

PETROLEUM POTENTIAL OF THE EQUATORIAL MARGIN AND EAST MARGIN BASINS – WHERE ARE WE AND WHERE DO WE WANT TO GO?




Marina Abelha

Exploration Superintended

September 13th, 2022



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An unprecedented transformation in the O&G Sector

We continue to make progress in opening the O&G sector

E&P



A completely **diverse sector** will emerge from Petrobras Divestment Plan. All onshore and shallow water fields are being sold, as well as some great offshore post-salt concessions.

With new investments in mature fields, pre-salt fields and offshore blocks in the exploratory phase, Brazil is ready to grow production and take a leading position in the sector.

Gas



First-ever **effective opening in the natural gas market** with Petrobras leaving the transport and distribution sectors.

A new legal framework has just been put in place for the gas market (Law 14,134/2021 and Decree 10,712/2021) and a strong regulatory agenda is underway to create opportunities for suppliers, free consumers and distributors. An open season calendar is set for this year.

Even at challenging times, Brazil's O&G Industry has responded with remarkable resilience

2020



5% of production growth and exports record

Pre-salt high performance

Exports of oil and fuel oil with low sulfur content

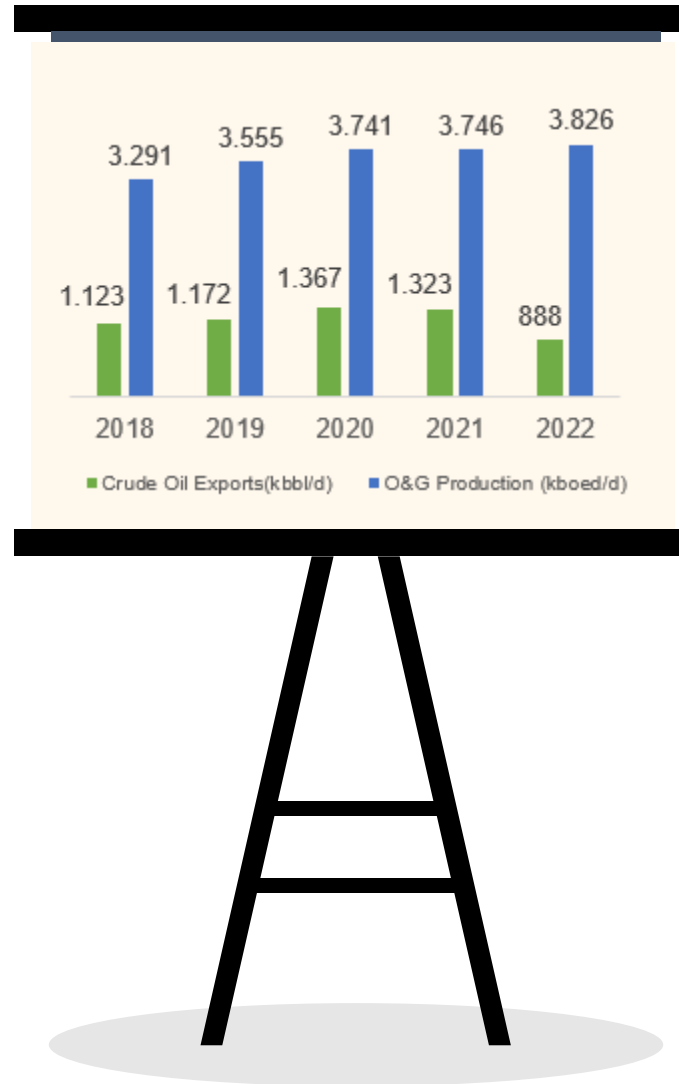


Assets Acquisition

56 M&As approved by ANP



Flexible emergency measures - supportive approach by ANP



2021/2022



Maintenance of O&G production and crude oil exports

*Jan-Feb results as shown in the graph



Assets Acquisition increased

138 M&As approved by ANP only up to July 2021



Returning to business-as-usual, but continued flexibility available where required

The background features several thin, flowing green lines that create a sense of movement and organic shape, primarily concentrated on the right side of the slide.

#1

E&P

Brazil is taking a leading role in the E&P sector

2022



8th

Crude Oil and
Condensate
producer
(BP Statistical
Review 2021)



84

E&P company
groups, 50% foreign
(April 2021)

Production:

3M

Bpd of oil
production
(February 2022)

133M

M³ of gas
production
(February 2022)

Reserves:

13B

Bbl in proved oil
reserves
(Dec 2021)

379B

M³ in proved gas
reserves
(Dec 2021)

Forecast

Potential to reach
more than



5

million oil bpd in
2030 (EPE)

Potential to be the



5th

Largest crude oil
exporter in 2030
(EPE)



E&P at a glance



Pre-Salt

One of the best plays in the world and the most competitive deepwater assets.

75% of production
127 producer wells
22,375 Average well production (boe/d)

Prod: **2,841,633** boe/d

Post-Salt

Green and brownfields, deep and shallow waters.

19% of production
468 producer wells
1,544 Average well production (boe/d)

Prod: **722,963** boe/d

Onshore

Mature basins and new frontier basins (gas prone).

5% of production
5,681 producer wells
33 Average well production (boe/d)

Prod: **189,888** boe/d

*February, 2022

27_B 

Barrels equivalent of O&G produced to date

375

Fields under development or production

248

Exploratory Blocks

400+

Production Installations

90 

Billion dollars E&P Investments Forecast 2021 – 2025

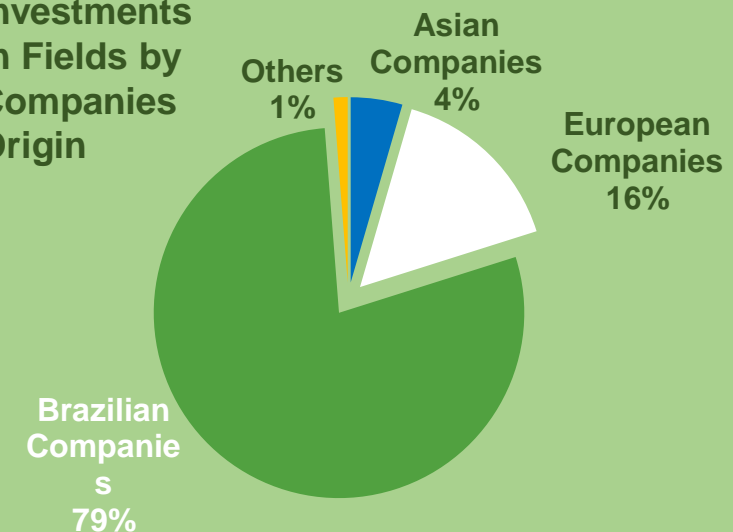
11 

Billion dollars Decommissioning Costs 2022-2026

30,000+
Wells drilled

19,000+
Km of O&G pipelines

Investments in Fields by Companies Origin





239 Exploration Blocks

Area: ~183 thousand km²

39 operators

Offshore

132 Exploration Blocks (55%)

Area: ~98 thousand km² (54%)

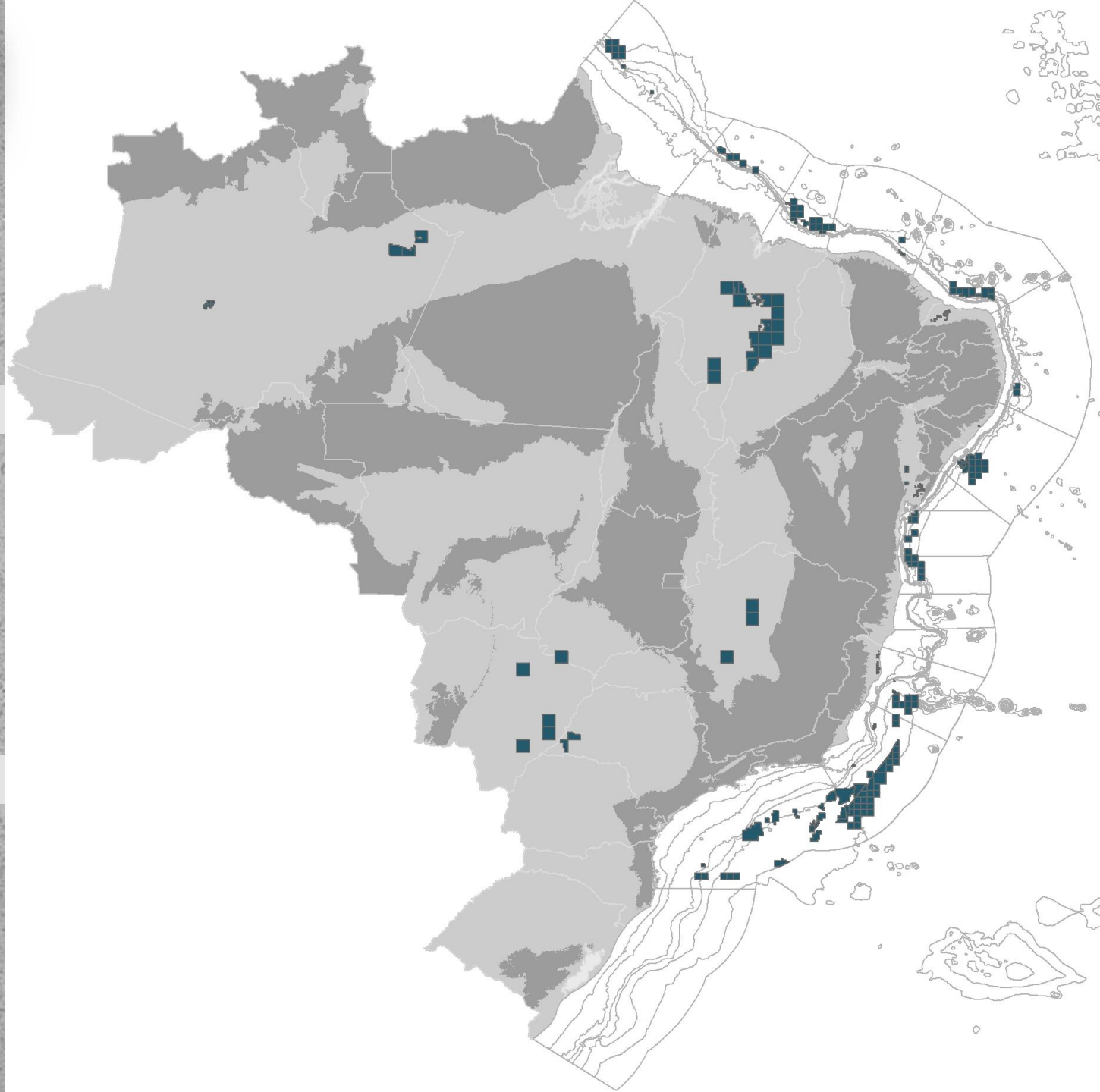
17 operators

Onshore

107 Exploration Blocks (45%)

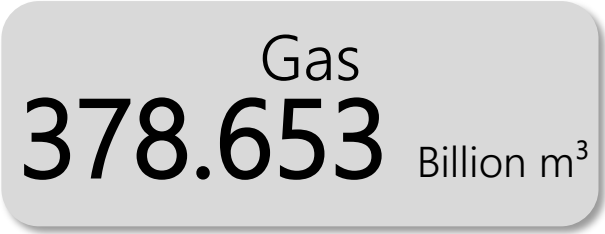
Aera: ~85 thousand km² (46%)

23 operators



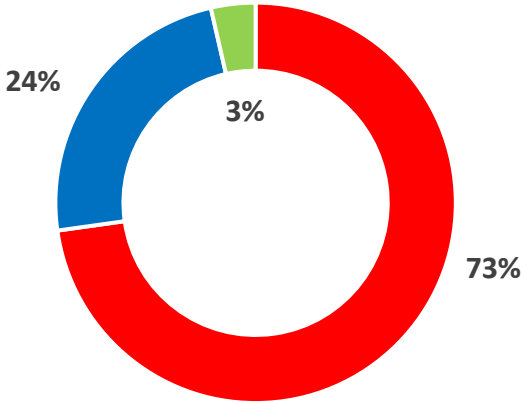
Proved Reserves

Dec/21



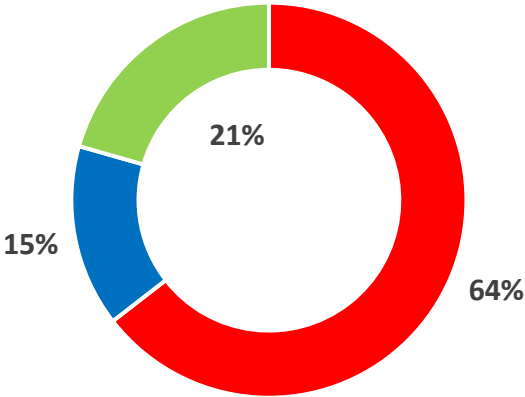
Dec/21

Oil Proven Reserves



■ Pre-Salt ■ Conventional Offshore ■ Onshore

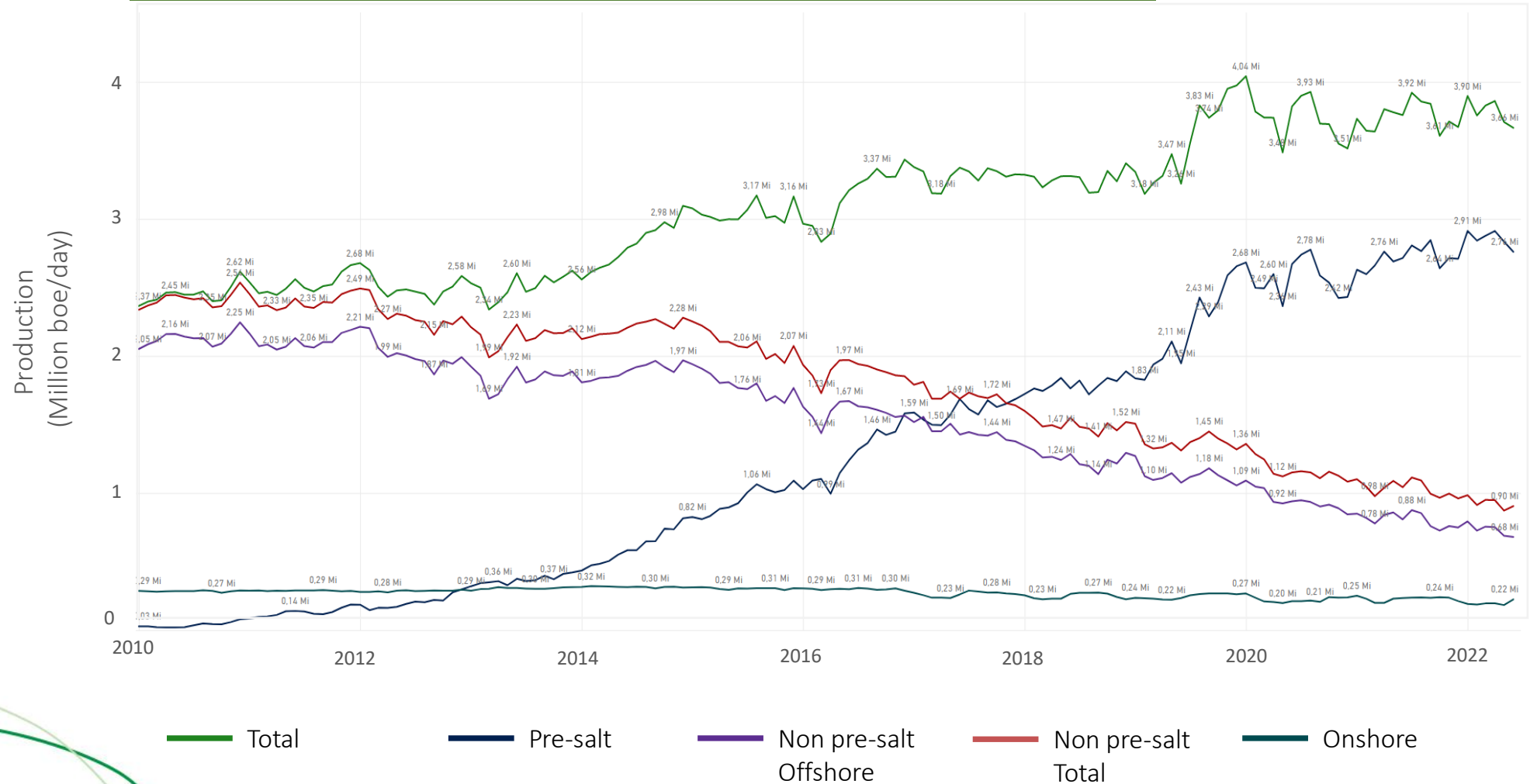
Gas Proven Reserves



■ Pre-Salt ■ Conventional Offshore ■ Onshore

Oil Production

Total Production: 5,445 wells
Pre-salt Production: 126 wells



3.664 MM boe/d
2.828 MM bbl/d

2.759 MM boe/d
2.188 MM bbl/d

E&P strategic goals



RIGHT ASSETS IN THE RIGHT HANDS

Petrobras Divestment Plan plays key role in this goal.
Support small and medium producers market



