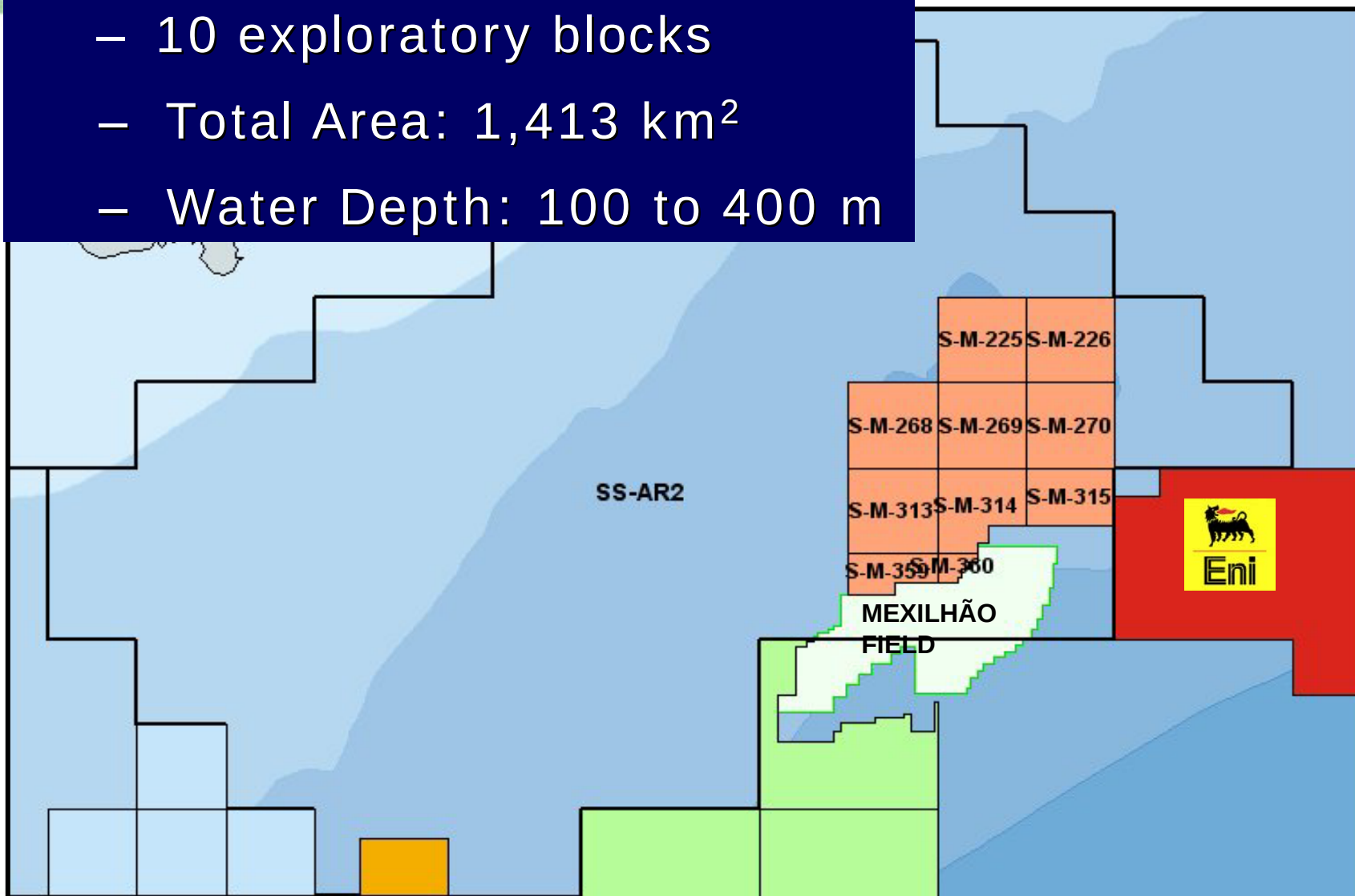


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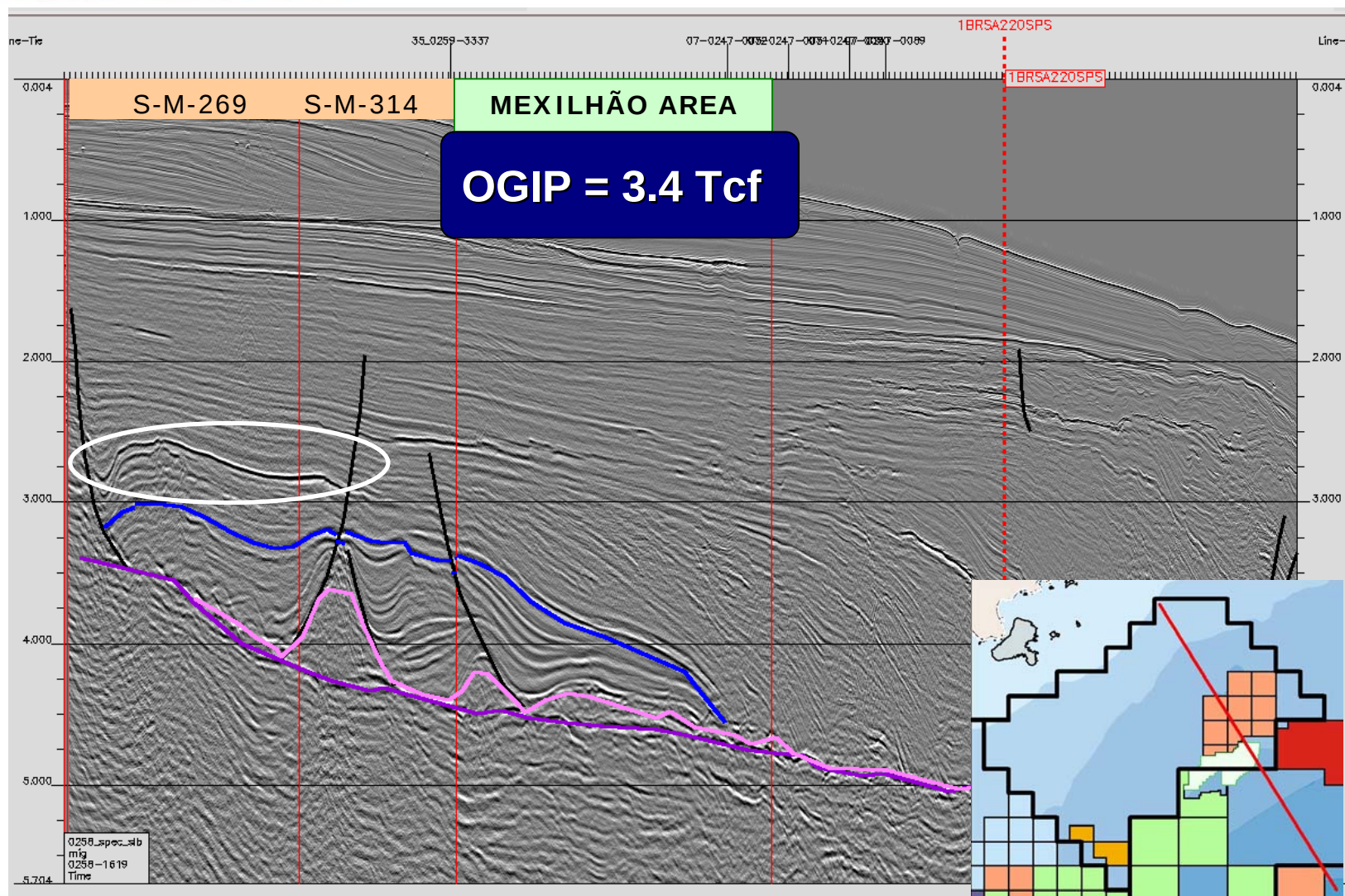


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- 10 exploratory blocks
- Total Area: 1,413 km²
- Water Depth: 100 to 400 m