INCREASE THE RECOVERY FACTOR

Brazil's Current RF: 10%
This represents an enormous opportunity in the **mature fields**.
Need to reduce OPEX and decommissioning costs



INCREASE EXPLORATORY ACTIVITIES

The COVID-19 pandemic accelerated **energy transition** discussions and reinforced the **sense of urgency** in exploring our resources

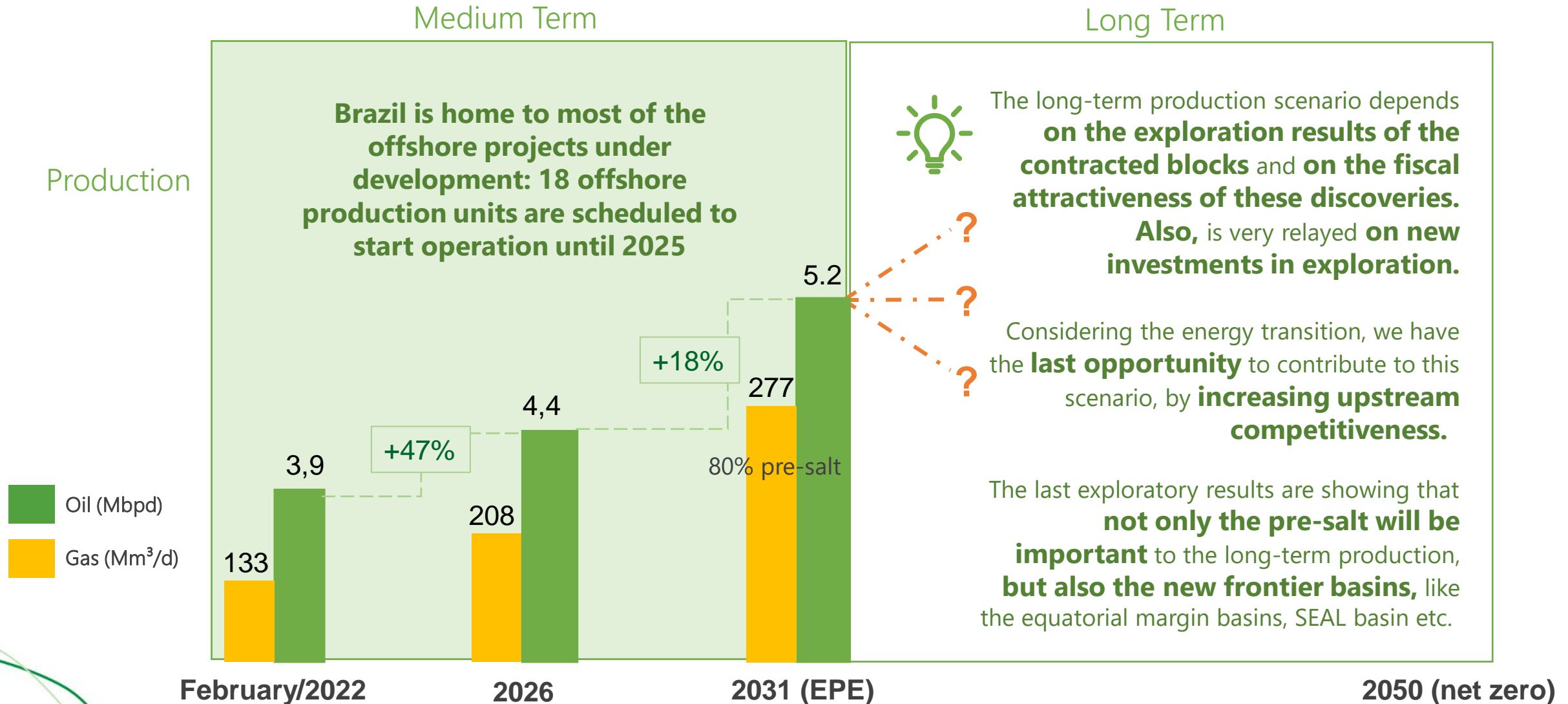


MAKE VIABLE THE MARGINAL DISCOVERIES

There are **many marginal discoveries** in the **different environments** that could be developed if we address the correct incentives to make them viable

We need to keep increasing **above ground competitiveness** in order to achieve our main goals

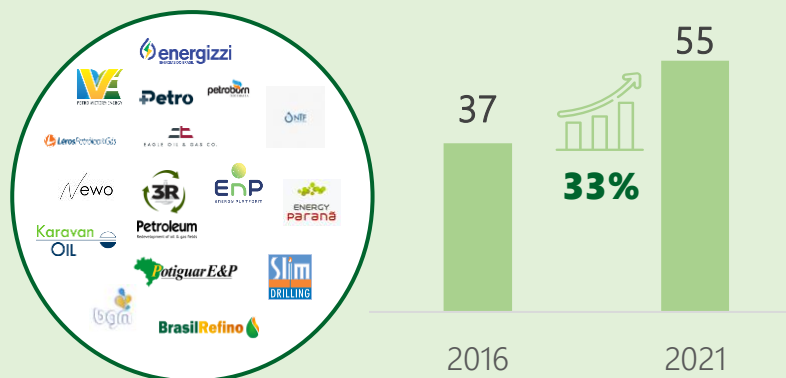
Brazil is poised to be one of the key sources of growth over the medium term, but still need to keep taking measures for the long term



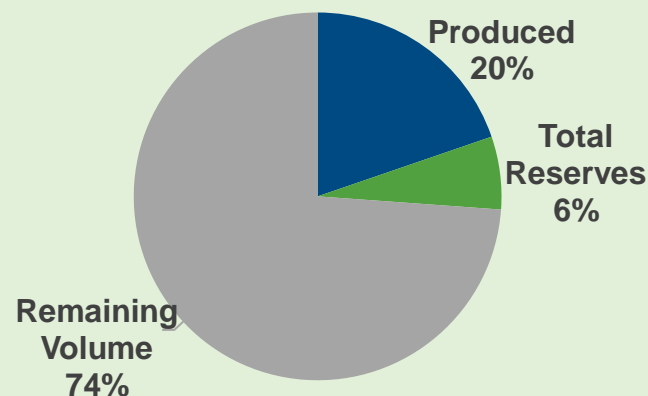
Also, a new onshore market is being set up

A new onshore market with small and medium companies is being established with Petrobras Divestment Plan, supported by foreign and national investors

Onshore E&P Groups in Brazil



Recovery Factor in Brazil



Key Messages

All onshore fields are being sold by Petrobras

The numbers of E&P groups acting in onshore activities increased more than **30%** since 2016

New operators are increasing production

Huge investment opportunities
in mature fields (IOR/EOR). 1%
more in the onshore RF
means **200Mboe**

Ongoing measures to attract investments



KEEP OFFERING AREAS

Open Acreage
+
Ongoing Petrobras
Divestment Plan



PUBLIC DATA AVAILABLE FOR FREE

Download of onshore data:
Reate.cprm.gov.br/anp

Download of offshore data:
helpdesk@anp.gov.br



MARGINAL FIELD DEFINITION

Draft under public
consultation. Specific
incentives should be
discussed afterwards



ROYALTIES REDUCTION FOR SMALL AND MEDIUM COMPANIES

New ANP Resolution
approved by ANP

Already implemented:
royalties reduction for
incremental production

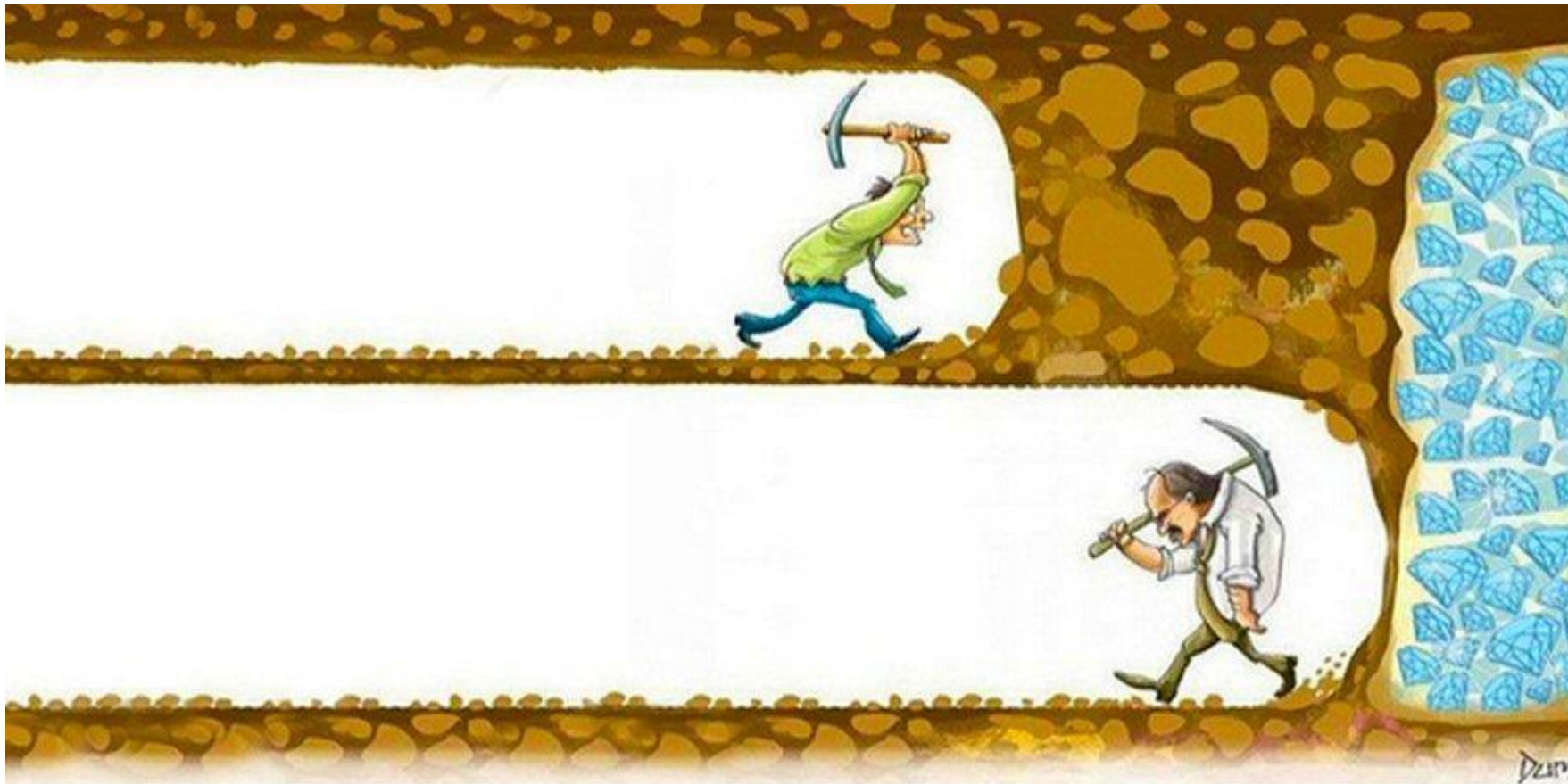


OTHER REGULATORY MEASURES TO REDUCE ABOVE GROUND RISKS AND IMPROVE FISCAL TERMS

Measures under REATE,
PROMAR and BIDSIM
programs, including studies to
improve environmental
licensing process and
competitiveness of marginal
discoveries

Also, the new gas law was a
decisive step towards a
competitive gas market, with
great opportunities