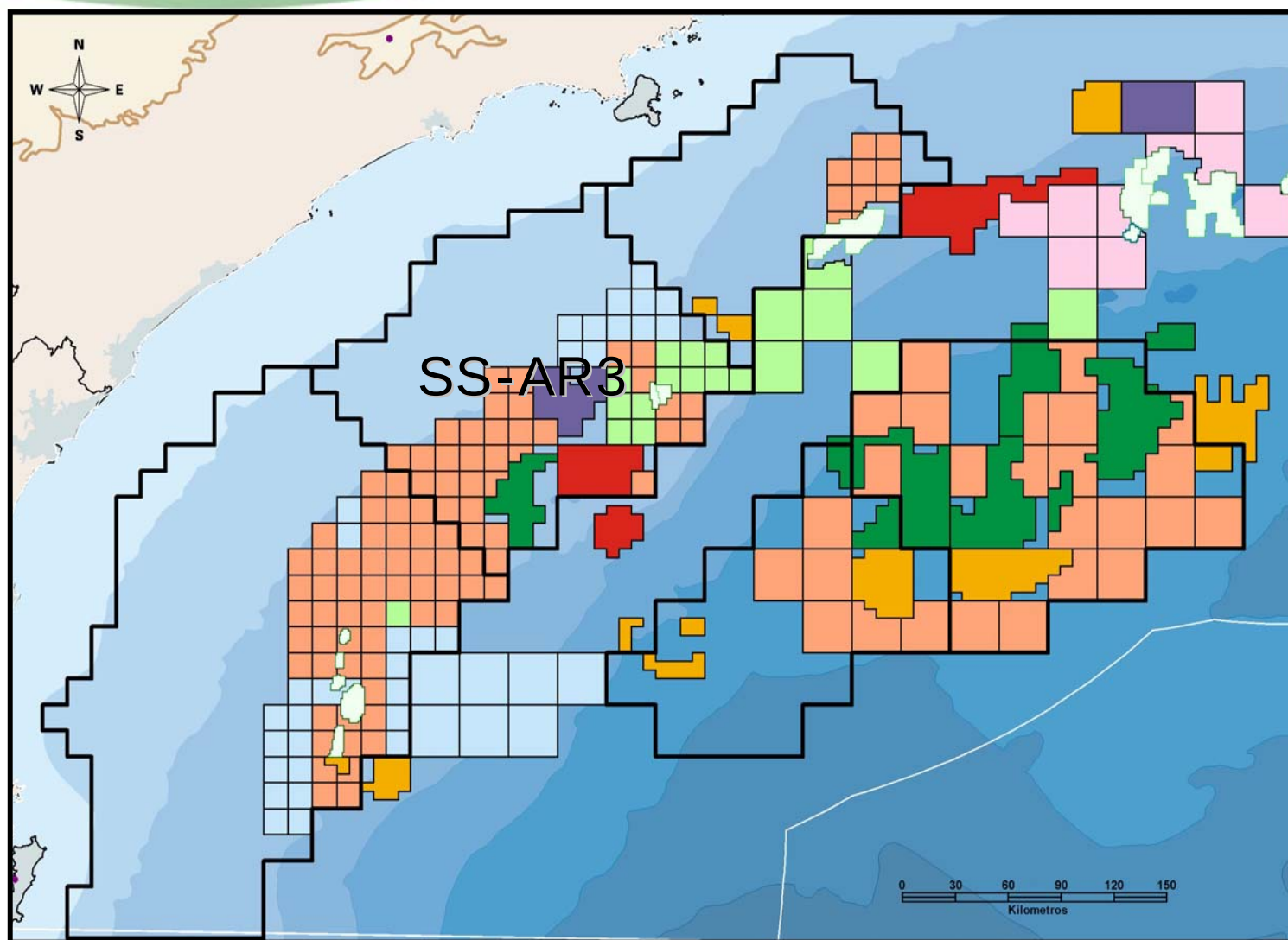


Upper Cretaceous Exploratory Opportunities



Courtesy Schlumberger-Western Geco

Sector SS-AR3 Blocks Offered



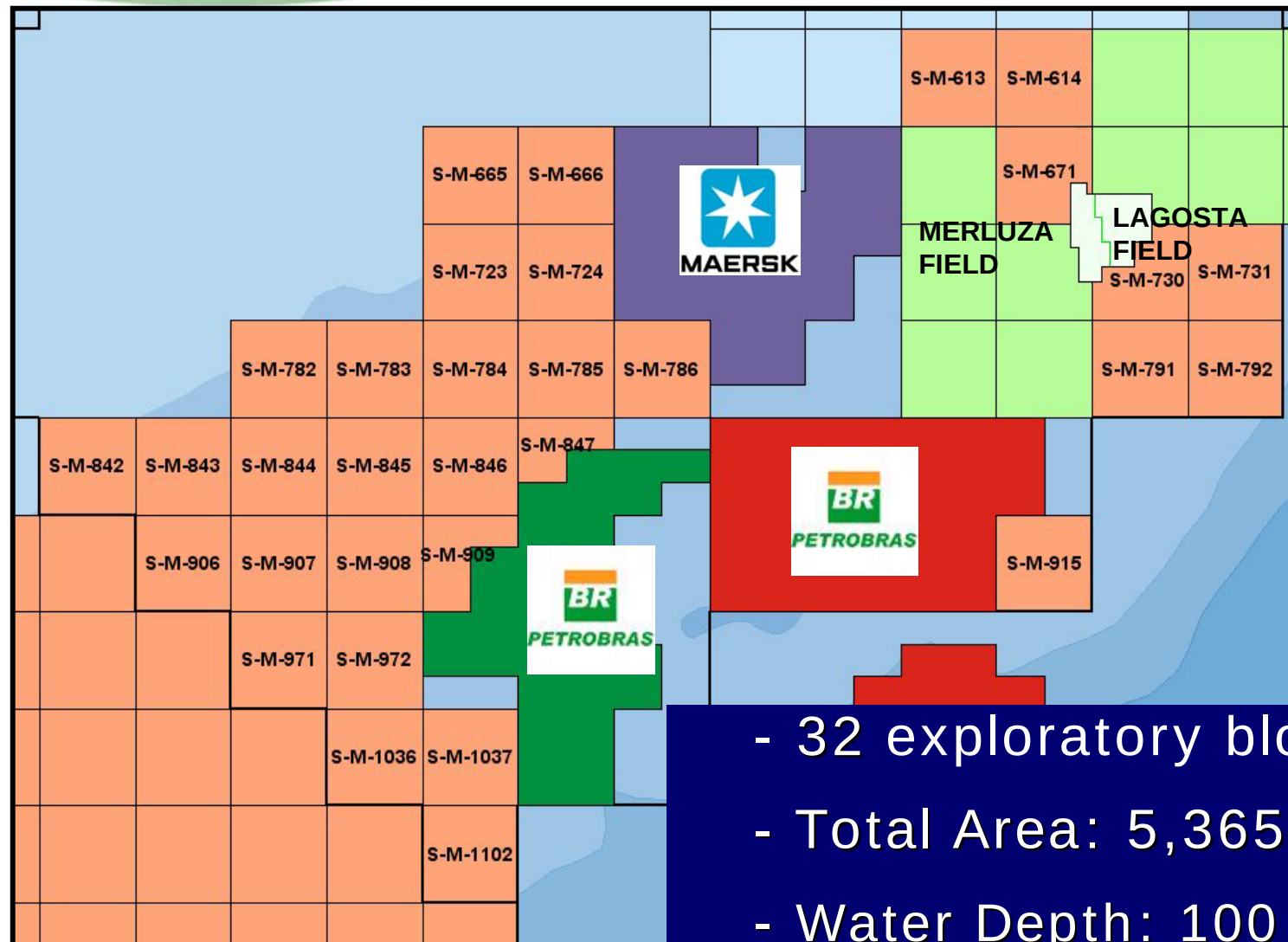


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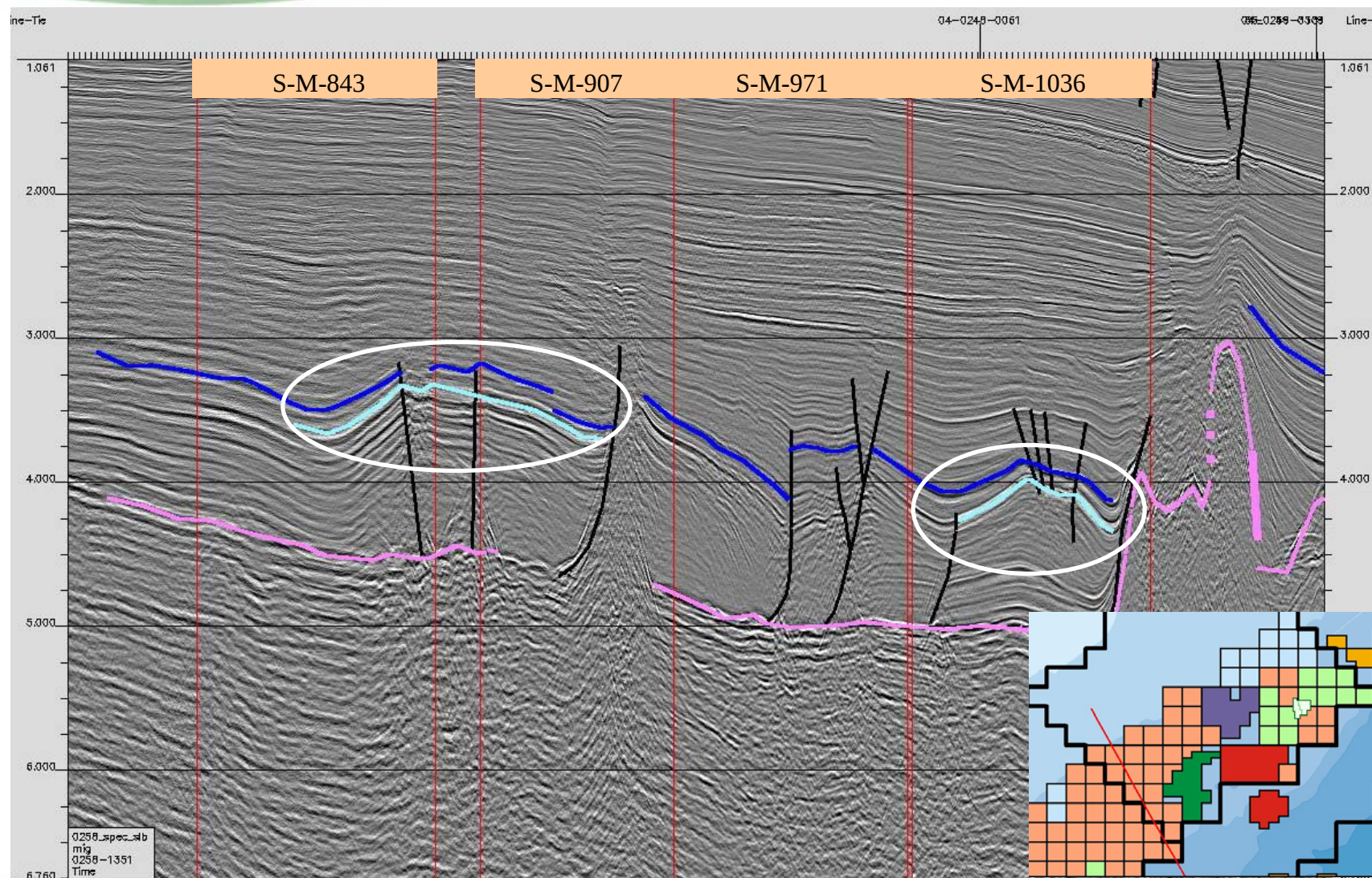
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Sector SS-AR3 Blocks Offered



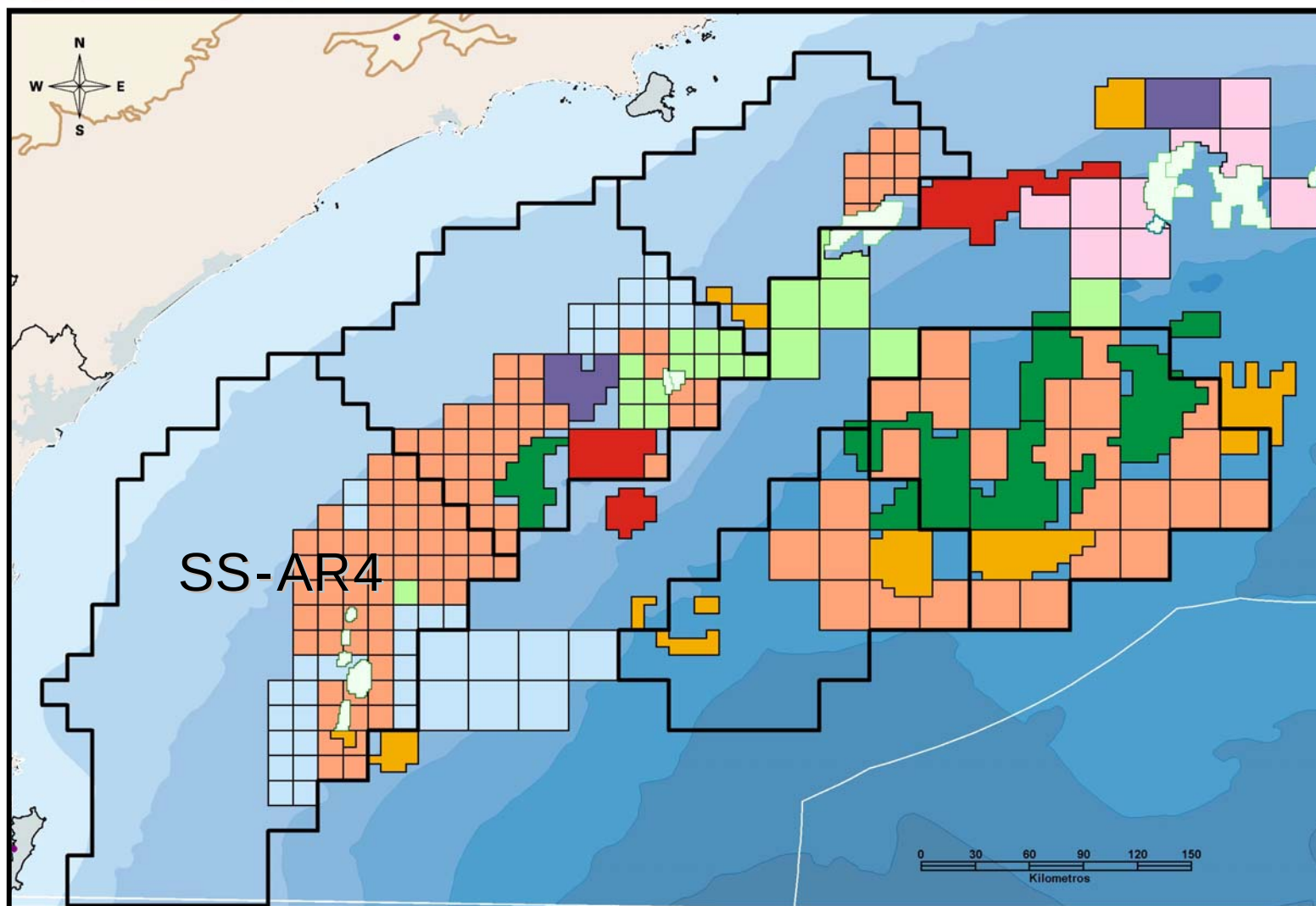
- 32 exploratory blocks
- Total Area: 5,365 km²
- Water Depth: 100 to 400 m

Albian Exploratory Opportunities



Courtesy Schlumberger-Western Geco

Sector SS-AR4 Blocks Offered



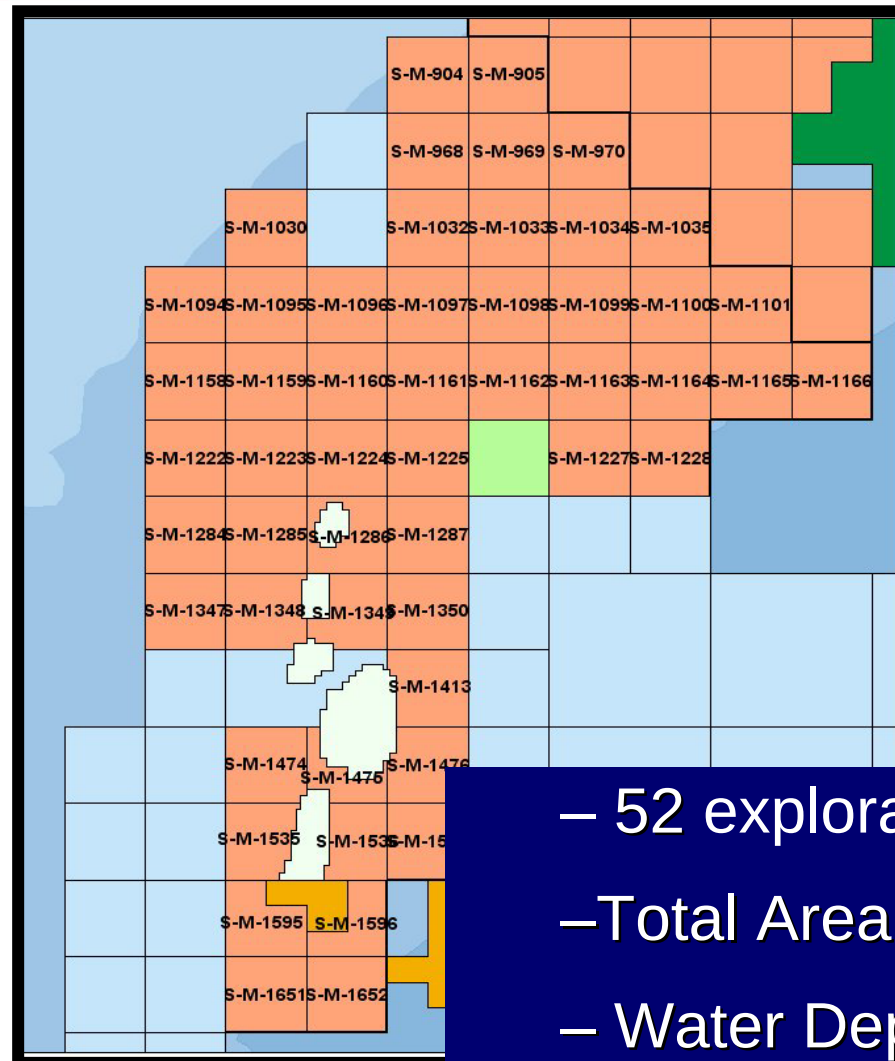


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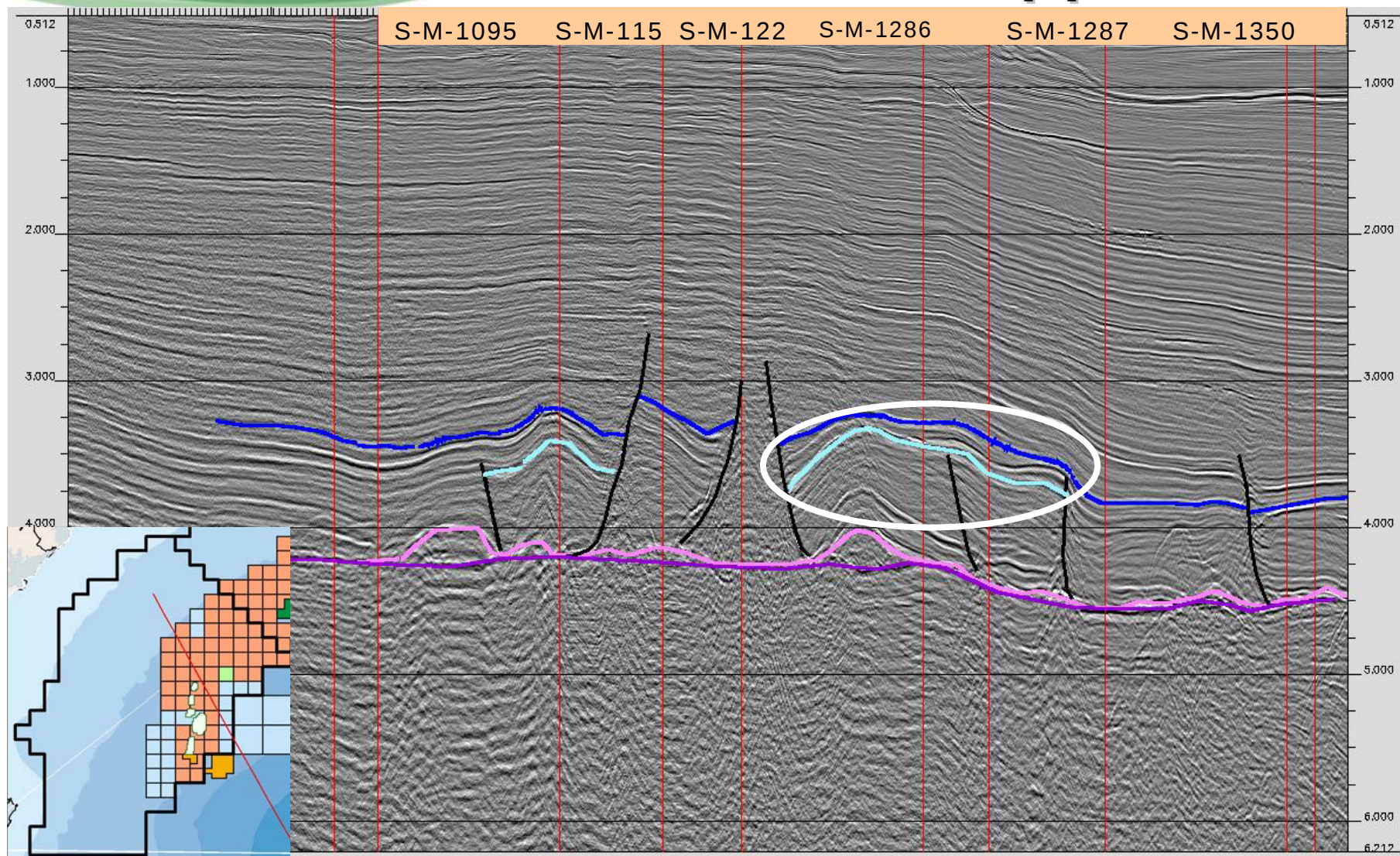
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Sector SS-AR4 Blocks Offered