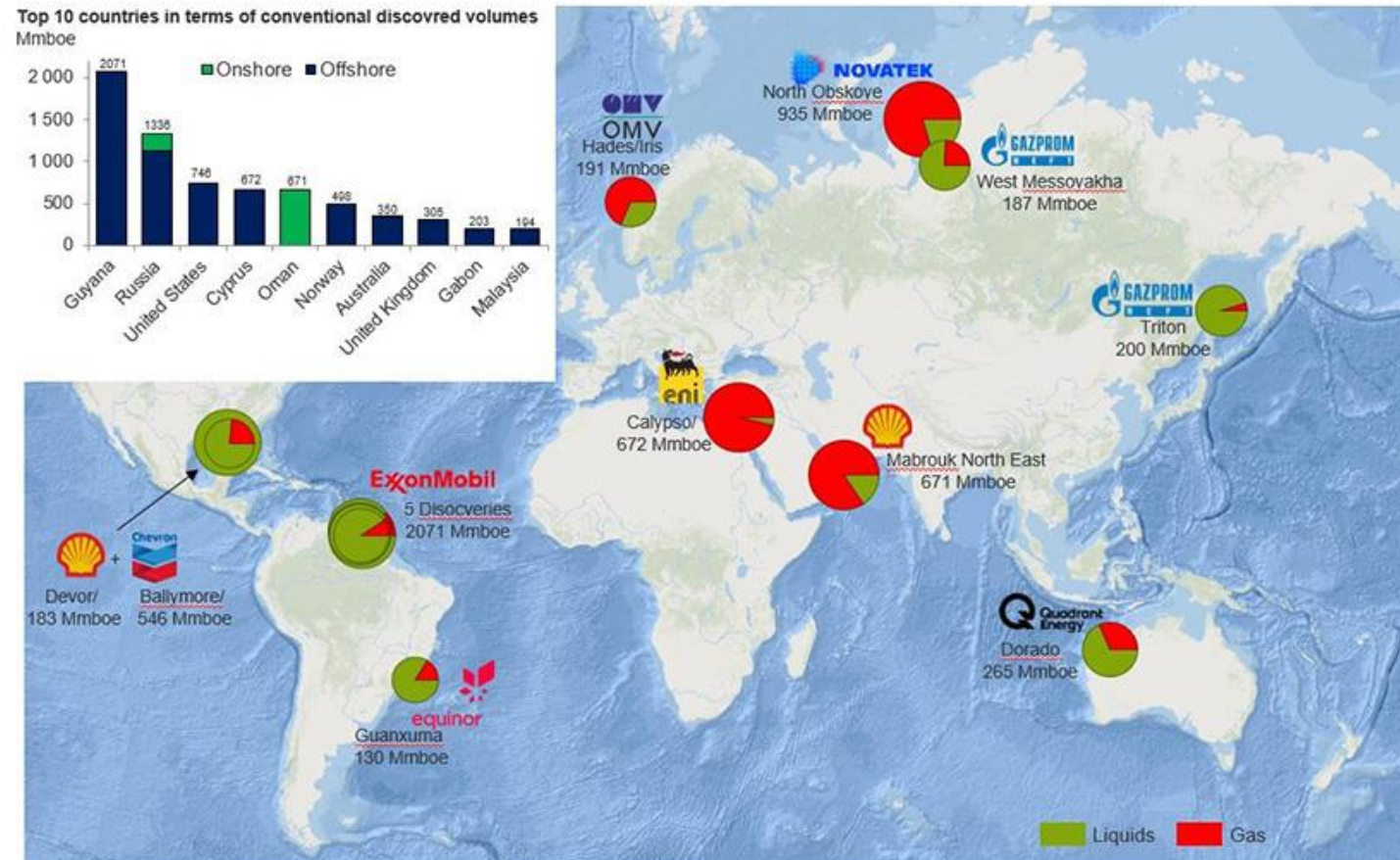
Is the pre-salt going to be our last exploratory Frontier in Brazil?



A Giant Potential Untapped

In 2022, the largest volumes of conventional discoveries were found in Guyana and Namibia, in Cretaceous turbidite reservoirs

Top global conventional discoveries 2018

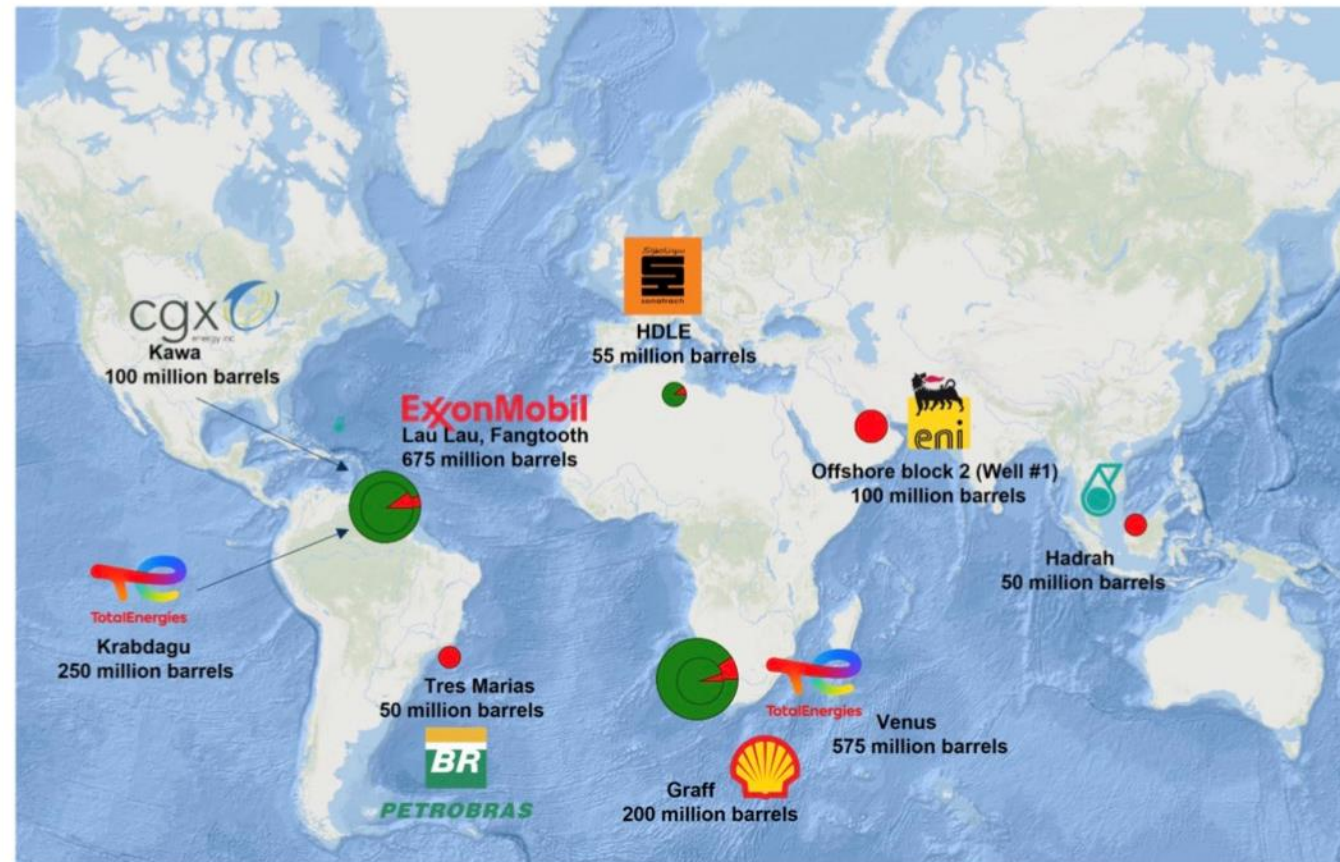


Source: Rystad Energy Cube December 2018

A Giant Potential Untapped

In 2022, the largest volumes of conventional discoveries were found in Guyana and Namibia, in Cretaceous turbidite reservoirs

Top 10 global discoveries in 1Q 2022



Source: Rystad Energy research and analysis; Rystad Energy Cube (Courtesy of Rystad)

FORECAST 2022



30 WELLS IN EXPLORATION BOCKS

22 WELLS ONSHORE

8 WELLS OFSHORE

TOTAL INVESTMENTS: R\$ 3.4 BILLION

FORECAST 2022 – Equatorial Margin



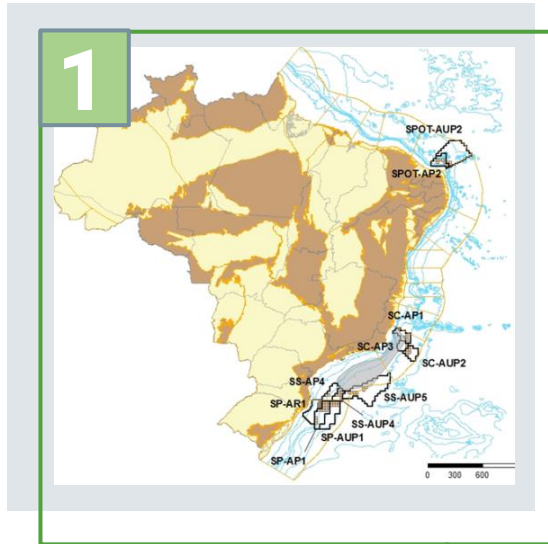
**The First Well to be Drilled in the Brazilian Equatorial
Margin for over 10 Years:
Petrobras Announcement – Foz do Amazonas Basin**



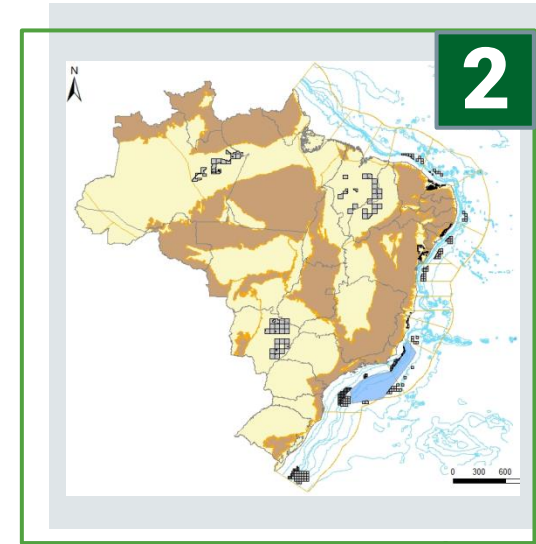
#2

Exploration Opportunities Offshore

Opportunities in the Open Acreage auction

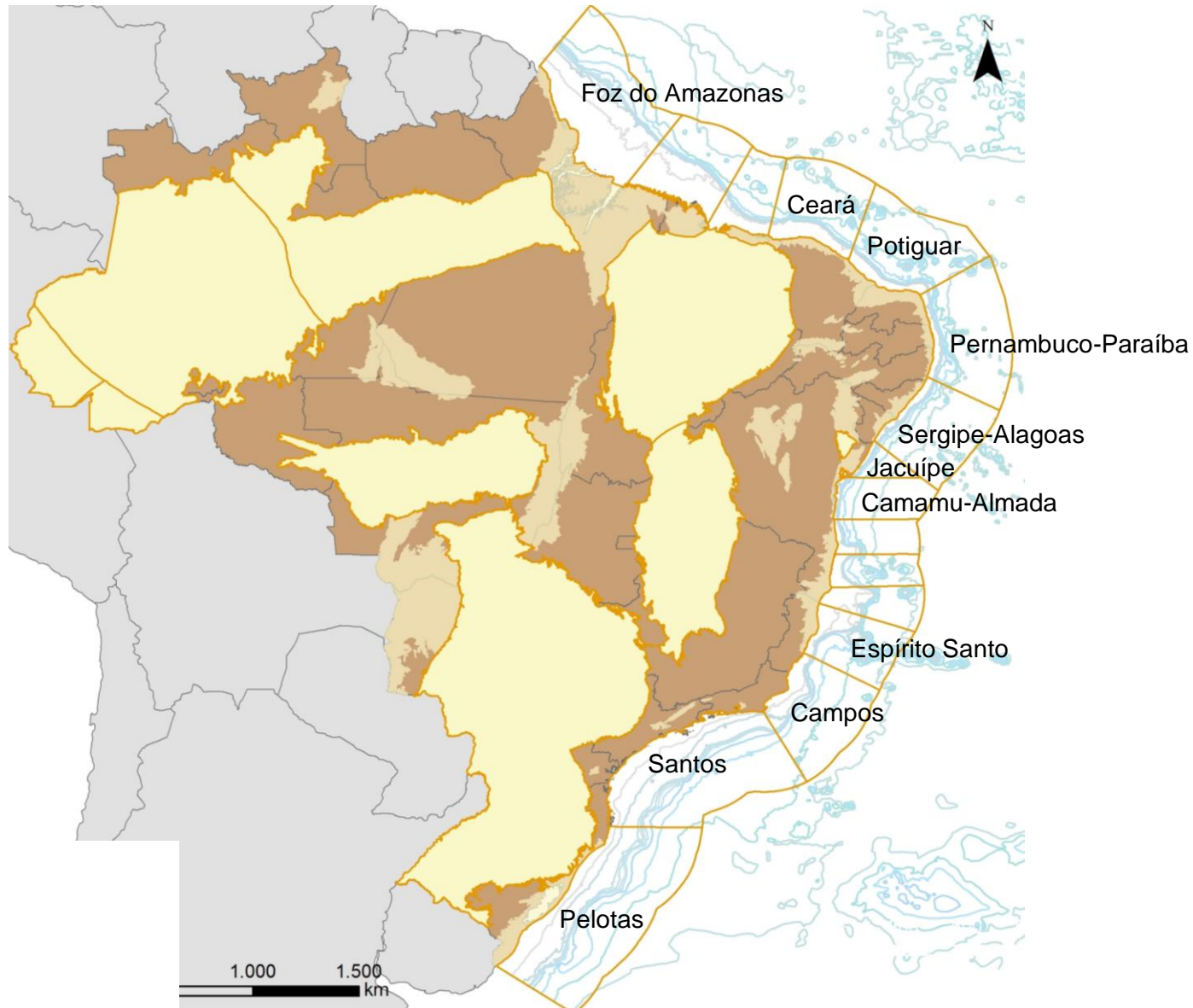


11 blocks available within the pre-salt polygon.
Public Presentation of Offers on
December 16th



1,096 blocks available.
Additional blocks and marginal
fields under study to be added
in the future.
The 4th cycle tender protocol is
currently under public
consultation