- 52 exploratory blocks
- Total Area: 8,638 km²
- Water Depth: 100 to 400 m

Albian Exploratory Opportunities



Courtesy Schlumberger-Western Geco

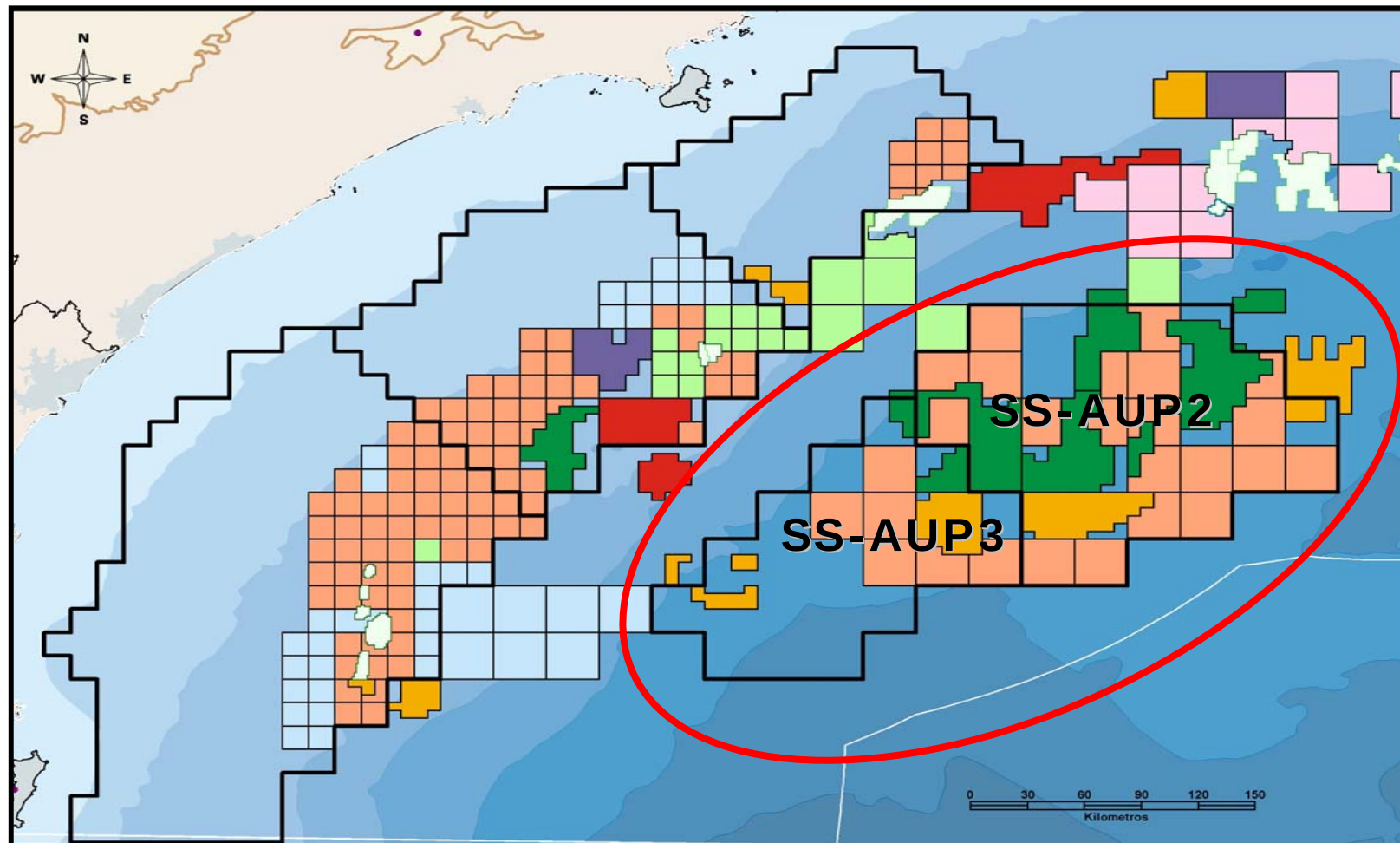


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Sectors SS-AUP2 & SS-AUP3 Blocks Offered

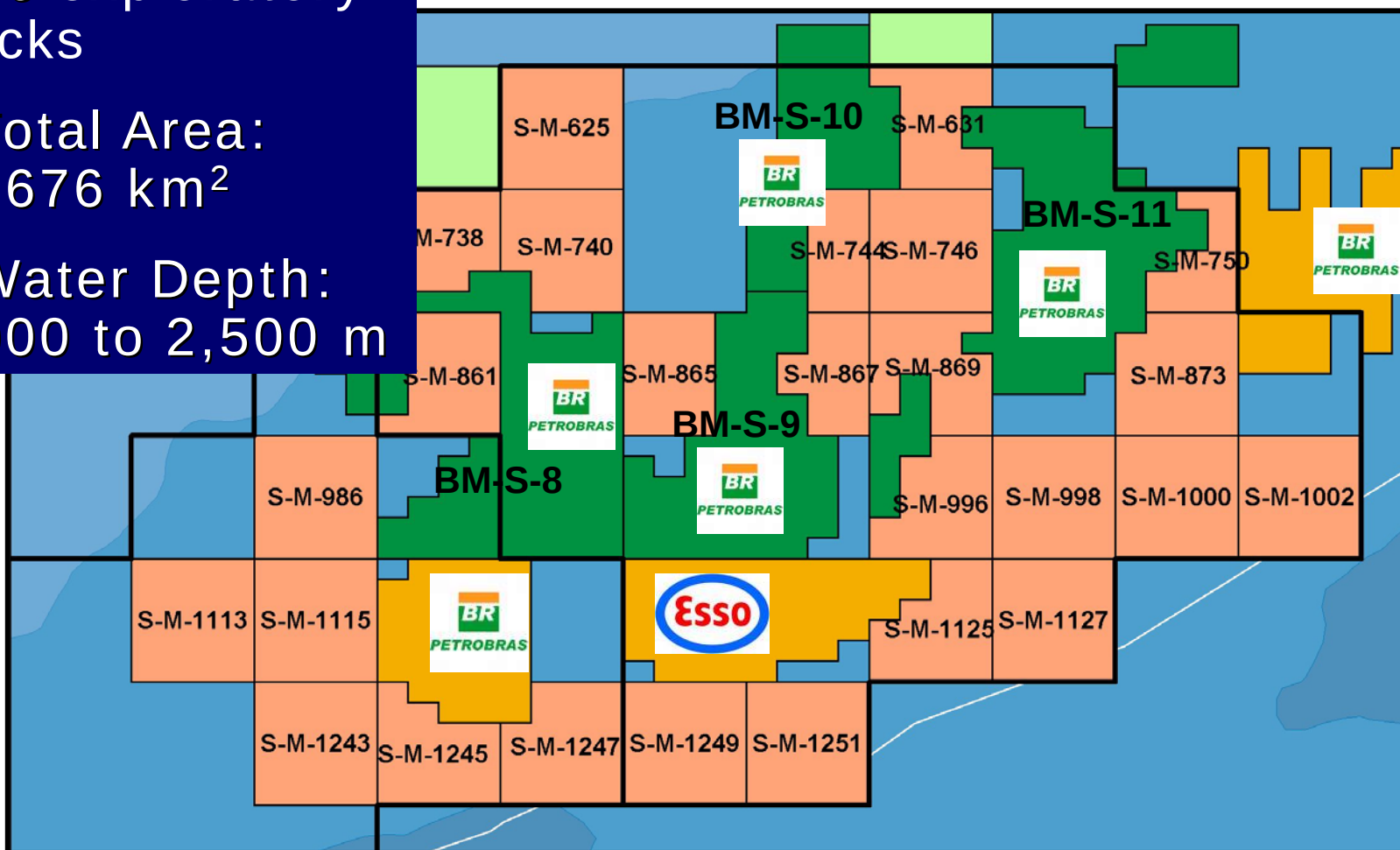


Sectors SS-AUP2 & SS-AUP3 Blocks Offered

– 26 exploratory
blocks

– Total Area:
15,676 km²

– Water Depth:
2,000 to 2,500 m



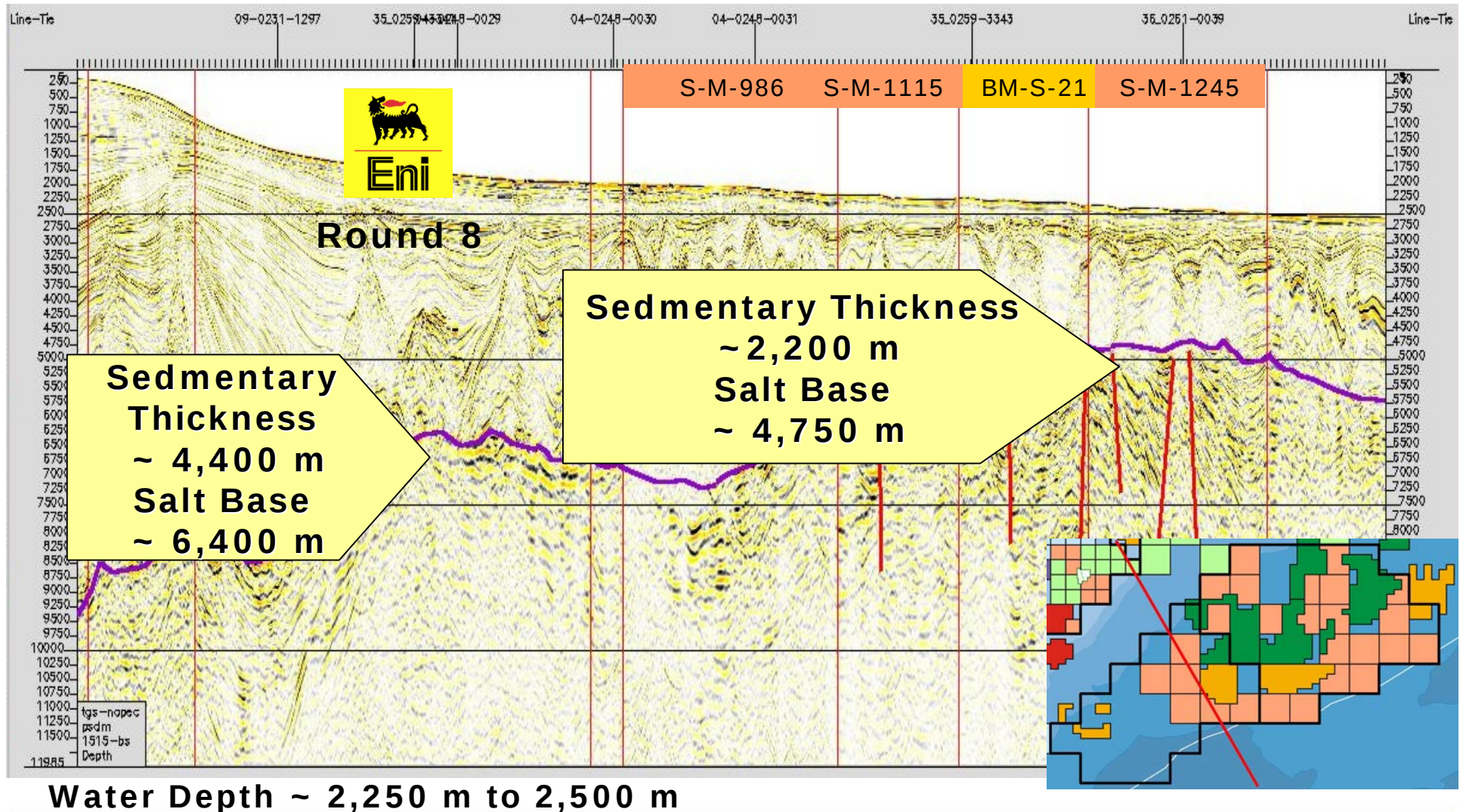


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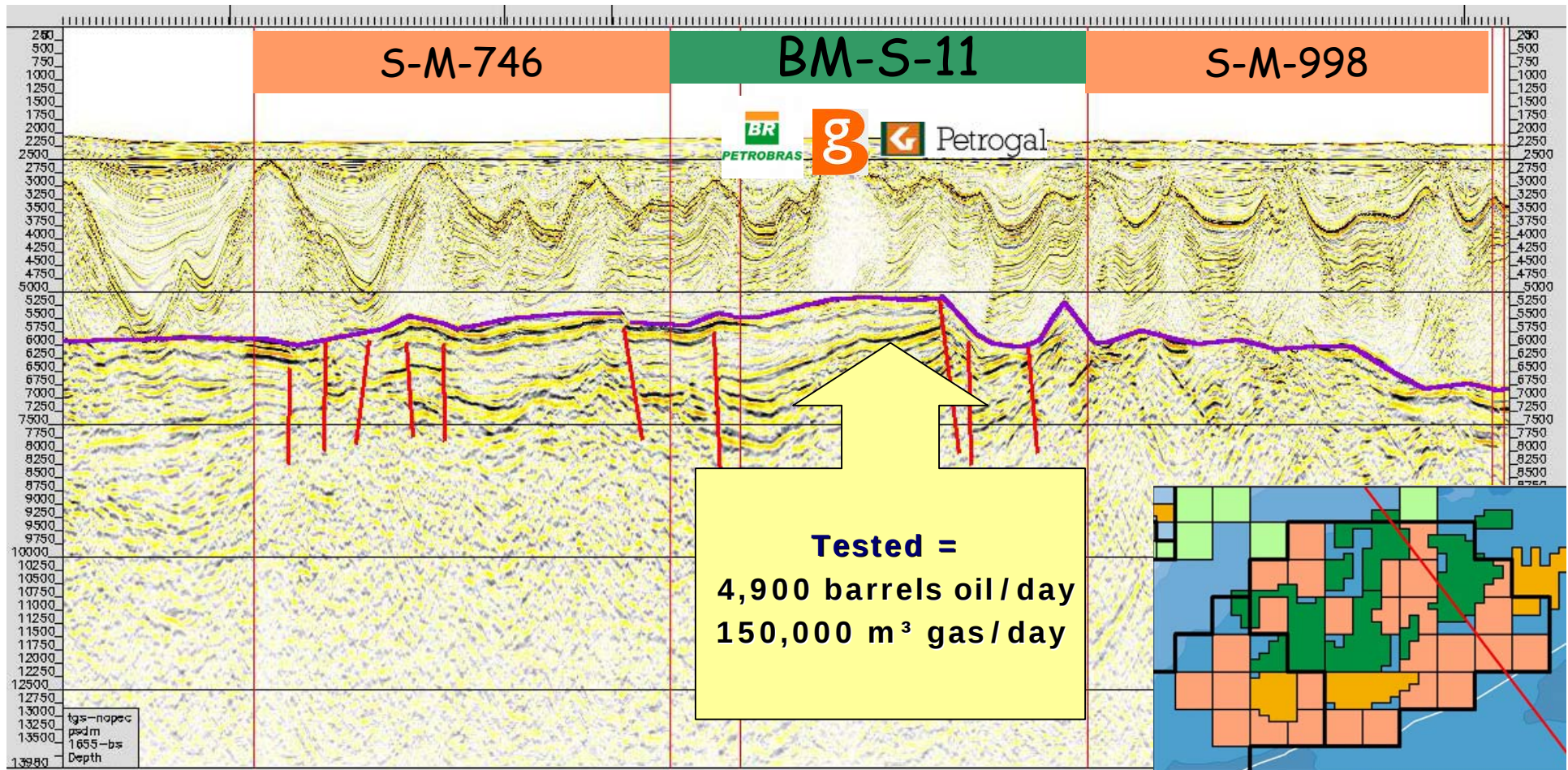


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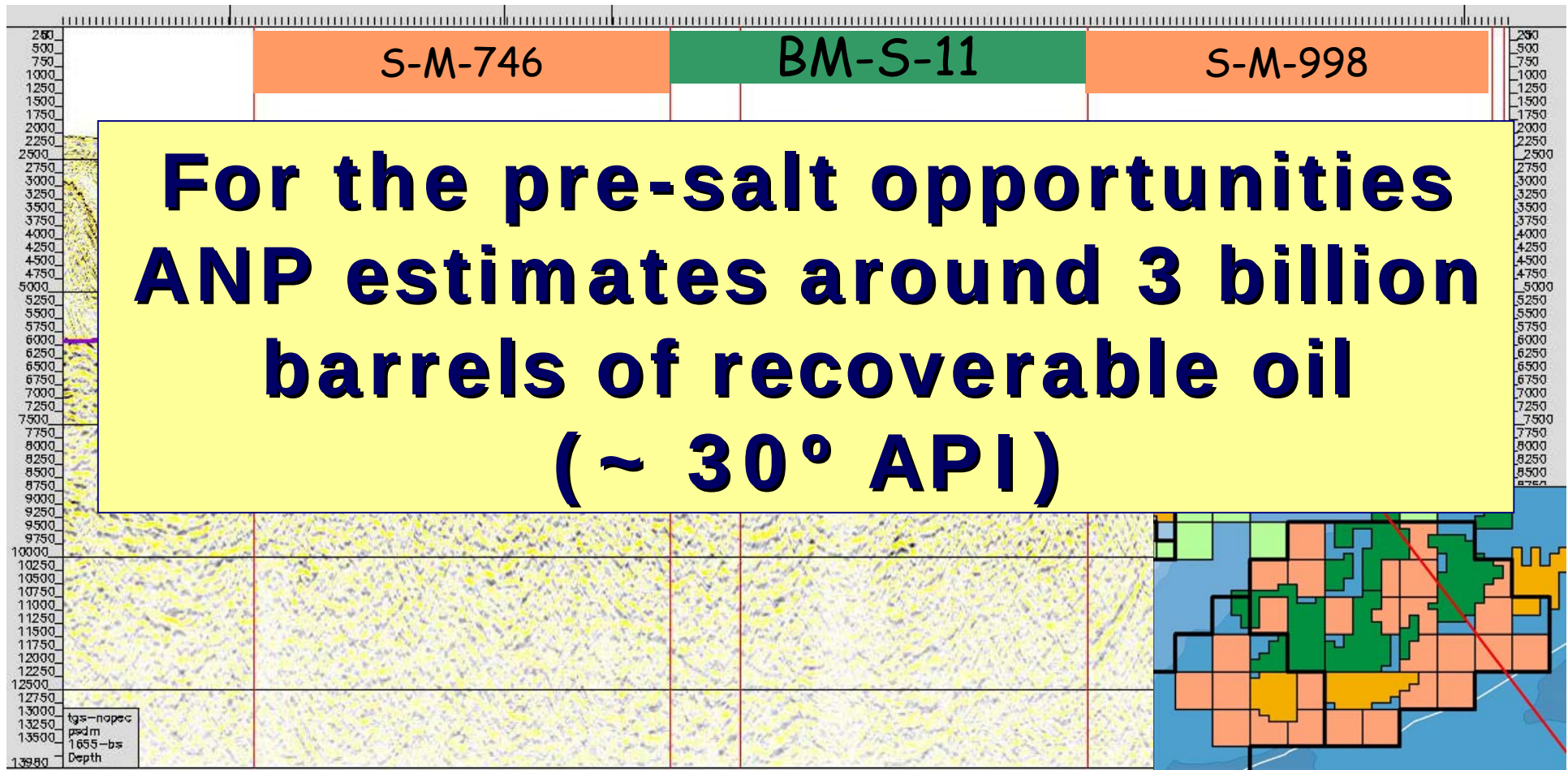
Pre-Salt Exploratory Opportunities



Pre-Salt Exploratory Opportunities



Water depth ~ 2,250 m





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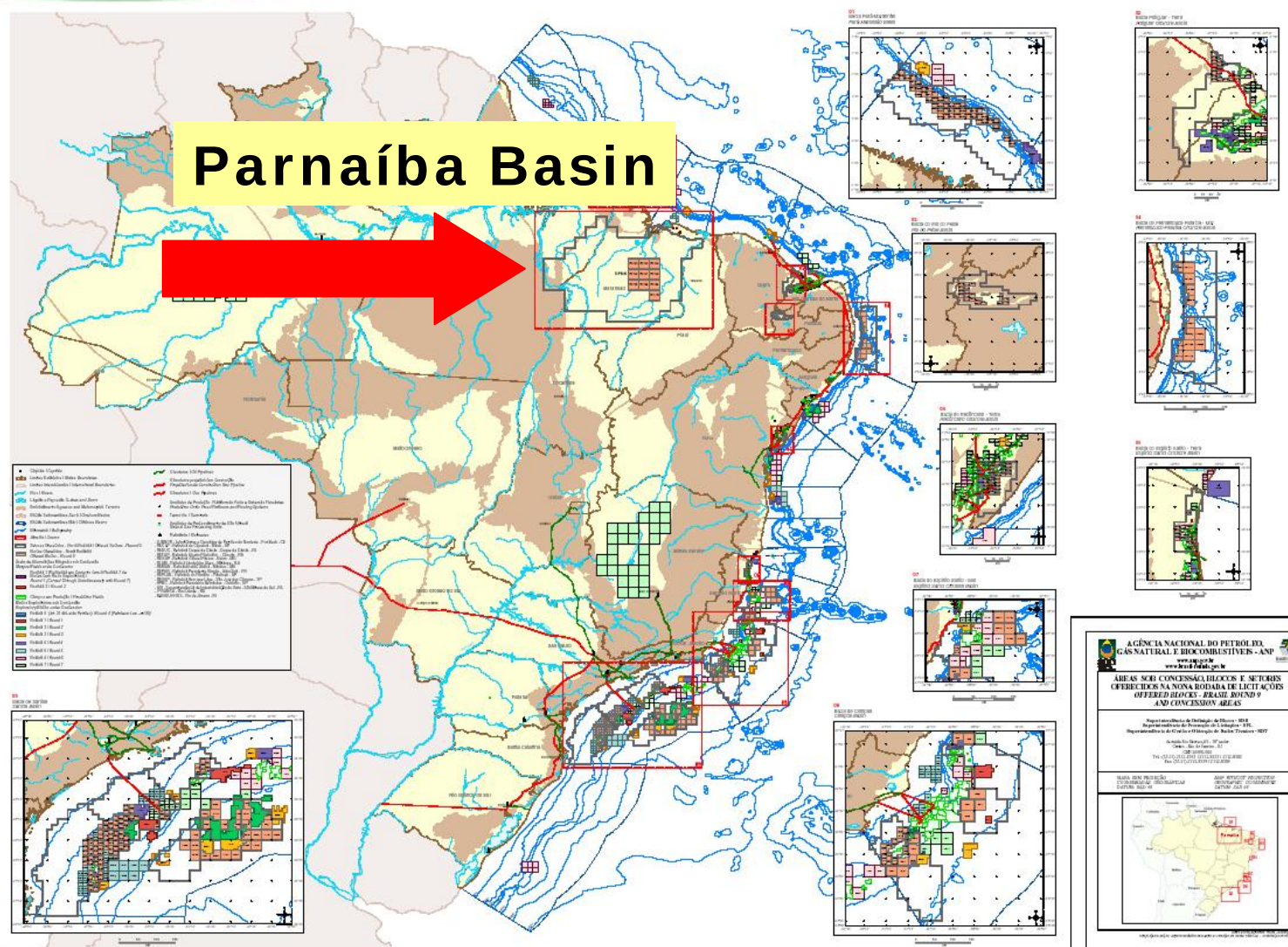
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Santos Basin

Bid and Contract Parameters

- Minimum Bonus (MMUSD): 2.4 @ 126
- Exploration Period (years) : 5 and 7

Brazil Round 9 Offered Areas





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Parnaíba Basin

- One of the country's largest onshore sedimentary basins
- Strategically located; almost unexplored; several oil and gas shows; known gas seeps.
- Close to Carajas Mining Complex, a world class project



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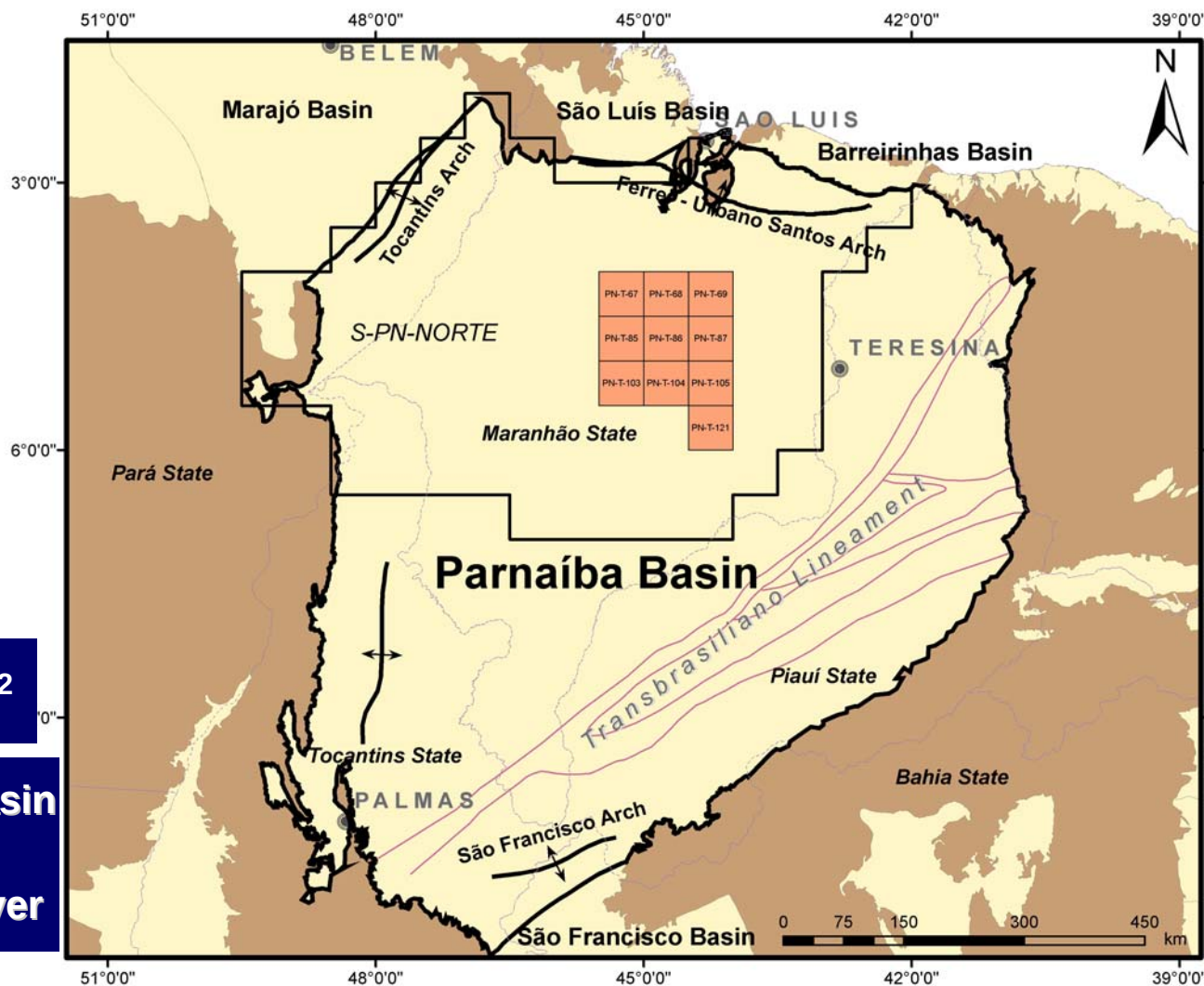
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Location