Offshore Basins

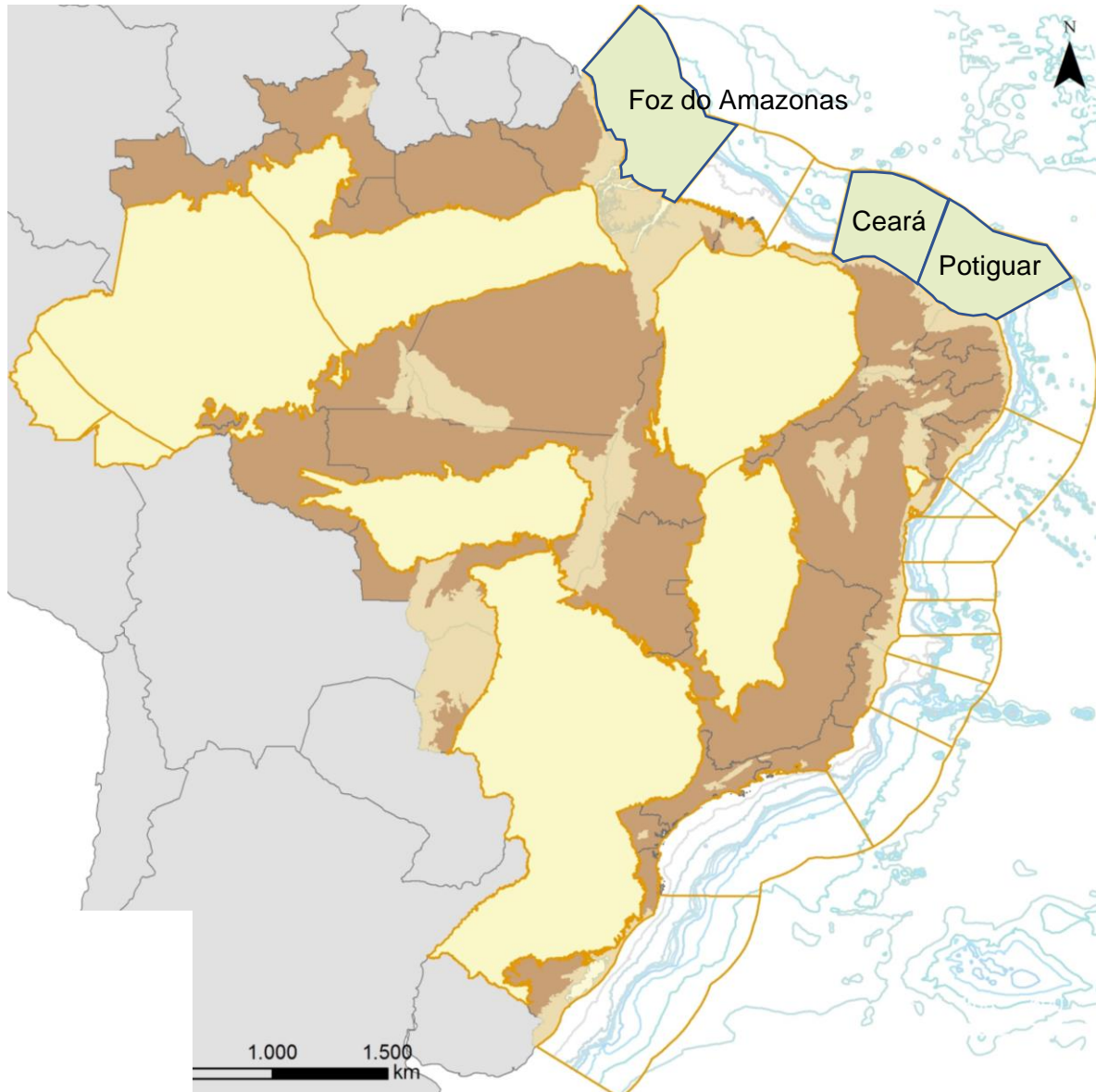


625 Offshore Blocks on Offer – Concession

11 Blocks in the Pre-salt – Production Sharing

Minimum Bonus (R\$ 320,000 – R\$ 372,700,000)

Offshore Basins



Equatorial Margin

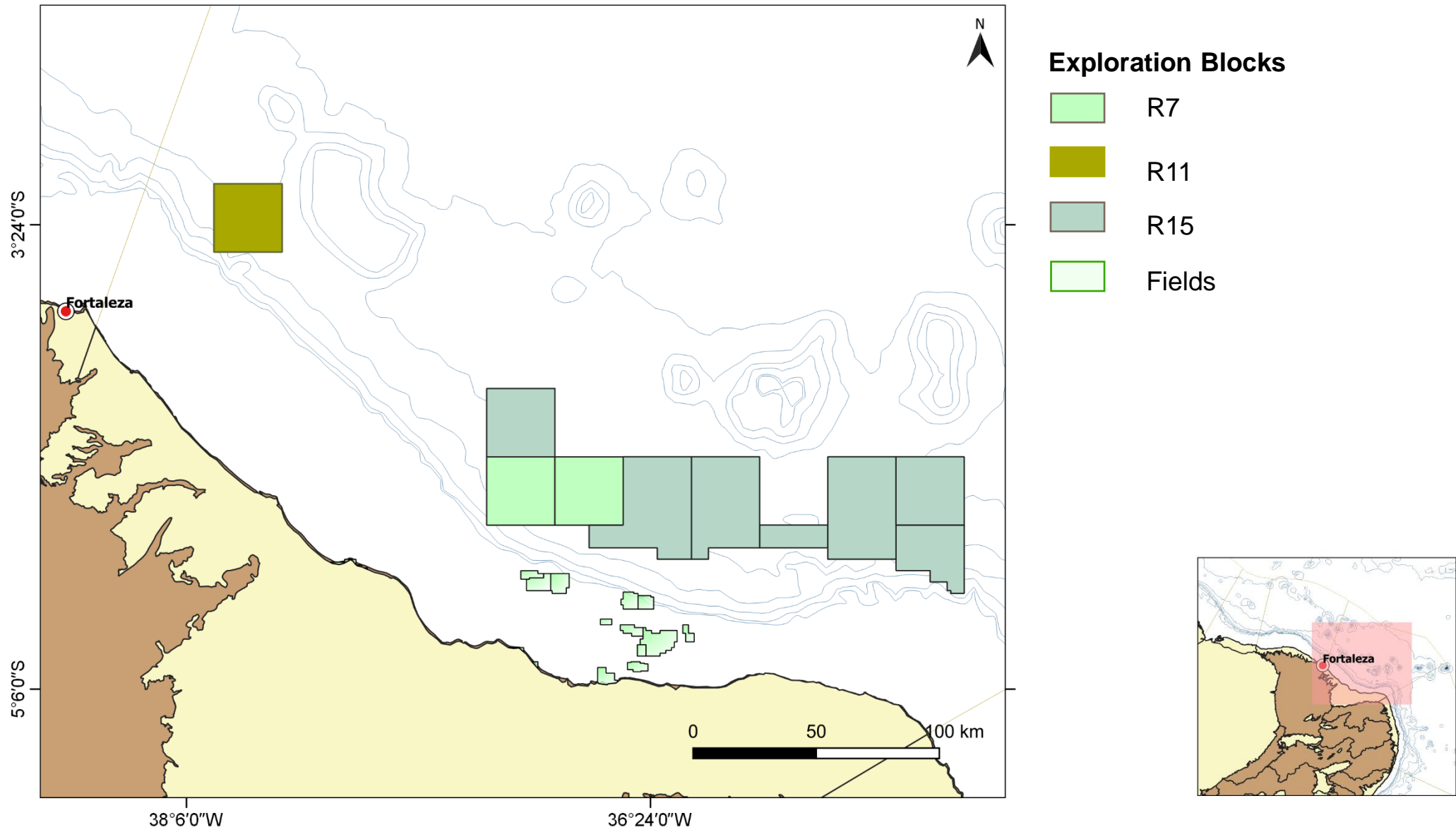
Worldclass Exploration Potential

Analogues to West Africa, Guyana and Suriname

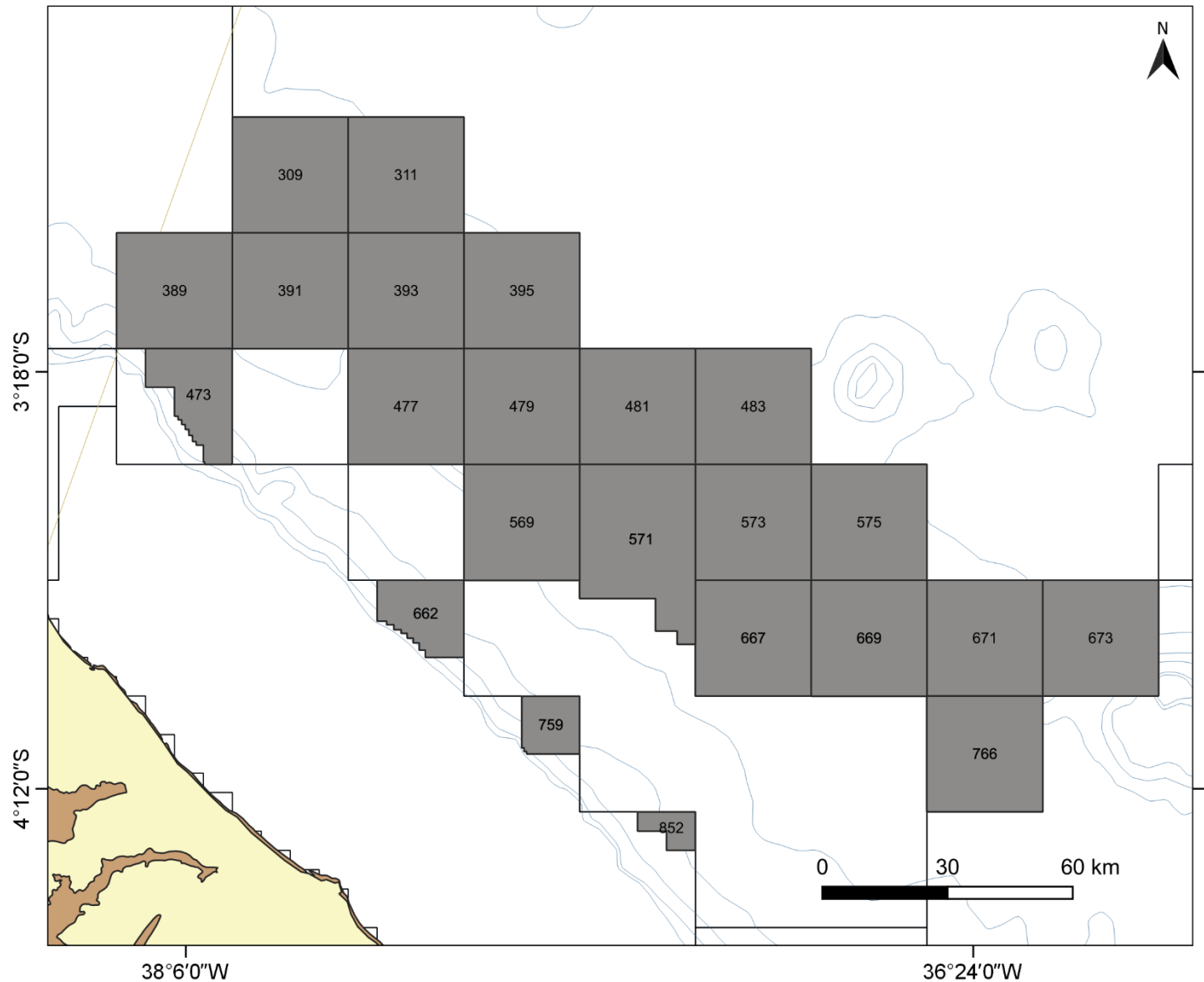
97 Blocks on Offer – Open Acreage

Minimum Bonus (R\$ 770,000 – R\$ 10,390,000)