Total Area = 668,858 km²

**Paleozoic Intracratonic basin
Sedimentary infill
Cretaceous – Tertiary cover**



Infrastructure of the Brazilian northeastern region

offered area

Itaqui Port

BR-135 - MA - Itaqui Port Access

BR-135-PI-BA-MG

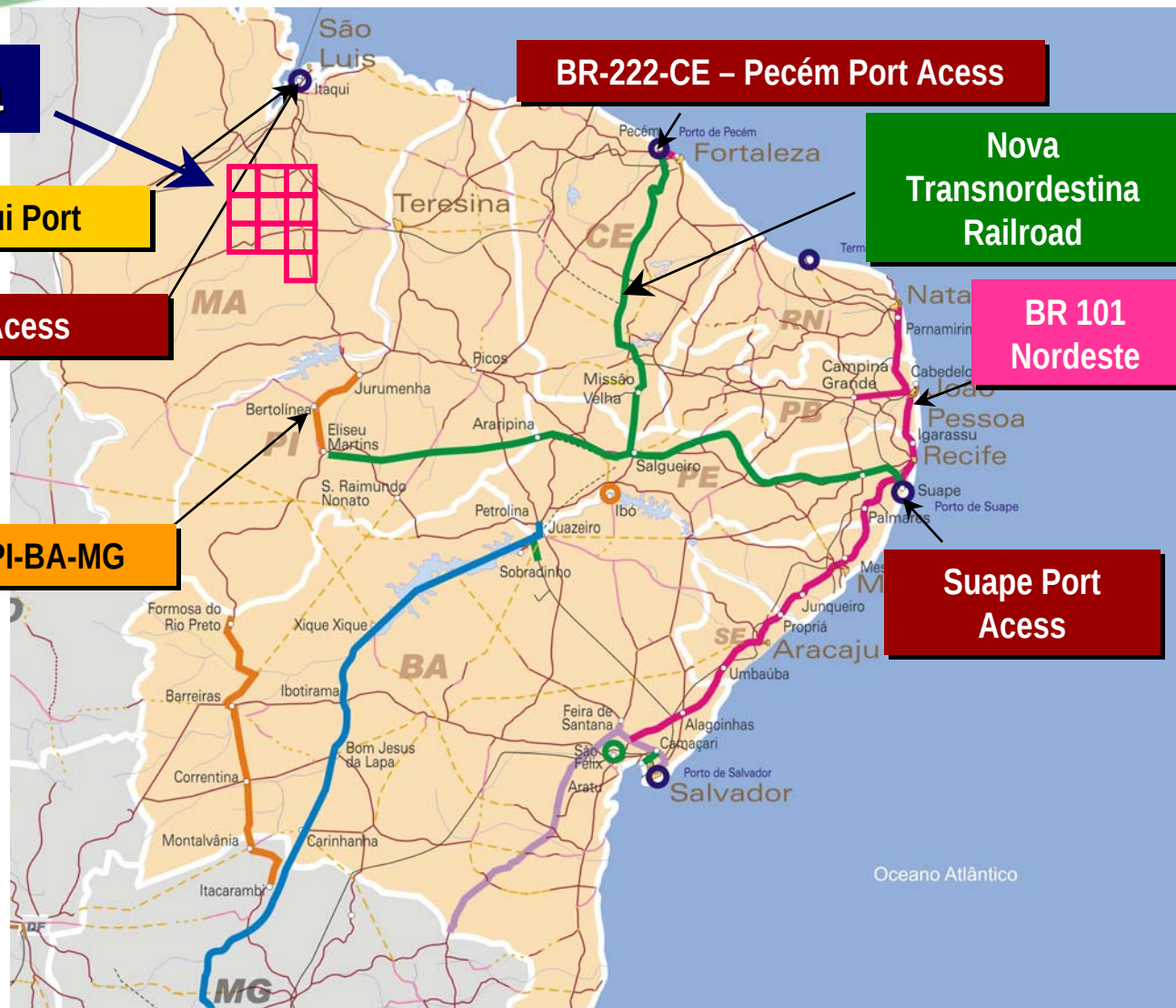
BR-222-CE - Pecém Port Access

**Nova
Transnordestina
Railroad**

**BR 101
Nordeste**

**Suape Port
Access**

**Total investment:
R\$ 7.3 bilhões
2007 - 2010**





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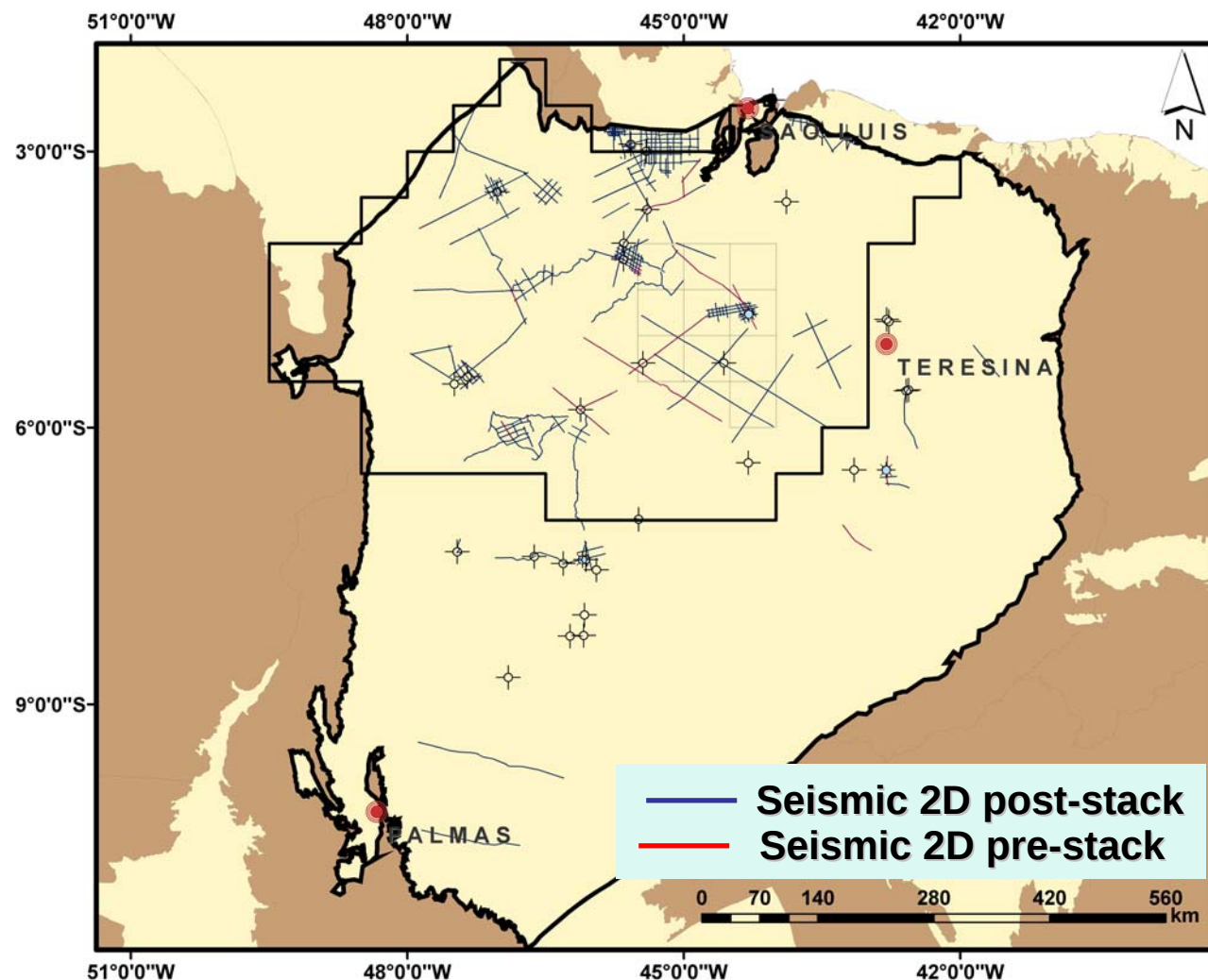


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Brazilian northeastern region

- ✓ Area of 1.5 million km²; population of 51 million inhabitants (28% of Brazilian population) and GNP of USD 93.6 billions (2004)
- ✓ Climate: tropical and wet equatorial
- ✓ Brazilian northeastern has incentive programs to productive activities and also fiscal benefits

Exploration History



34 wells

22 wildcats

12 stratigraphic wells

7 special wells

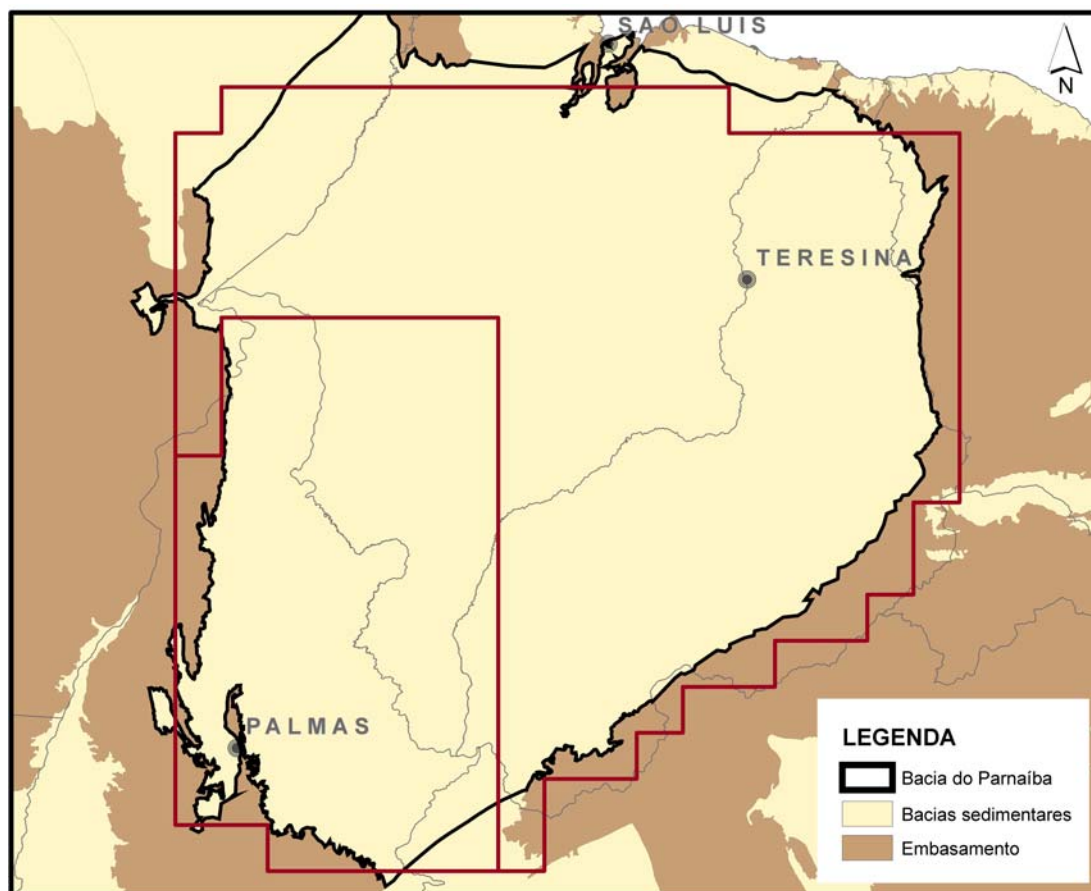
**13,194 km
2D seismic**

**163,690 km² of
magnetometry data**

**116,360 km² of gravimetry
data**

Aerogeophisic survey ANP / 2006

Bacia do Parnaíba



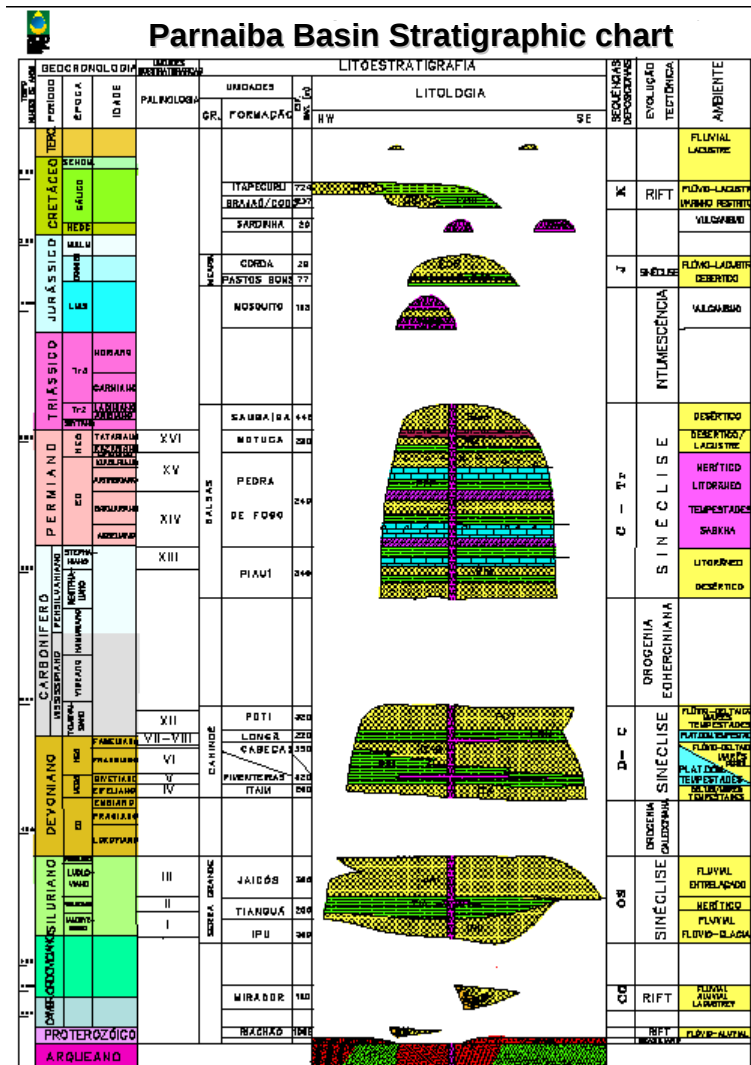
Grav/Mag

Area: 748,612,4 km²
(183,877.03 linear km)

Gama/Mag

Area: 240,000 km²
(544,446 linear km)

Tectonic stratigraphic evolution



The stratigraphic framework of the Parnaíba Basin is comprised by the following depositional sequences

CRETACEOUS

Urucuia, Areado, Itapecuru, Codó, Grajaú and Sardinha formations

JURASSIC

Corda, Pastos Bons and Mosquito formations

TRIASSIC

Sambaíba, Motuca, Pedra de Fogo and Piauí formations

DEVONIAN

CARBONIFEROUS

Poti, Longá, Cabeças, Pimenteiras and Itaim formations

SILURIAN

Jaicós, Tianguá and Ipu formations

ORDOVICIAN
LATE PROTEROZOIC

Mirador Formation
Riachão Formation

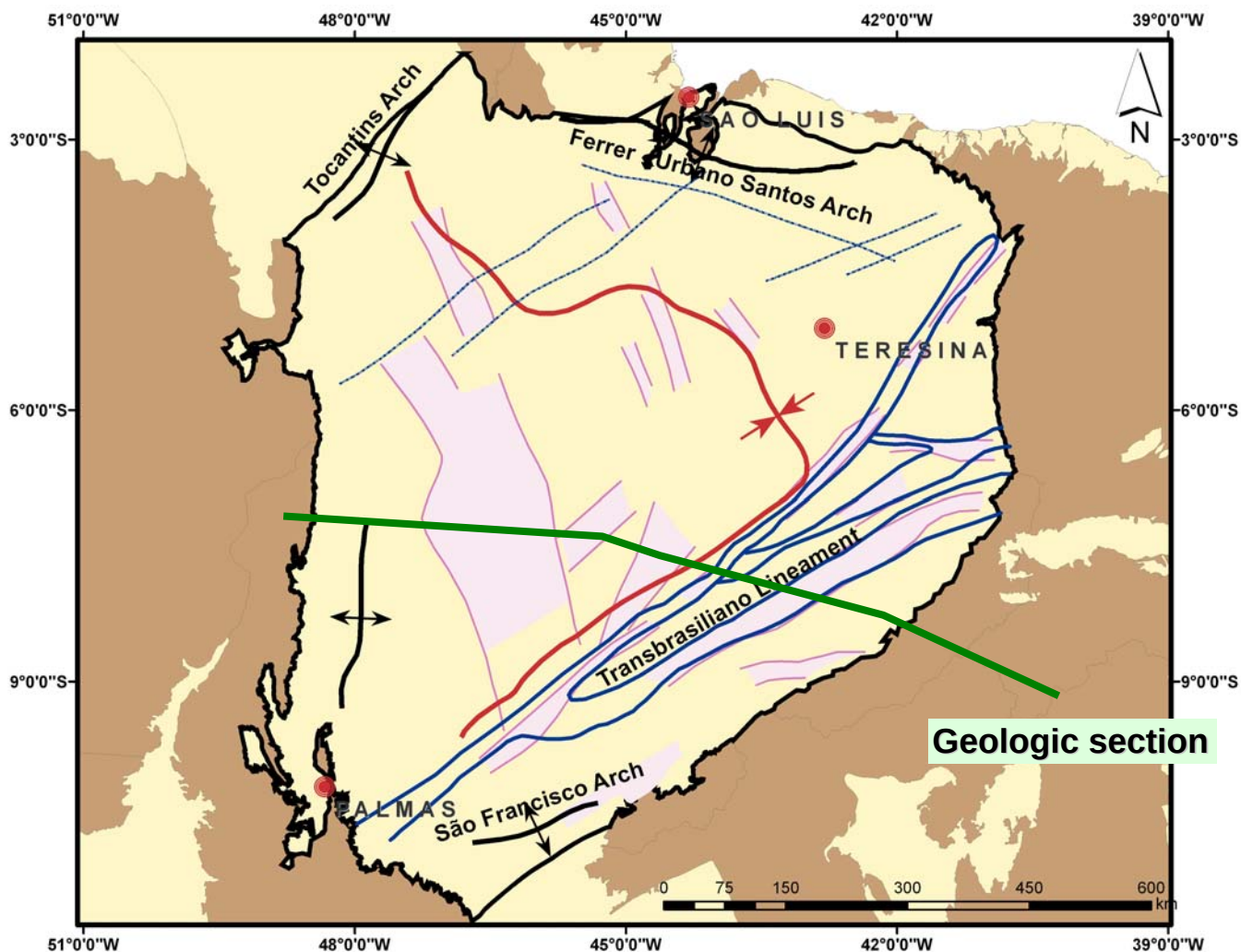


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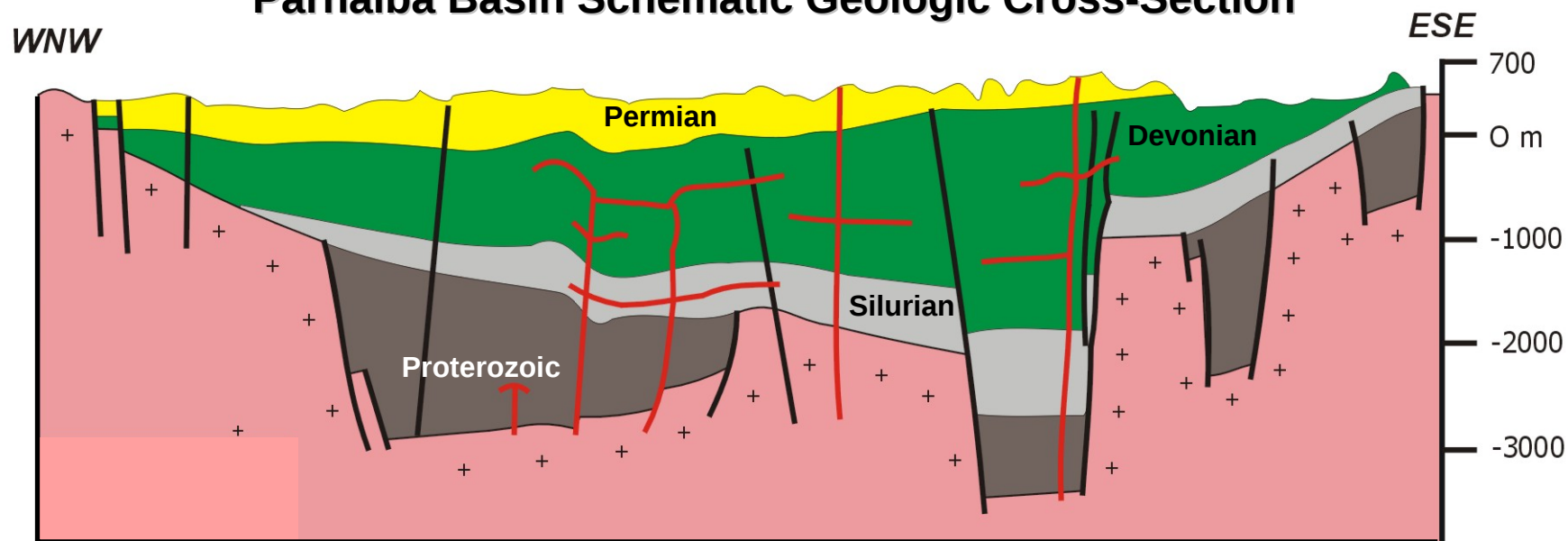
Structural Framework



Source: Milani e Zalan, 1998

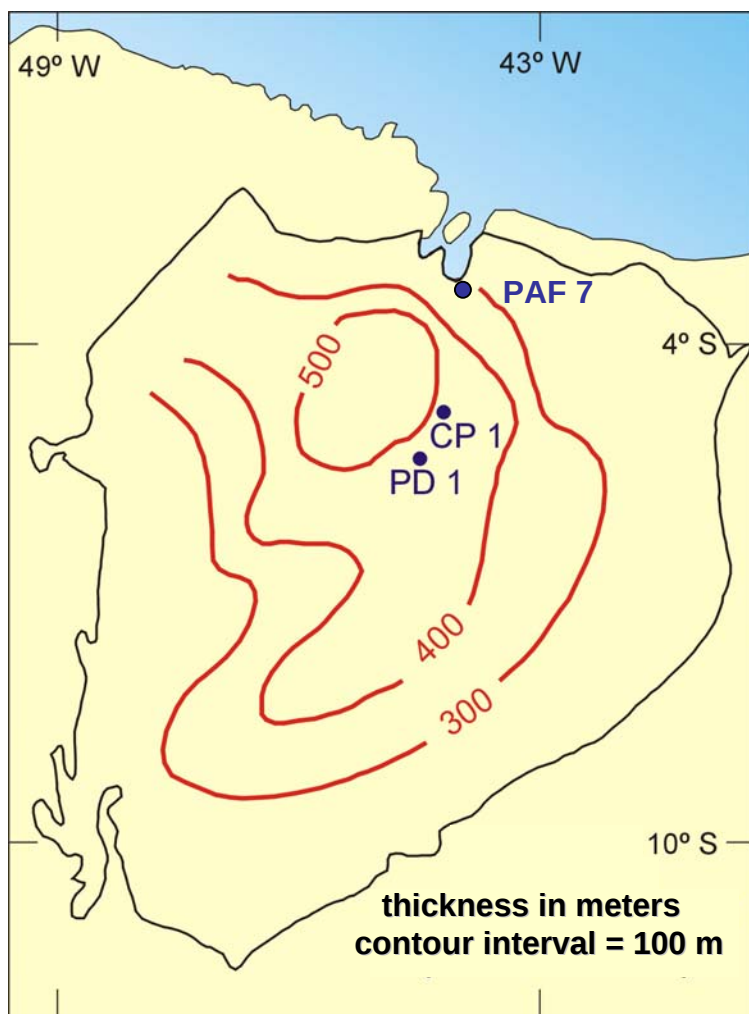
Schematic Geologic Cross-Section

Parnaíba Basin Schematic Geologic Cross-Section



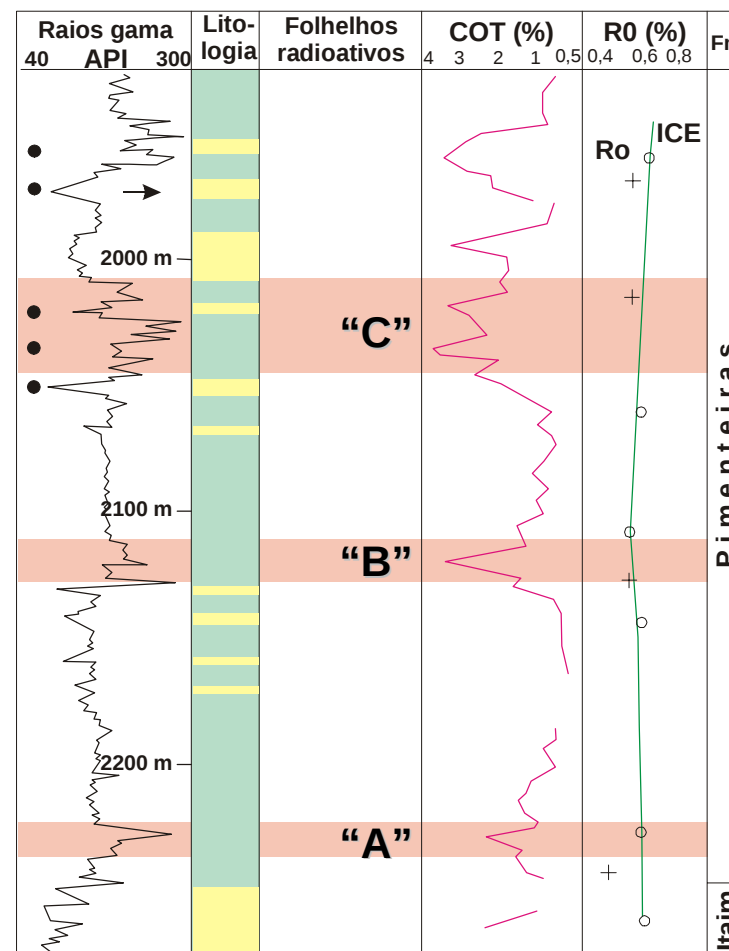
(Modificado de Góes et al., 1993)
(Modified from Góes et al., 1993)

Source rocks



Isopach maps of the Pimenteiras Formation

Well 9 – PAF – 7 – MA drilled in 1964



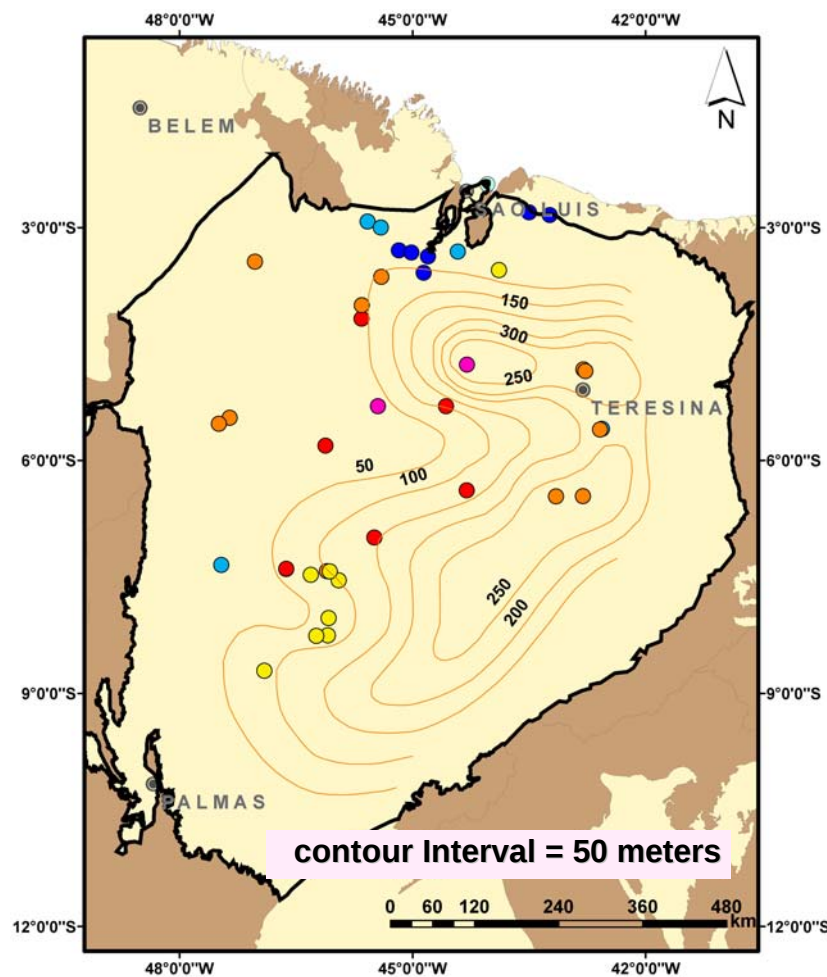


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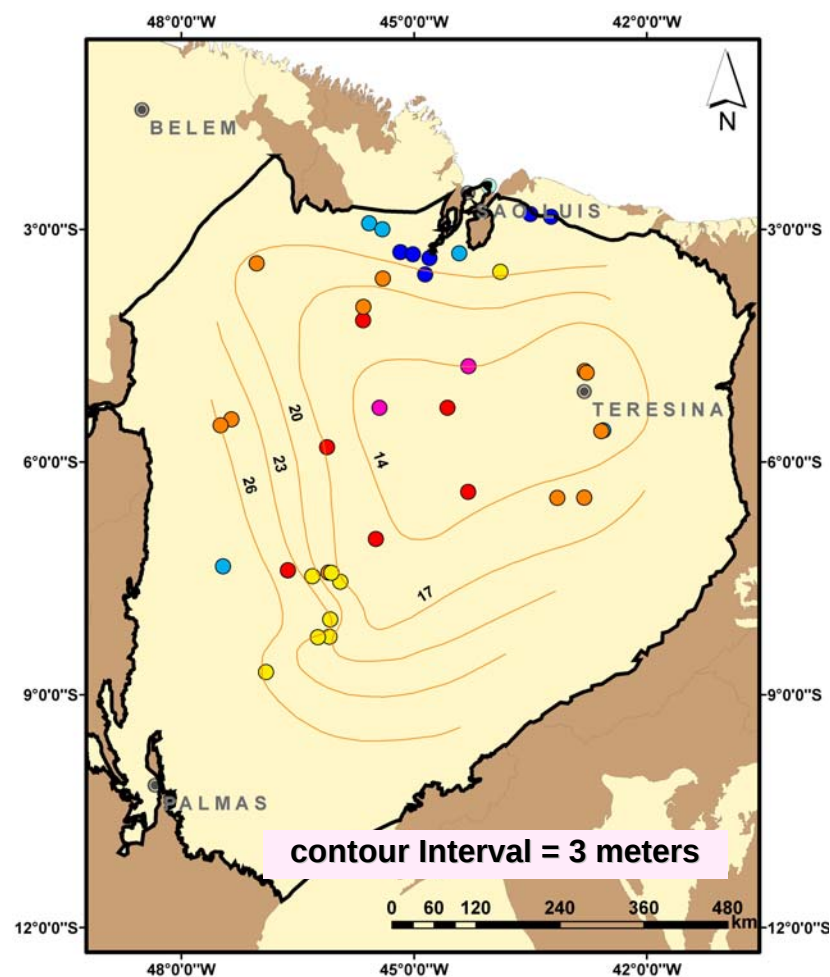
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Reservoirs