Offshore Potiguar Basin

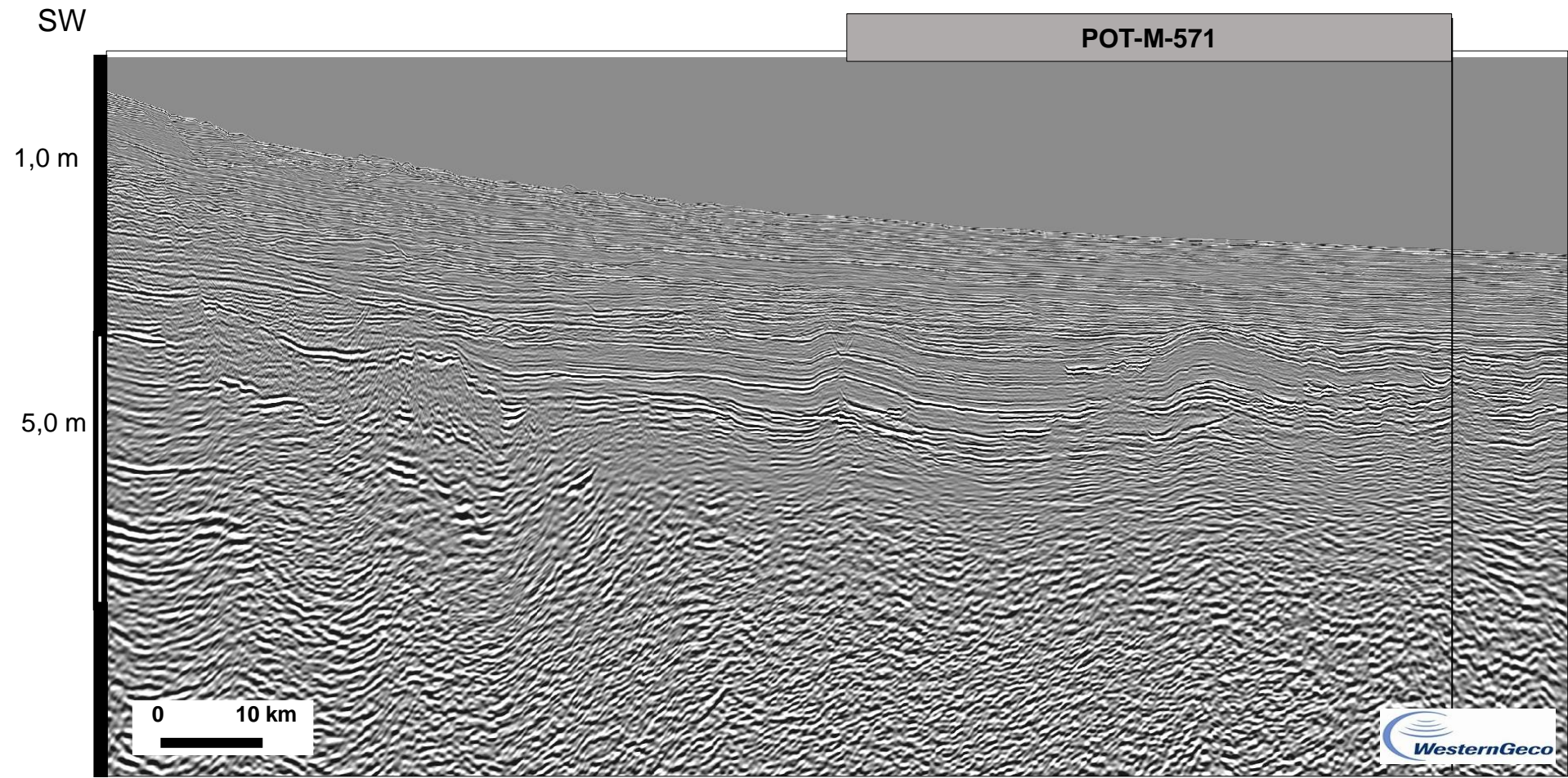



Offshore Potiguar Basin

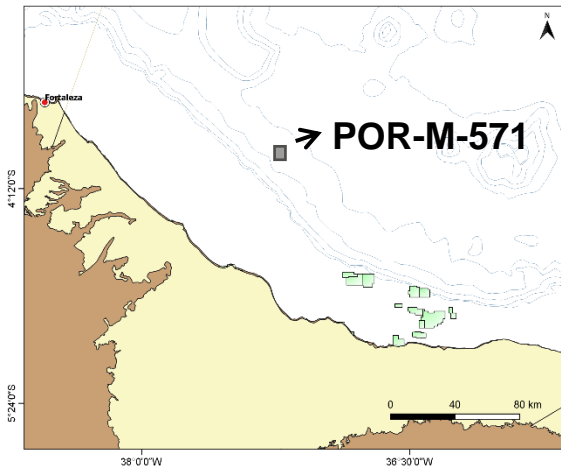


37 Blocks on Offer

Offshore Potiguar Basin

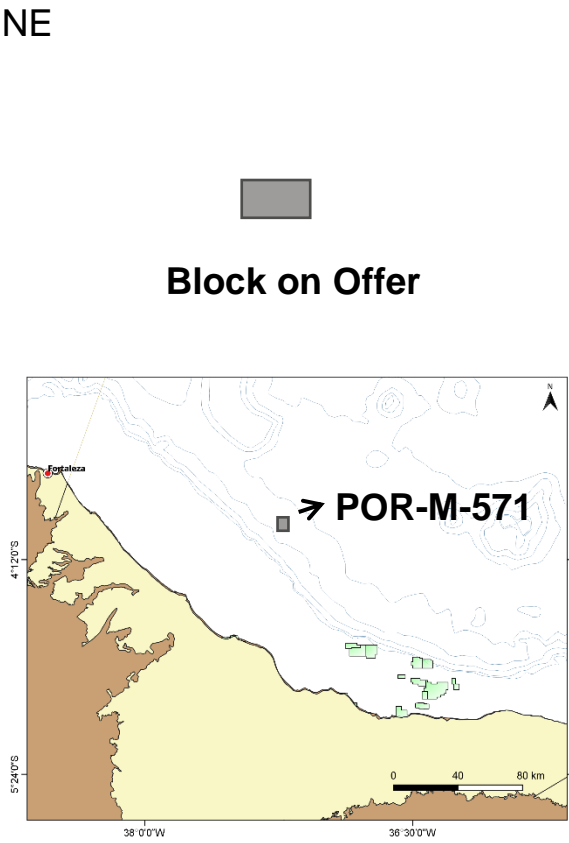
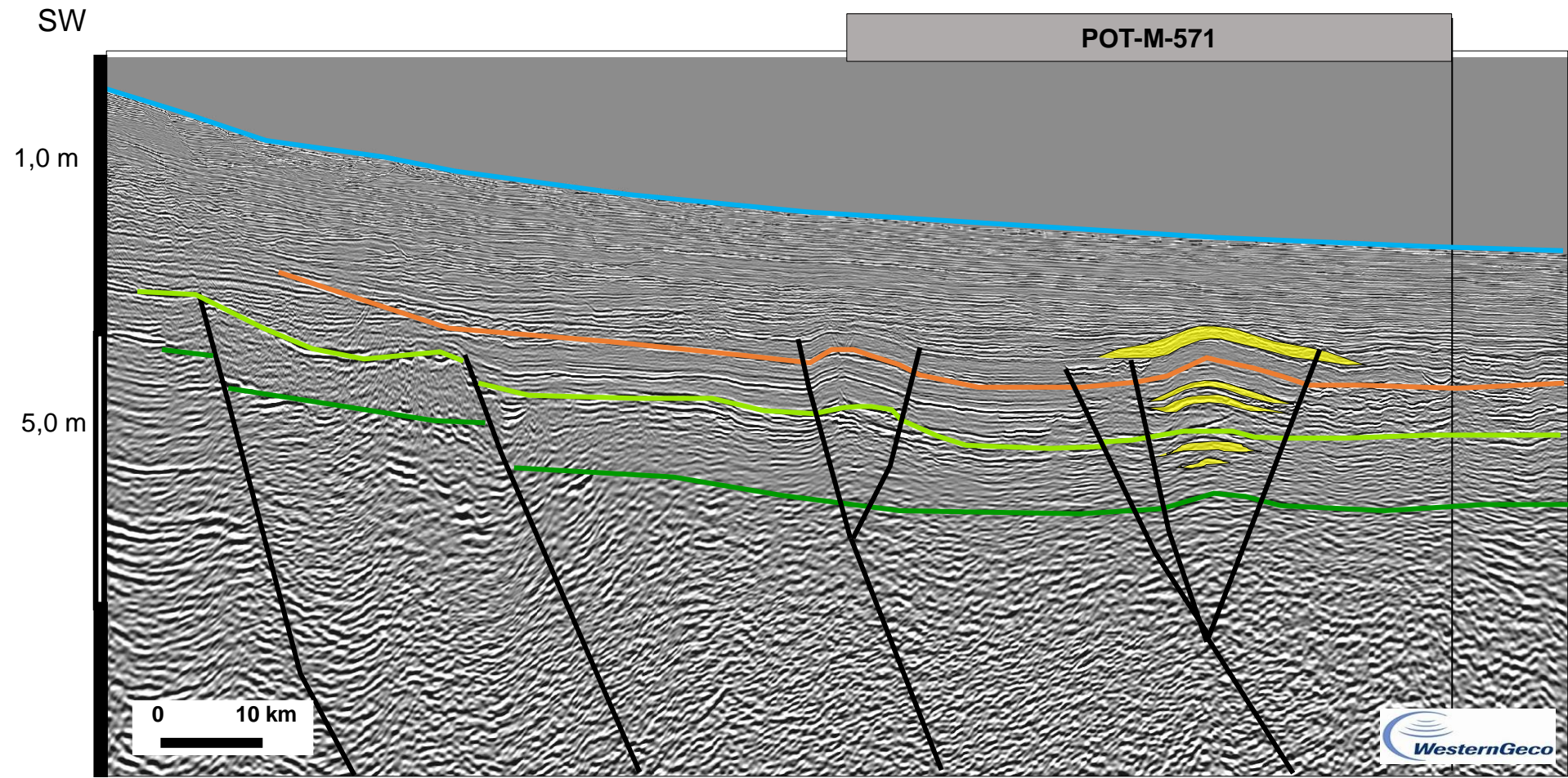


 Block on Offer



Line 0258-6273 [R0258_2D_SPEC_PSDM_TTI_BM_POT]

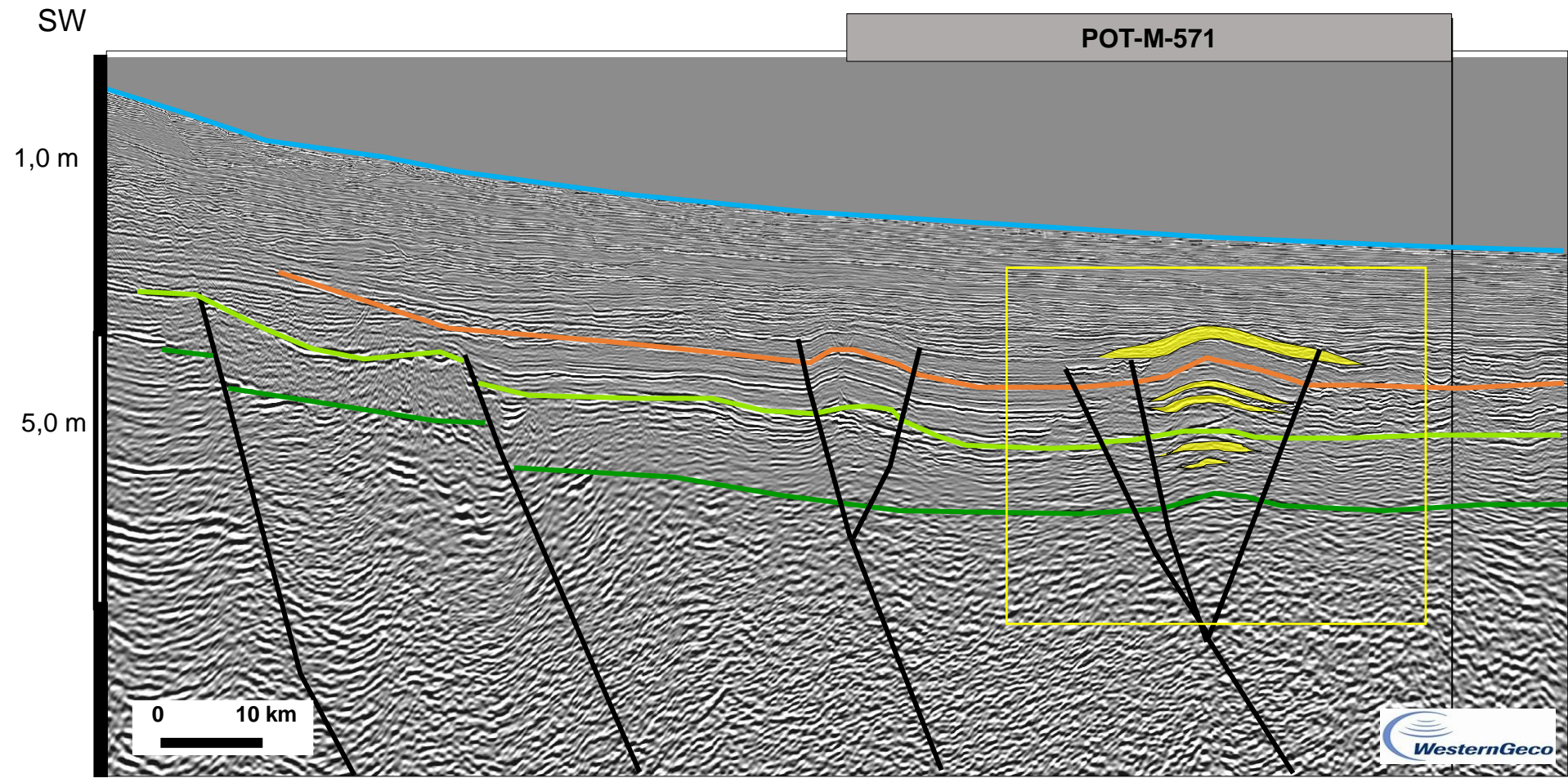
Offshore Potiguar Basin



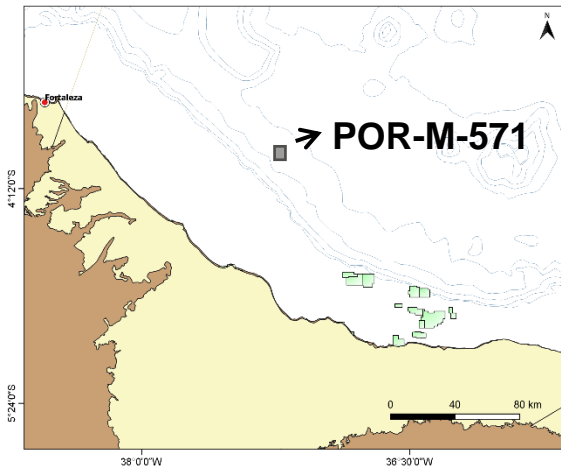
- Sea Bottom
- Top of Alagamar Fm
- Top of Quebradas Fm
- Top of Pescada Fm
- Lead

Line 0258-6273 [R0258_2D_SPEC_PSDM_TTI_BM_POT]

Offshore Potiguar Basin



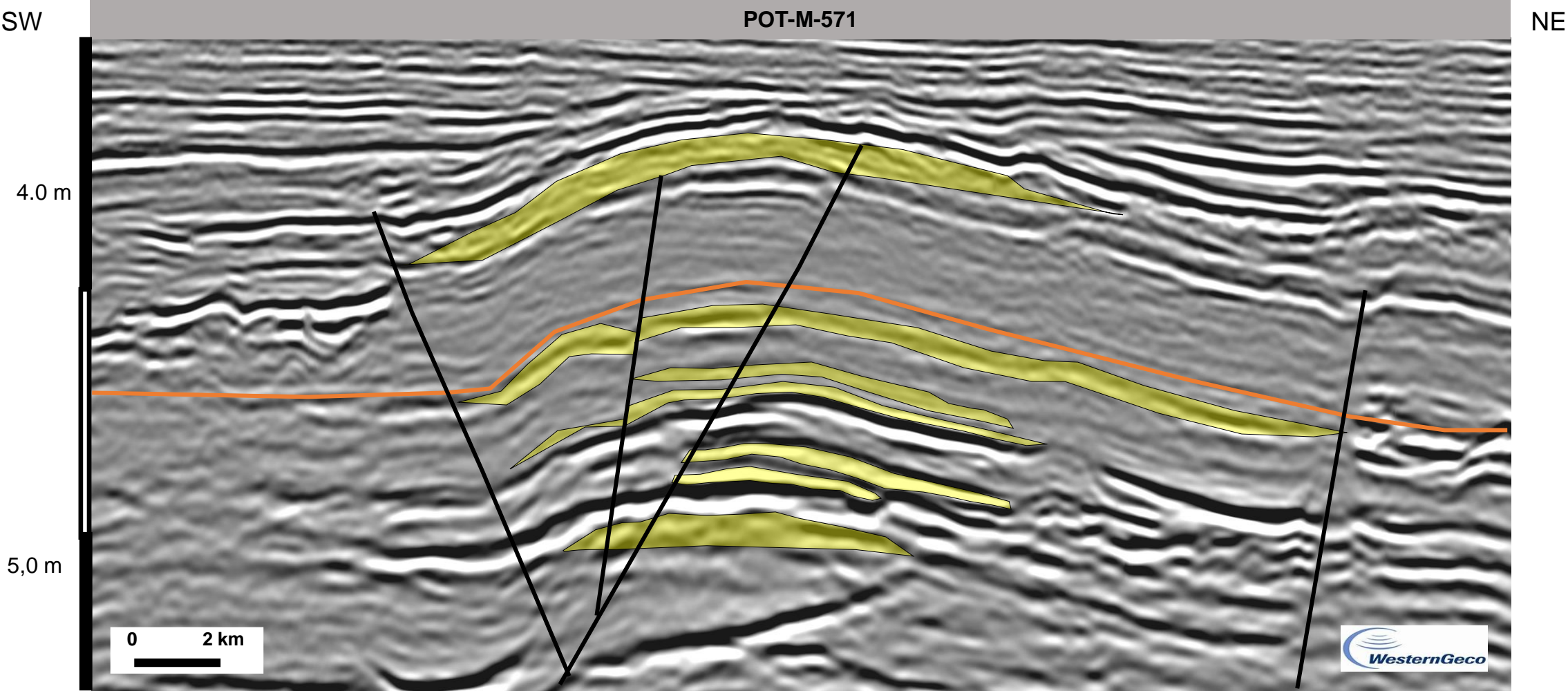
Block on Offer



Line 0258-6273 [R0258_2D_SPEC_PSDM_TTI_BM_POT]

- Sea Bottom
- Top of Alagamar Fm
- Top of Quebradas Fm
- Top of Pescada Fm
- Lead

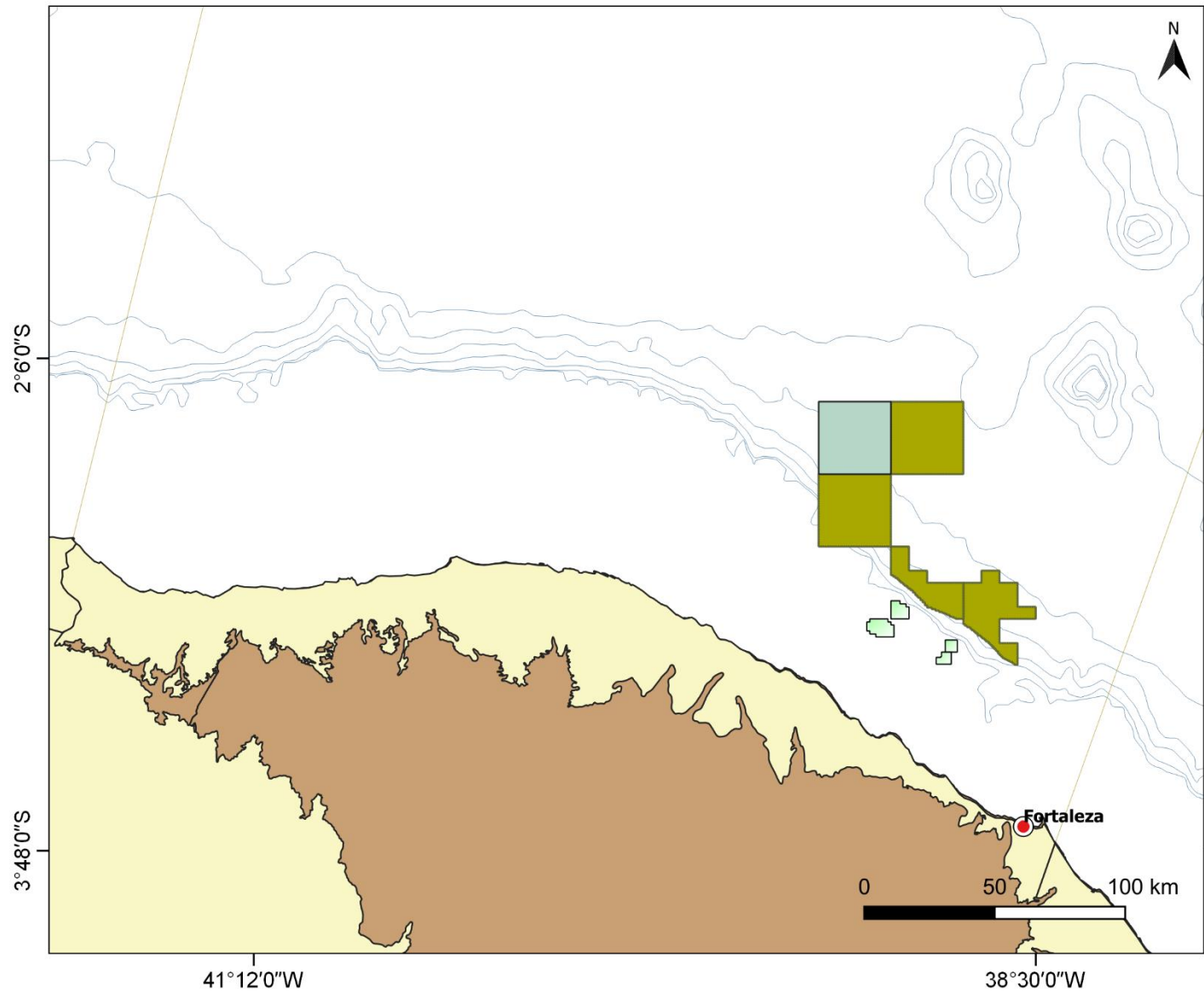
Offshore Potiguar Basin



— Top of Quebradas Fm
 Lead

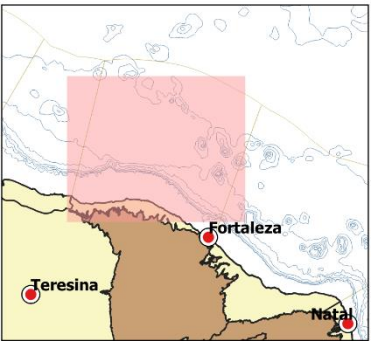
Line 0258-6273 [R0258_2D_SPEC_PSDM_TTI_BM_POT]