Isopach map

Devonian Reservoir (Cabeças Formation)



Porosity distribution map

Devonian Reservoir (Cabeças Formation)

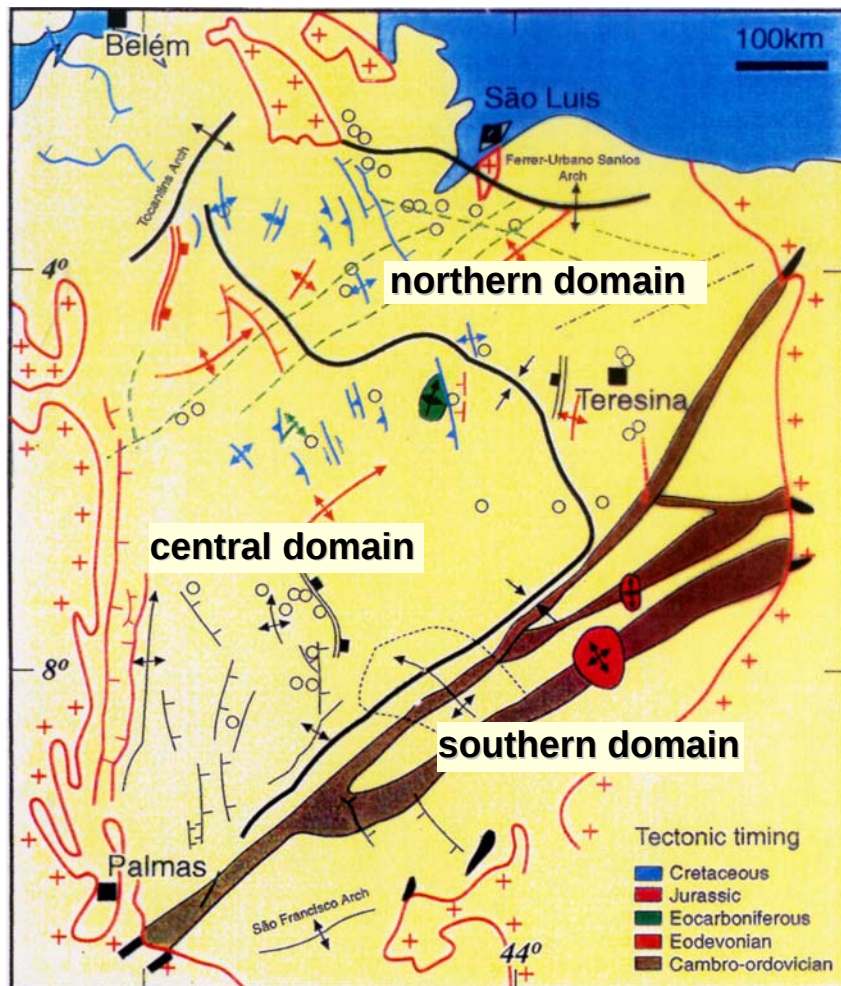


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Traps



Source: Milani and Zalán, 1998

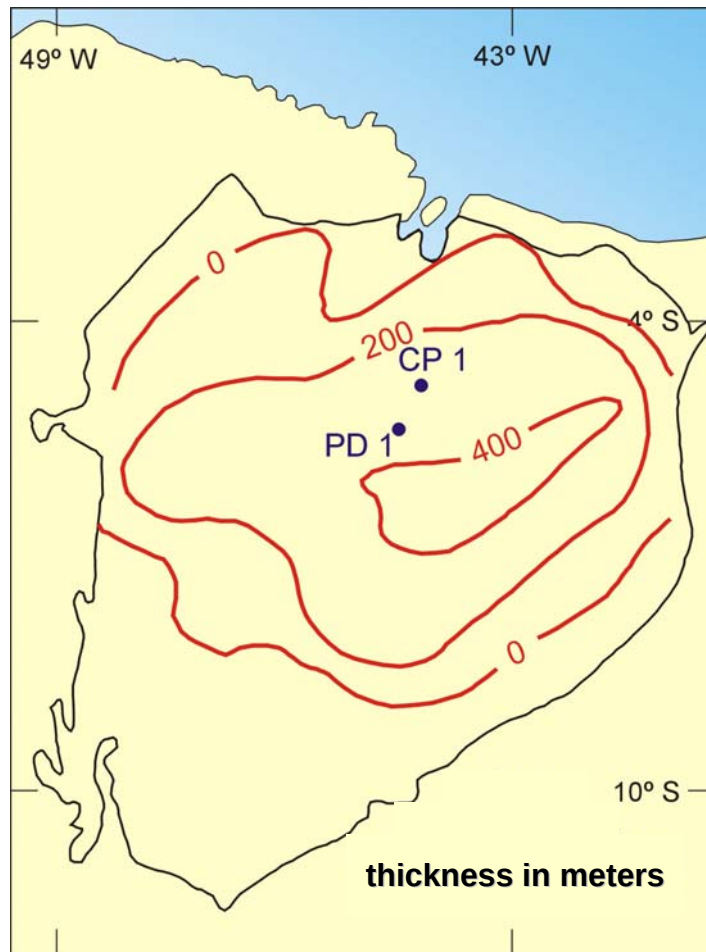
The northern domain is characterized by regional arches and abundant normal fault attributed to the tectonic processes that resulted in the Equatorial Atlantic opening

In the central domain occurs structures related to the igneous intrusions

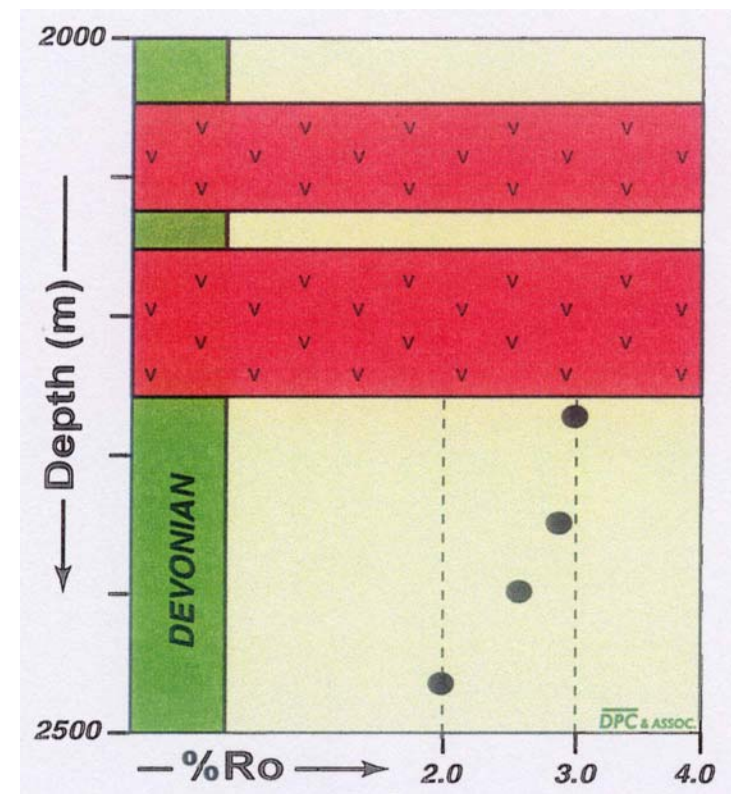
In the southern domain occurs structures related to the strike slip tectonics

Maturation

Thermal effect of basic igneous rocks intruded in source rocks had contributed to the maturation of organic matter

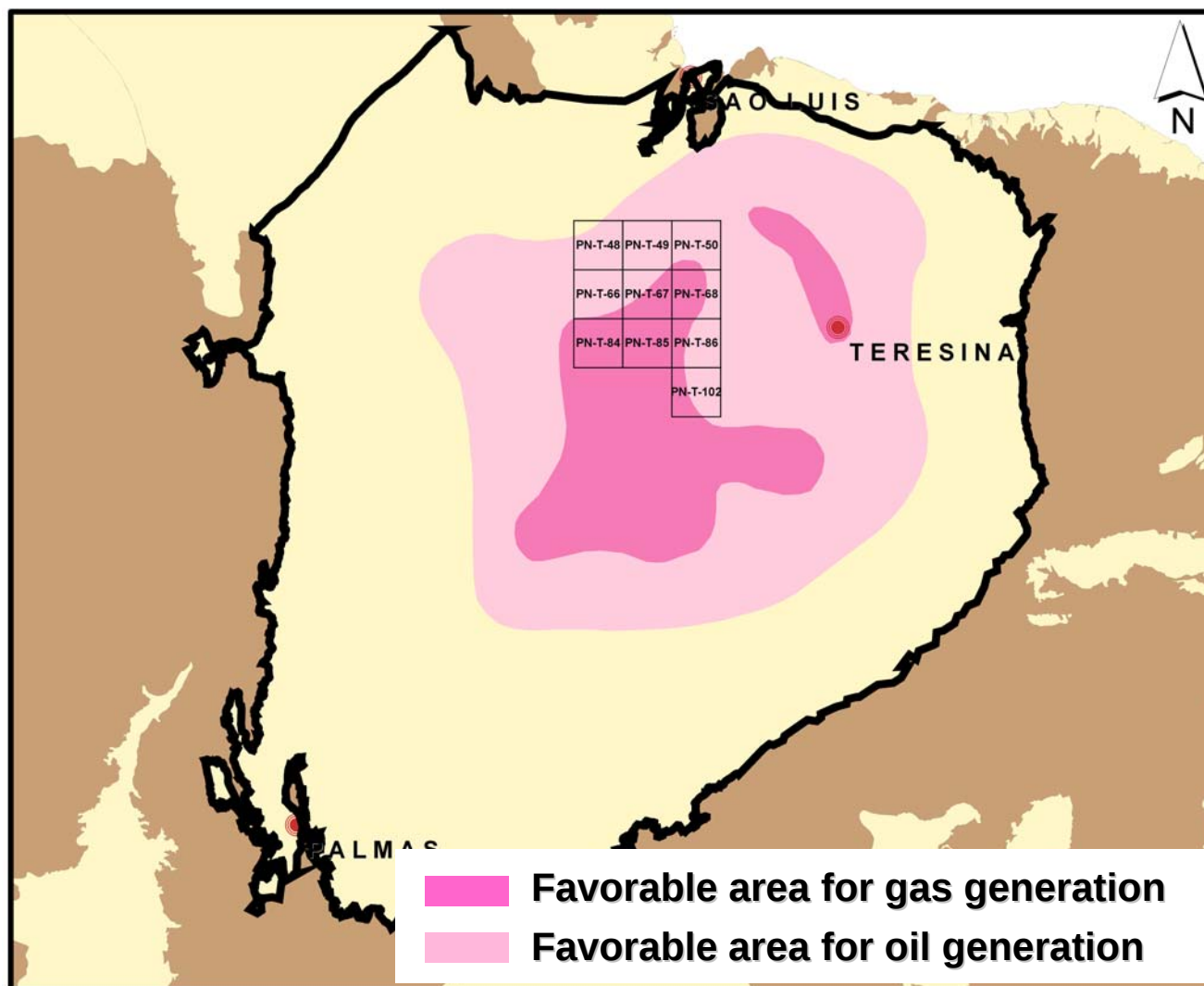


Isolith map of the igneous rocks (basalt + diabase)