Offshore Ceara Basin

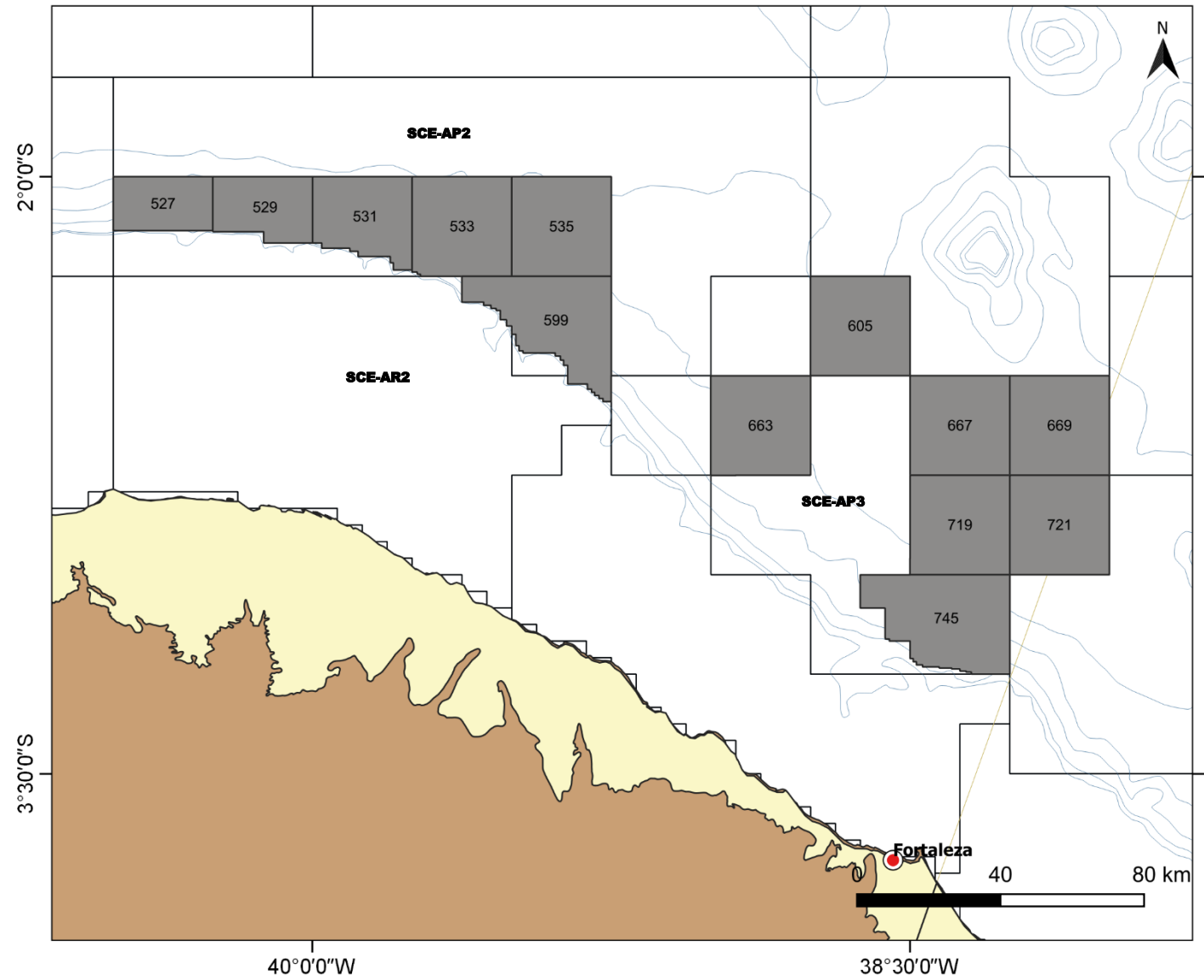


Exploration Blocks

- R11
- R15
- Fields

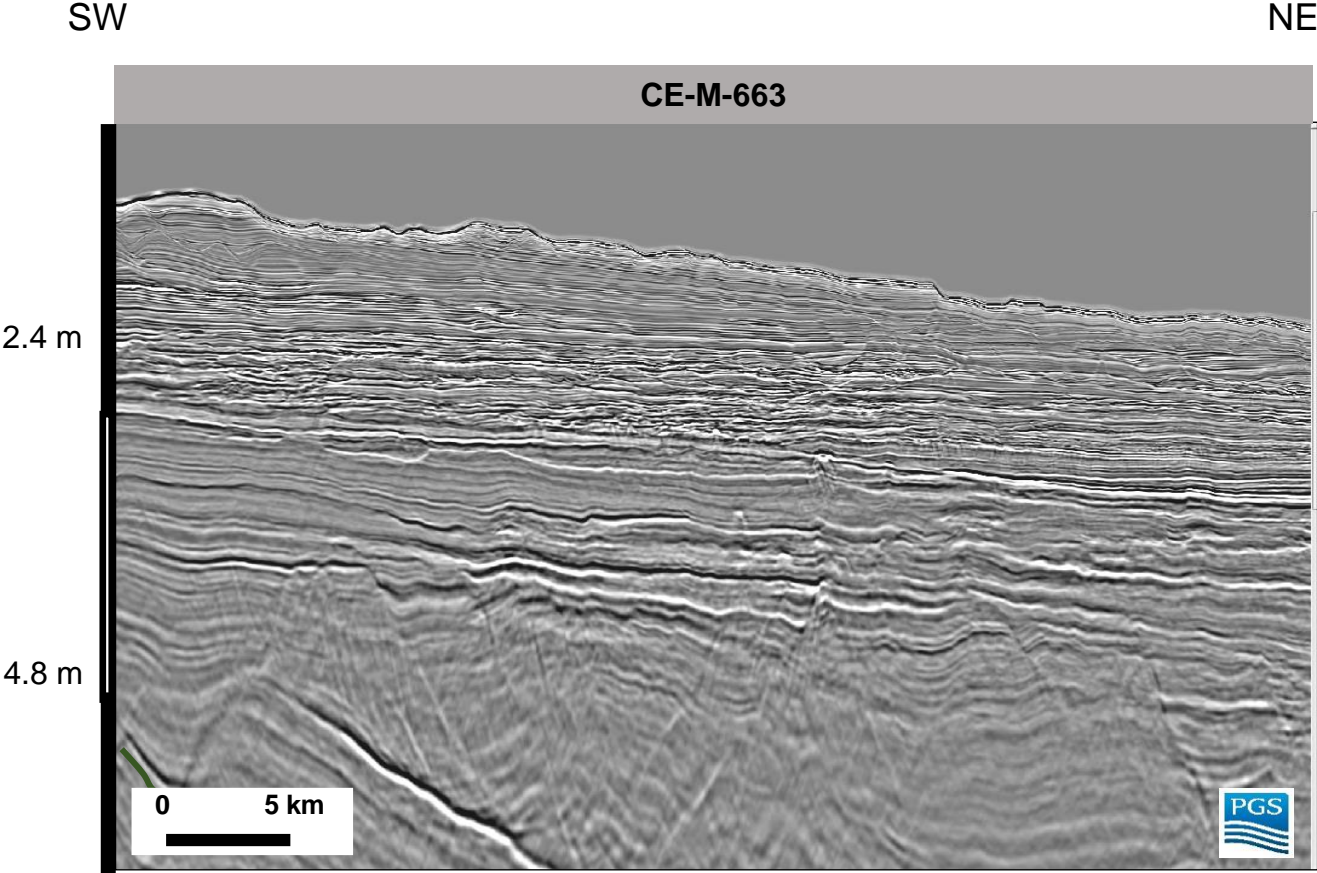


Offshore Ceara Basin



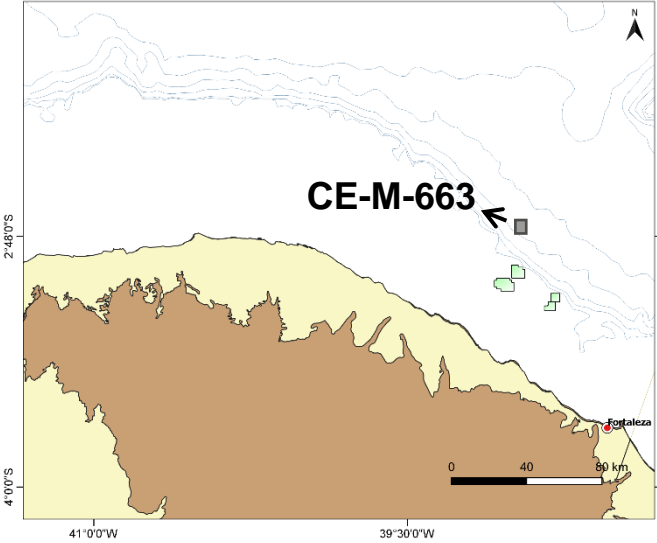
13 Blocks on Offer

Offshore Ceara Basin

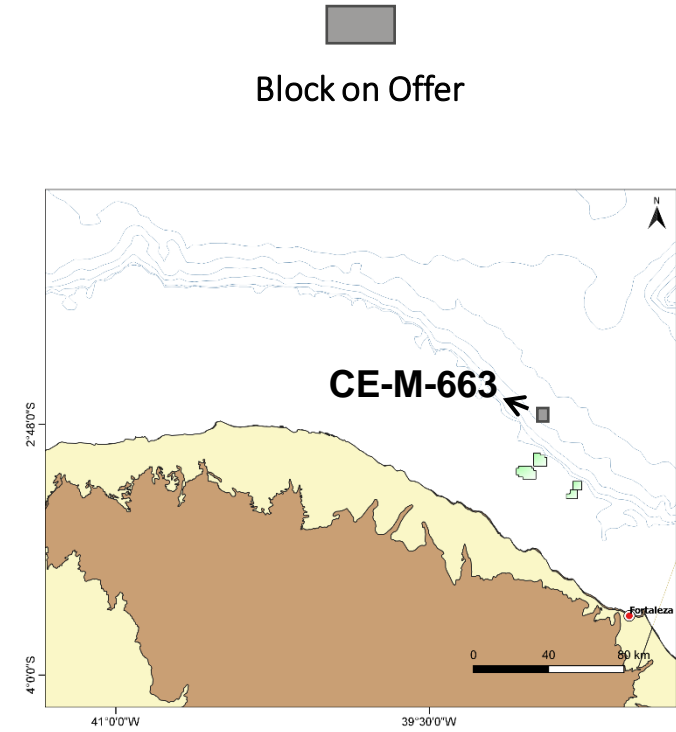
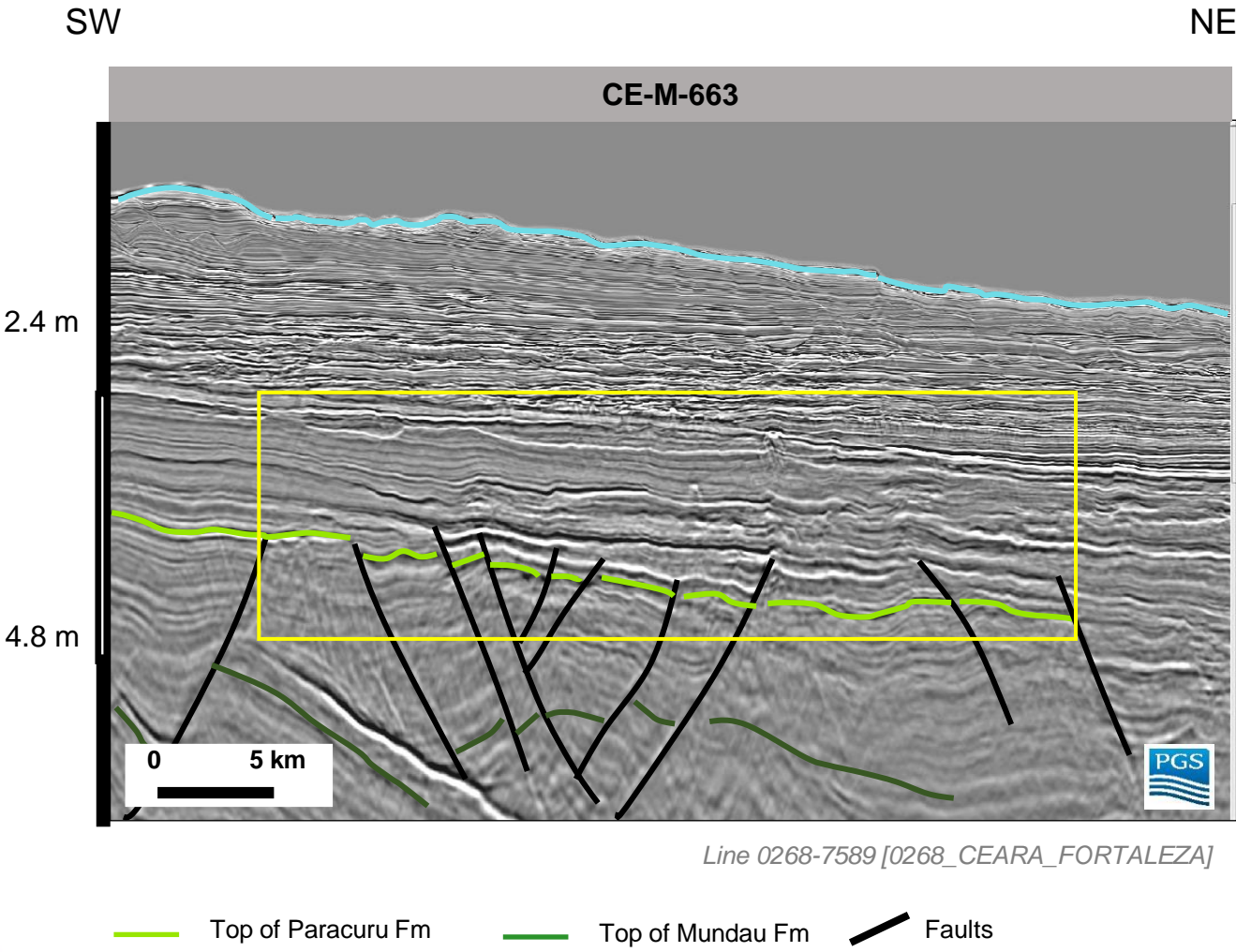


Line 0268-7589 [0268_CEARA_FORTALEZA]


Block on Offer



Offshore Ceara Basin

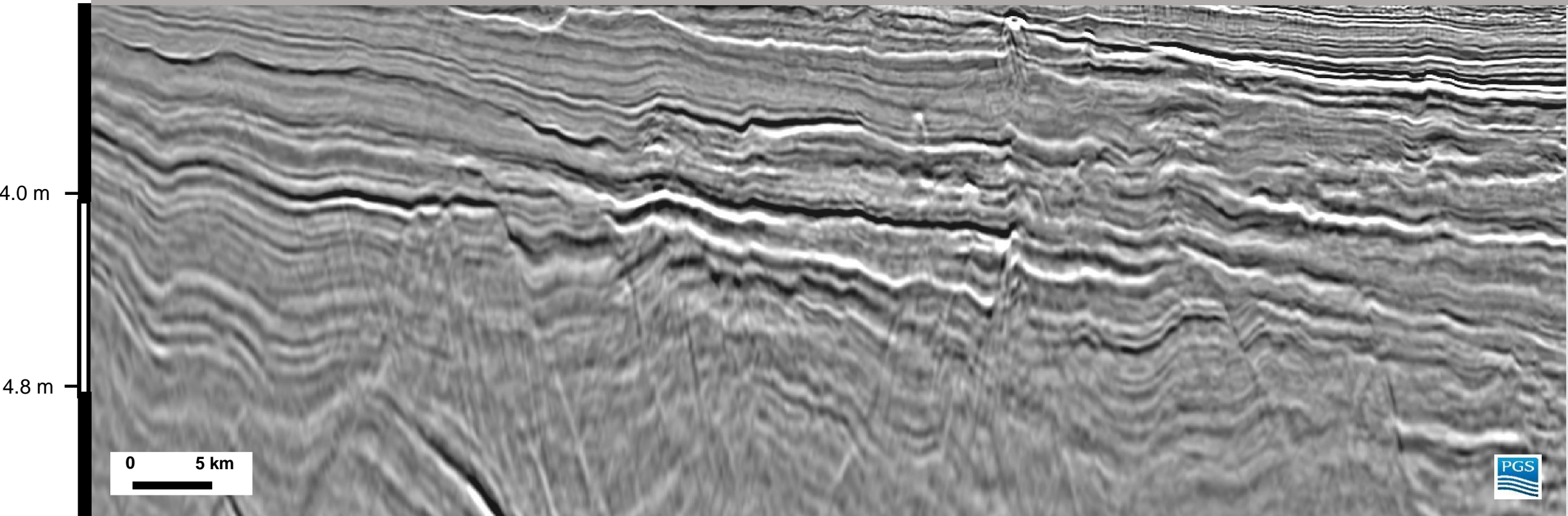


Offshore Ceara Basin

SW

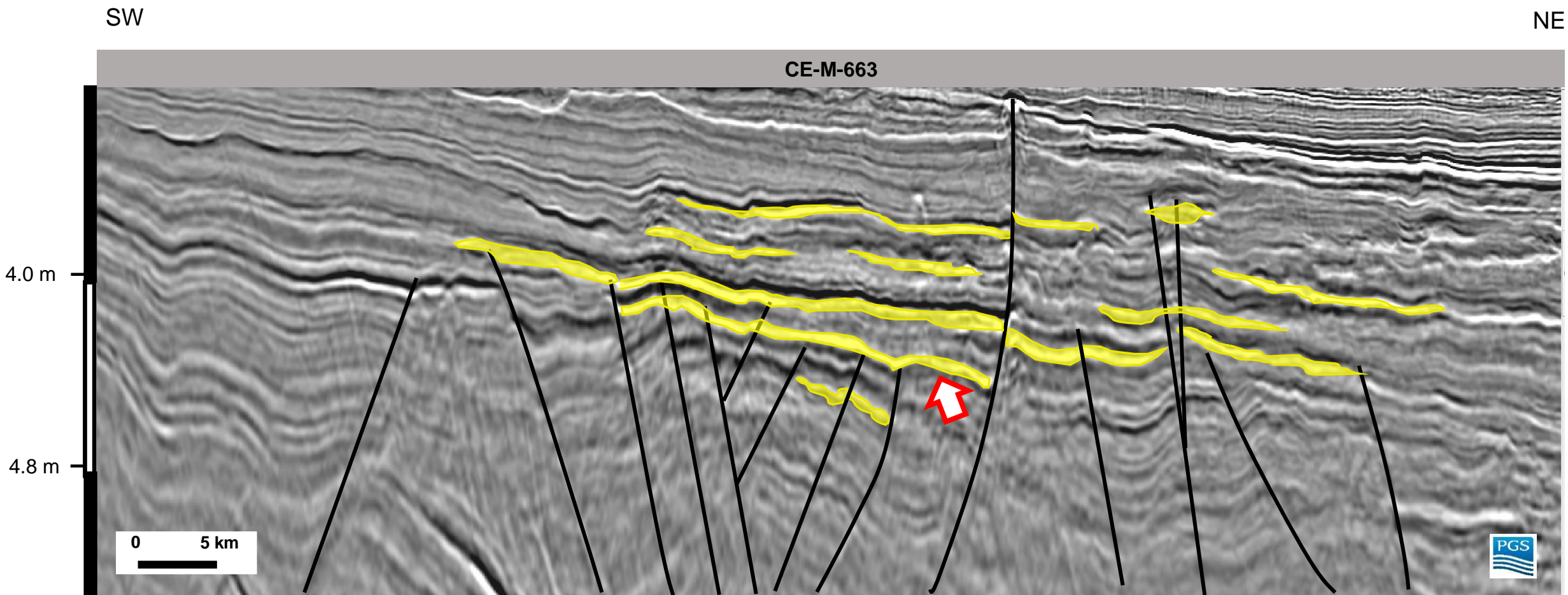
NE

CE-M-663



Line 0268-7589 [0268_CEARA_FORTALEZA]

Offshore Ceara Basin



Line 0268-7589 [0268_CEARA_FORTALEZA]

 Lead

Offshore Basins



New Frontier and Consolidated Basins

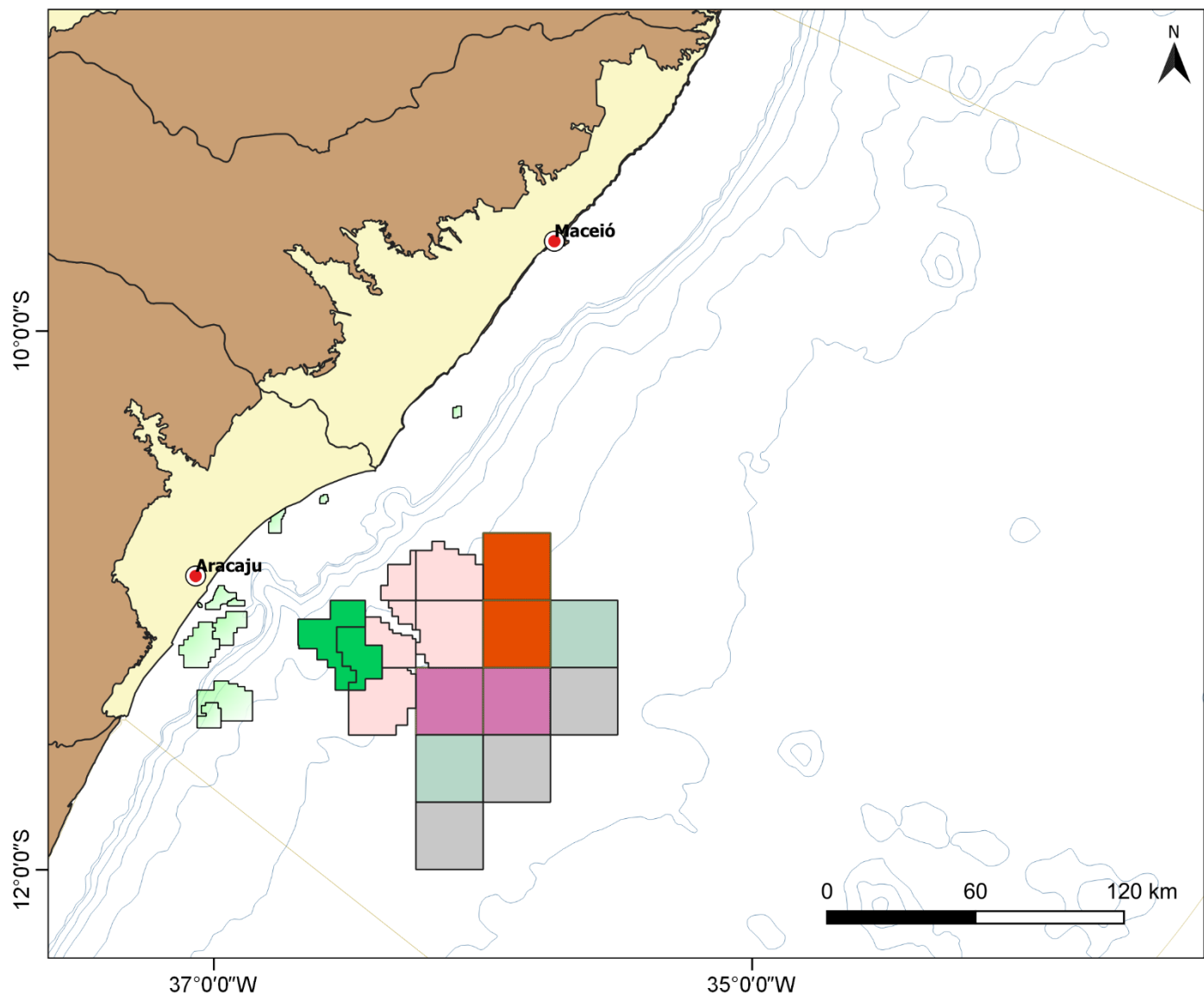
World Class Plays

Several Giant Fields

528 Blocks on Offer – Concession

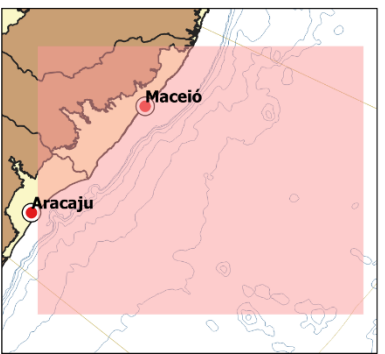
Minimum Bonus (R\$ 320,000 – R\$ 372,700,000)