Thermal influence of igneous intrusions in Devonian rocks

Thermal evolution map of radioactive shale



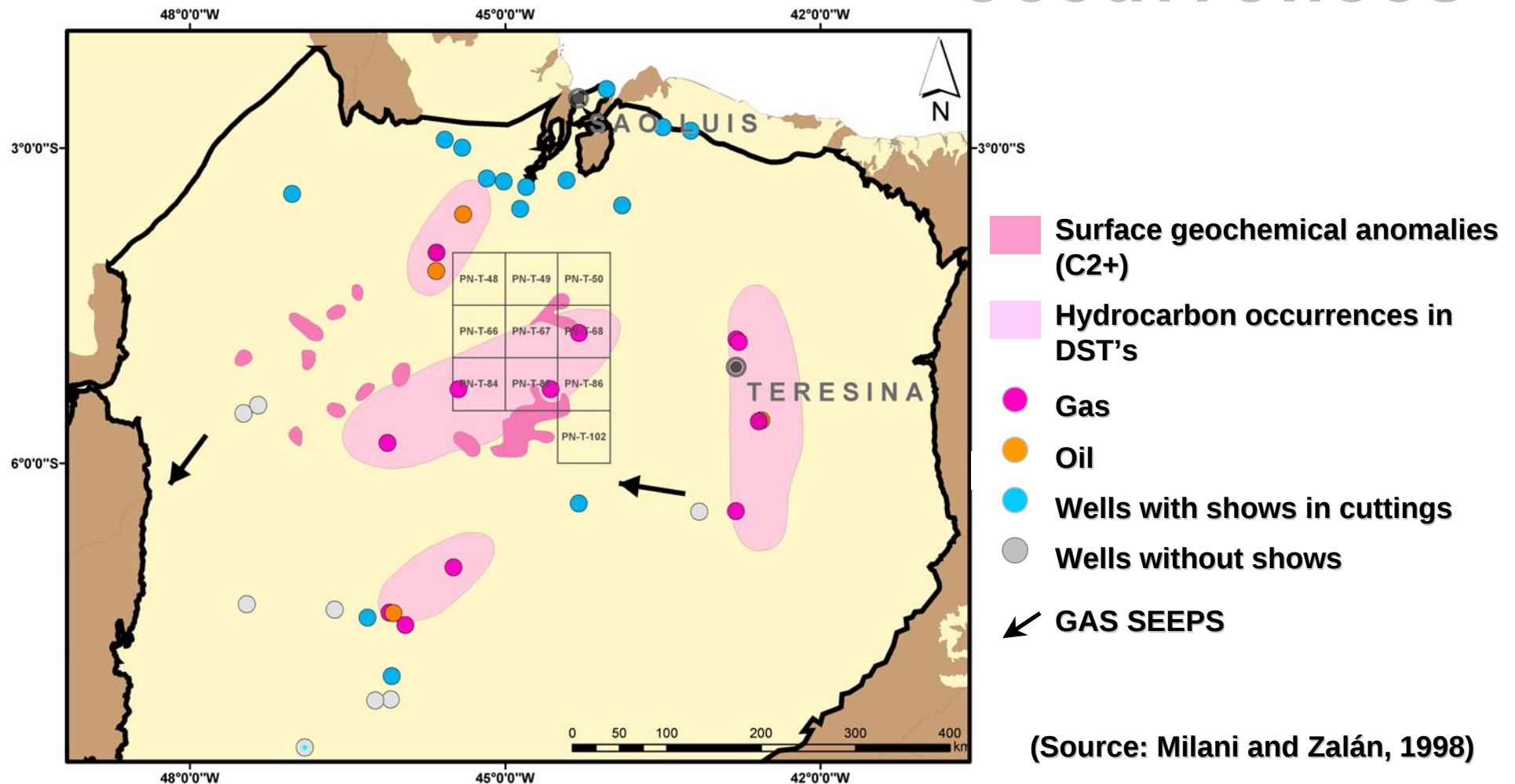


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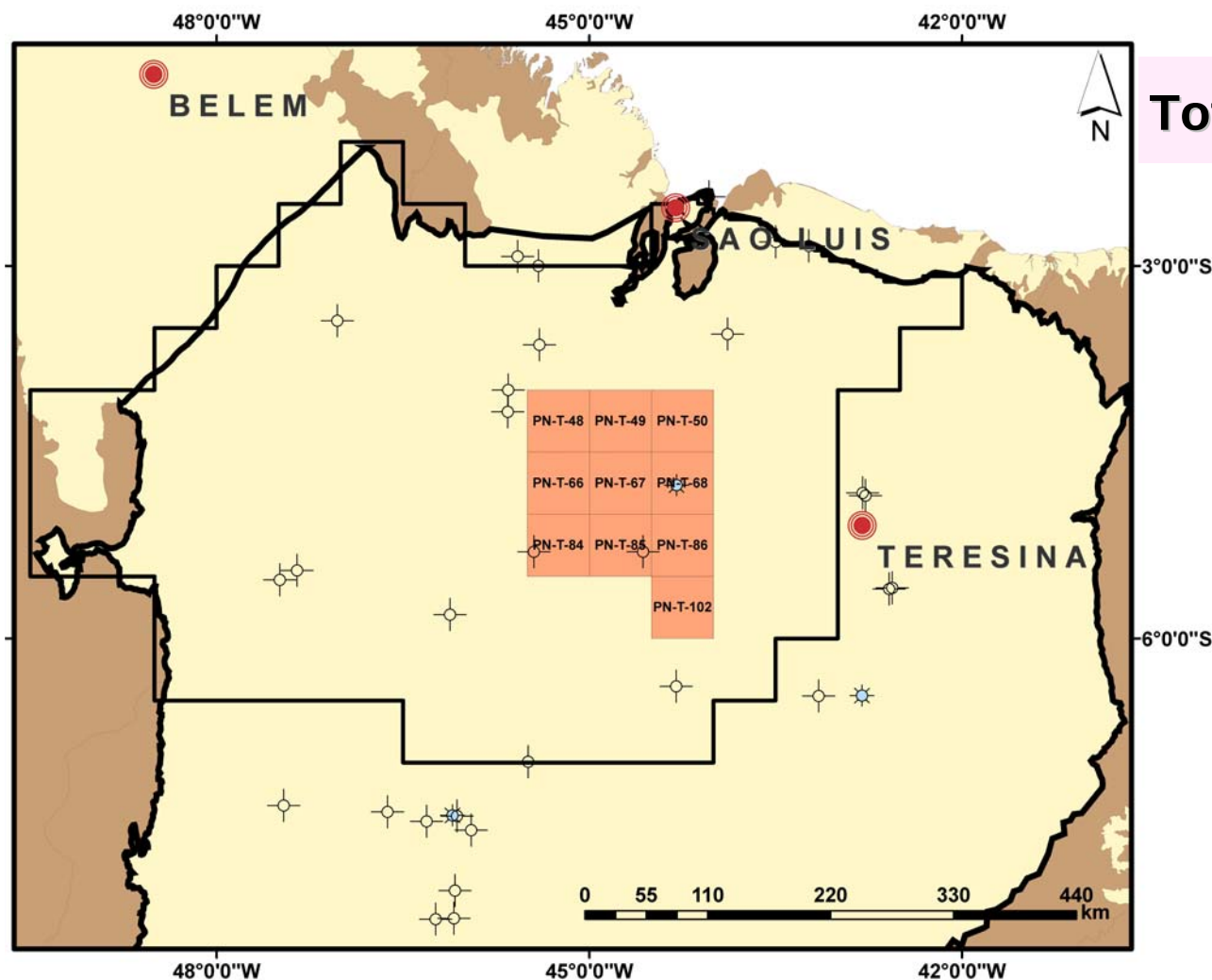


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Main petroleum occurrences



Offered Area



Total bid area 30,664 km²

10 blocks ~ 3,000 km²

Drilled wells:

- ✓ **2 CP 0001 MA (1987)**
3,423 meters – Basement
- ✓ **2 BAC 0001 MA (1988)**
(3,252 meters – Basement)
- ✓ **1 PD 0001 MA (1960)**
(2,843 meters – Silurian)



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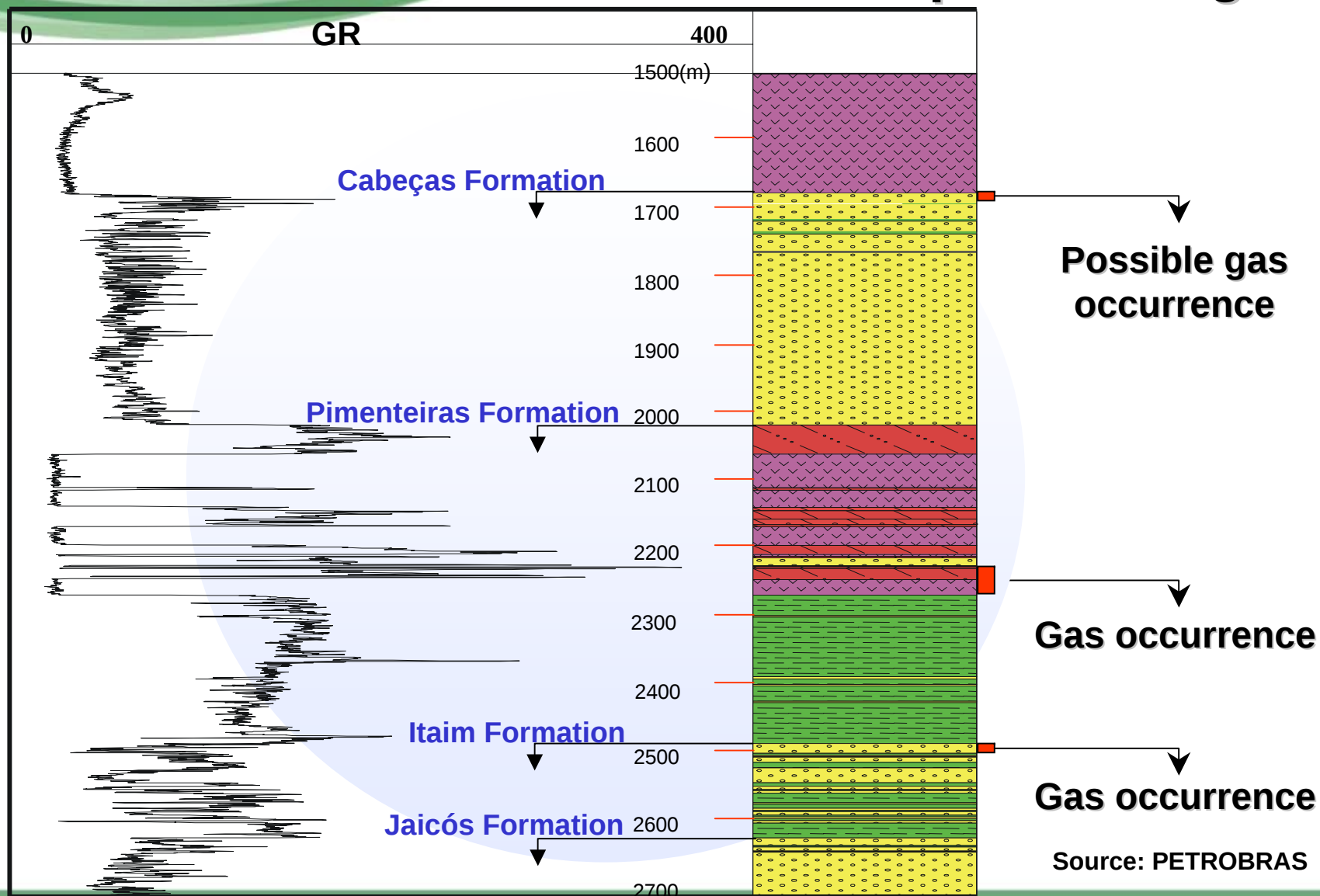
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Gas Discovery

Capinzal Well – 2 CP 0001 MA

- ✓ located in the depocentre of the basin; thickness of sedimentary column in excess of 3,000 m, favoring the hydrocarbon generation
- ✓ main source rock (Devonian – Pimenteiras Formation) with thickness in the order of 400 meters
- ✓ total organic carbon is around 2.0%
- ✓ main reservoir (Cabeças Formation) reaches thicknesses of up to 250 m
- ✓ intrusions affecting the main source rocks acted as a catalyst for the hydrocarbons generation
- ✓ thermogenic gas recovered at surface proves an active petroleum system

Capinzal well composite log





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Speculative resources

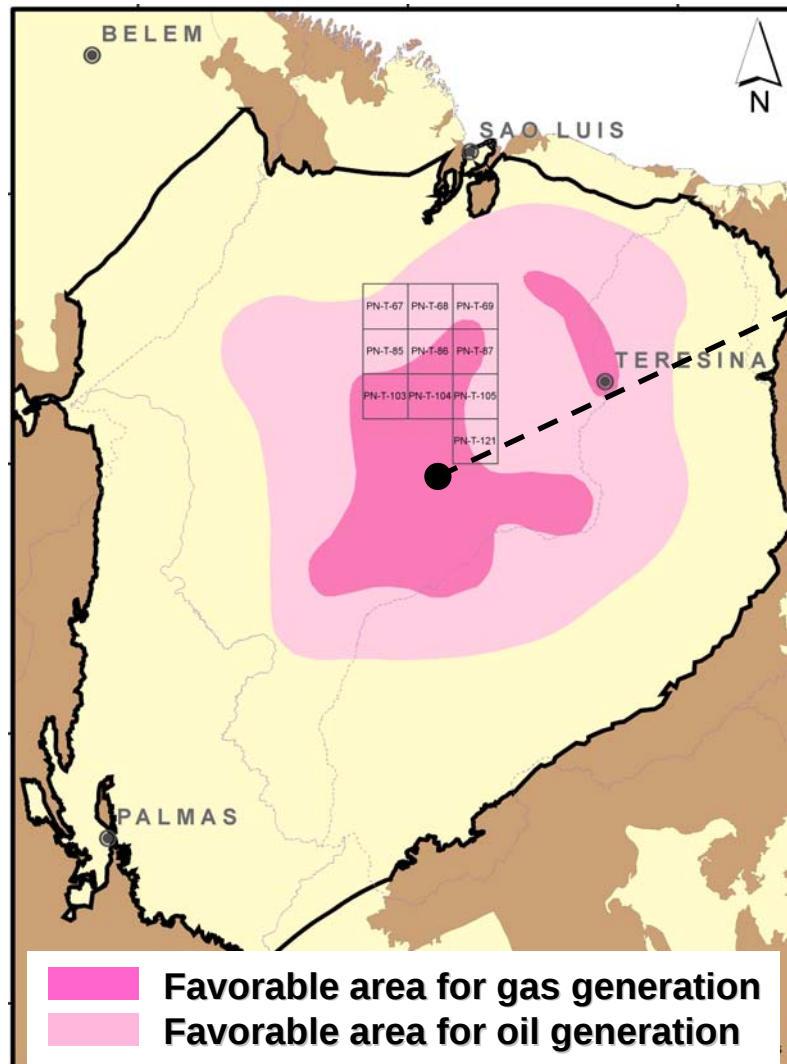
66,874.4 km²

Based on a structure with:

- ✓ area = 50 km²
- ✓ netpay = 10 m

**Appraised volume
20 BCM of gas**

**Possibility of 10 structures within
the area boundary
200 BCM of gas**





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Remarks

- ✓ New Frontier Basin almost unexplored, but attractive when considered similar basins world-wide
- ✓ Situated in an area with great need for gas. Gas supply from other places could be otherwise too expensive
- ✓ Sediments with quality and quantity of source rock adequate to commercial petroleum generation
- ✓ Favorable conditions for generation, migration, reservoirs, trapping and seal



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Parnaíba Basin

Bid and Contract Parameters

- Minimum Bonus (MUSD): 10.5 @ 16.8
- Exploration Period (years) : 6



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