Sergipe Alagoas Offshore Basin

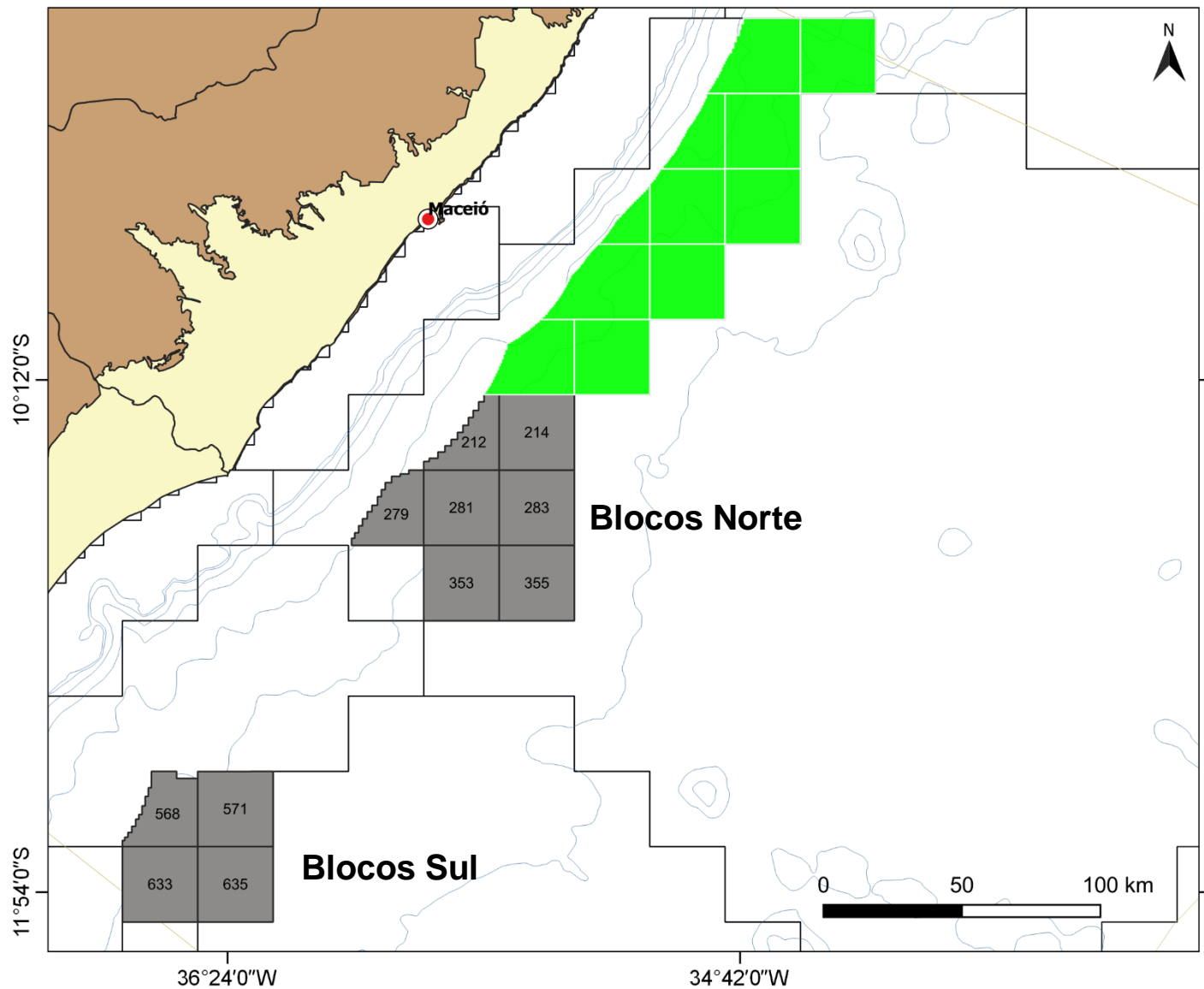


Exploration Blocks

- R2
- R6
- R13
- R14
- R15
- 1st Cycle Open Accreage
- Fields



Sergipe Alagoas Offshore Basin



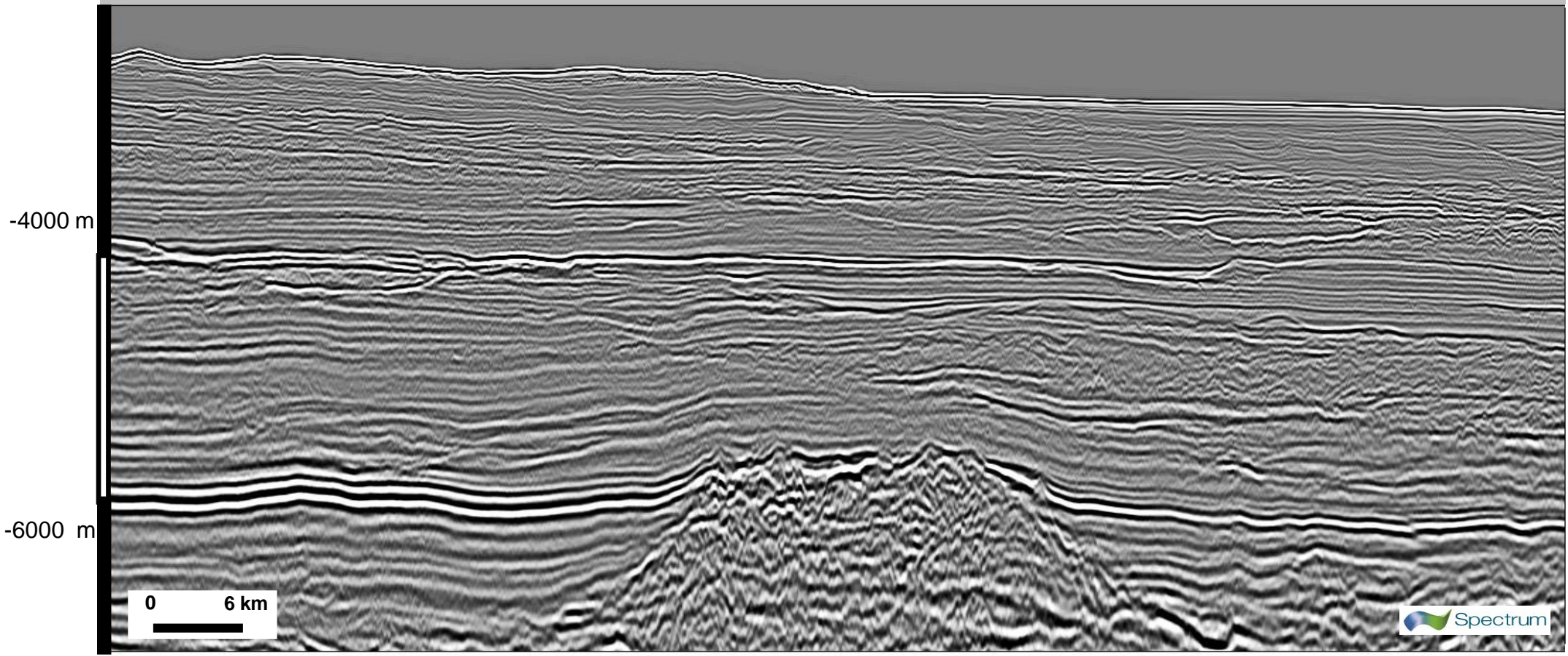
11 Blocks on Offer

Sergipe Alagoas Offshore Basin

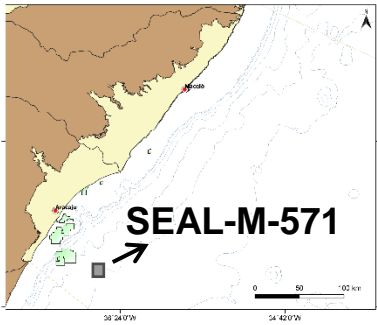
NW

SE

SEAL-M-571



Block on Offer



[R0257_SEALP1_PSDM]

Sergipe Alagoas Offshore Basin

NW

SE

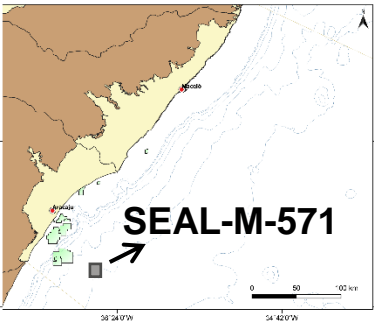
SEAL-M-571

-4000 m

-6000 m

0 6 km

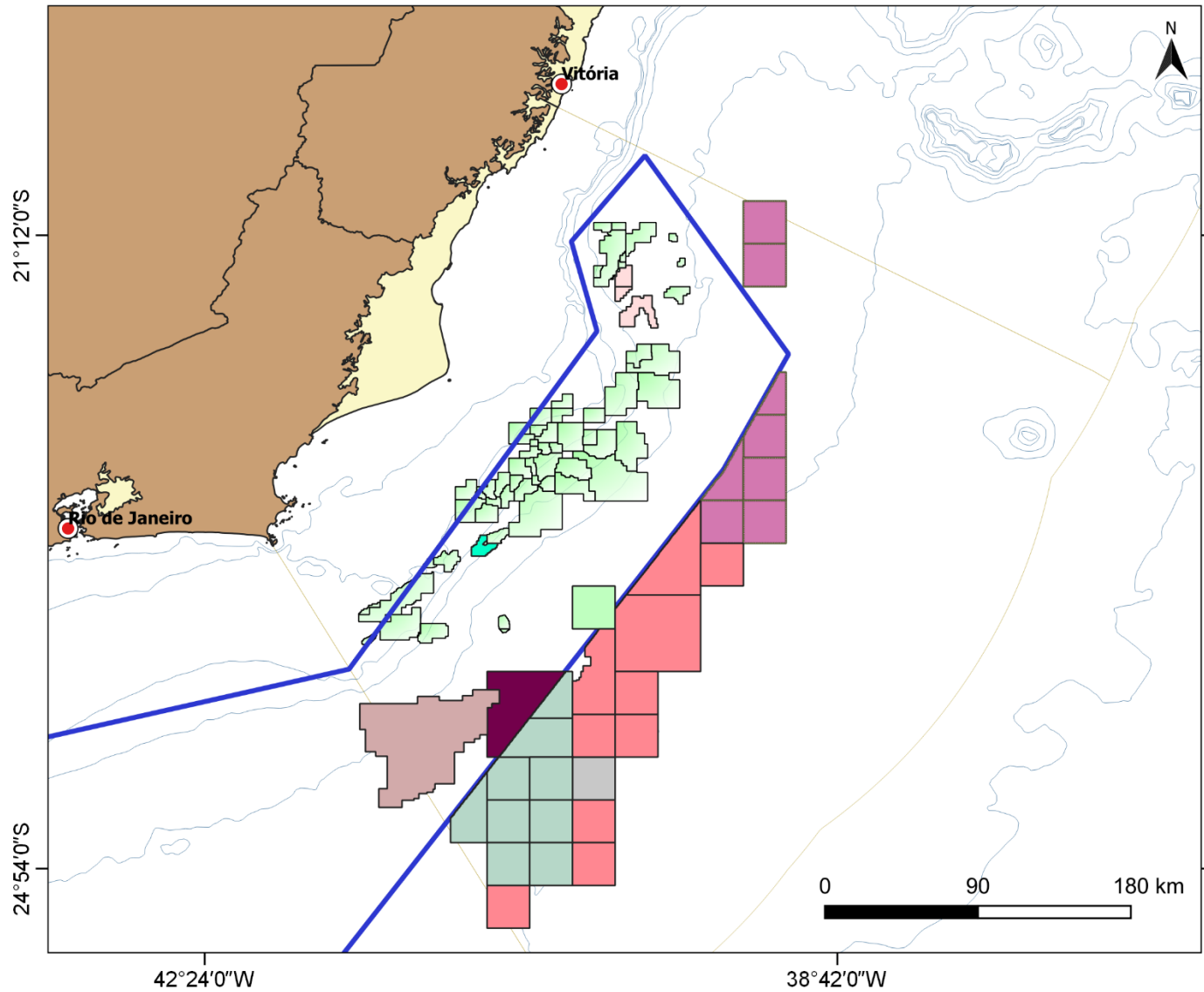
Block on Offer













[R0257_SEALP1_PSDM]

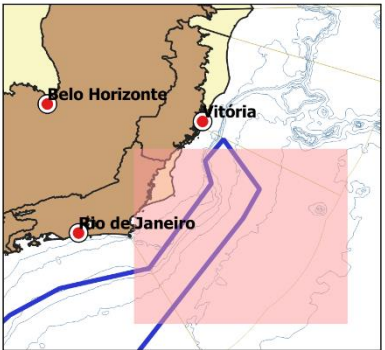
Paleocene Turonian Maastrichtian Volcanic Rocks Leads

Campos Basin

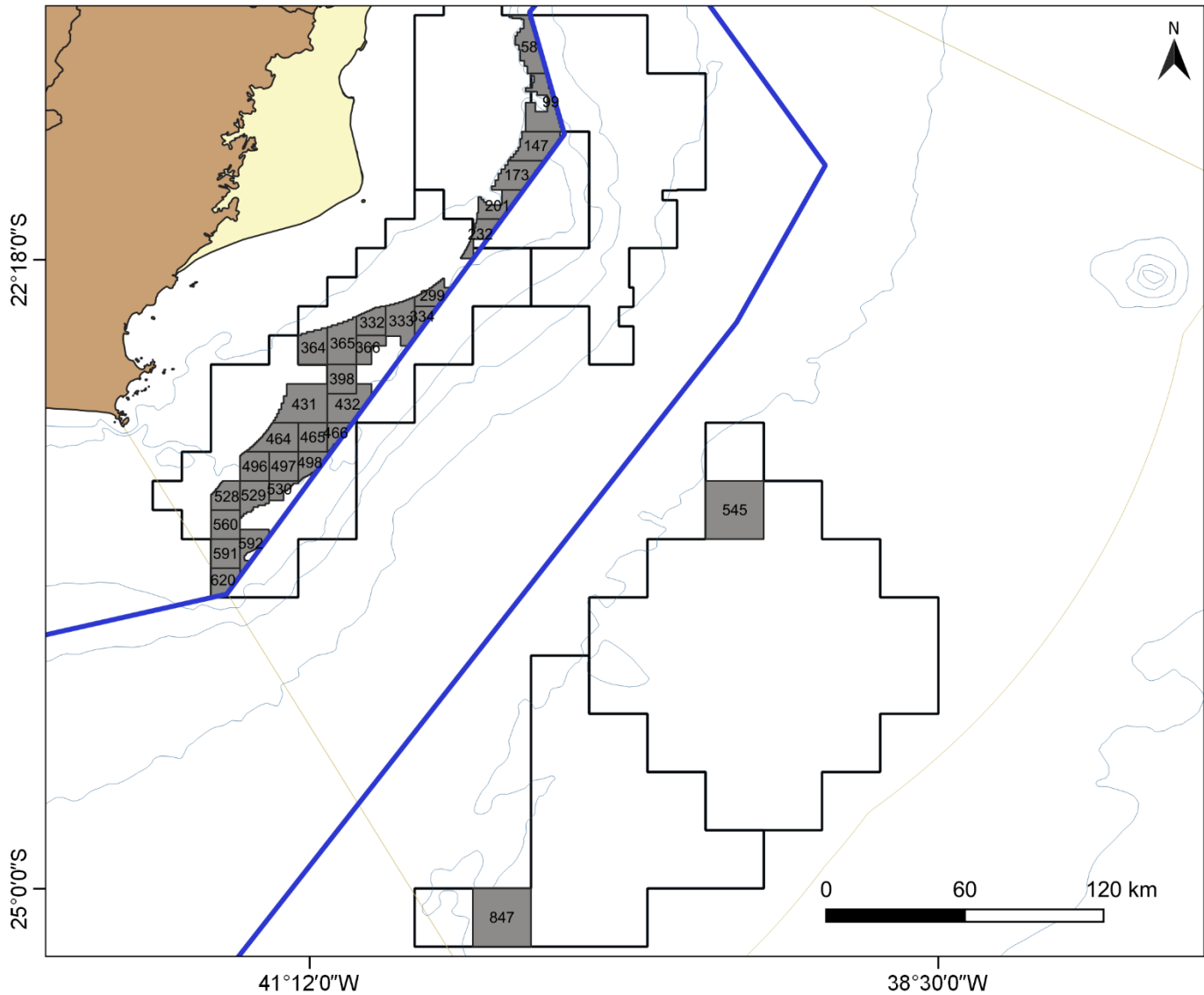


Exploration Blocks

	R6		Production Sharing 3
	R7		Production Sharing 4
	R14		Production Sharing 5
	R15		
	R16		
	2nd Cycle Open Acreage		
	Fields		

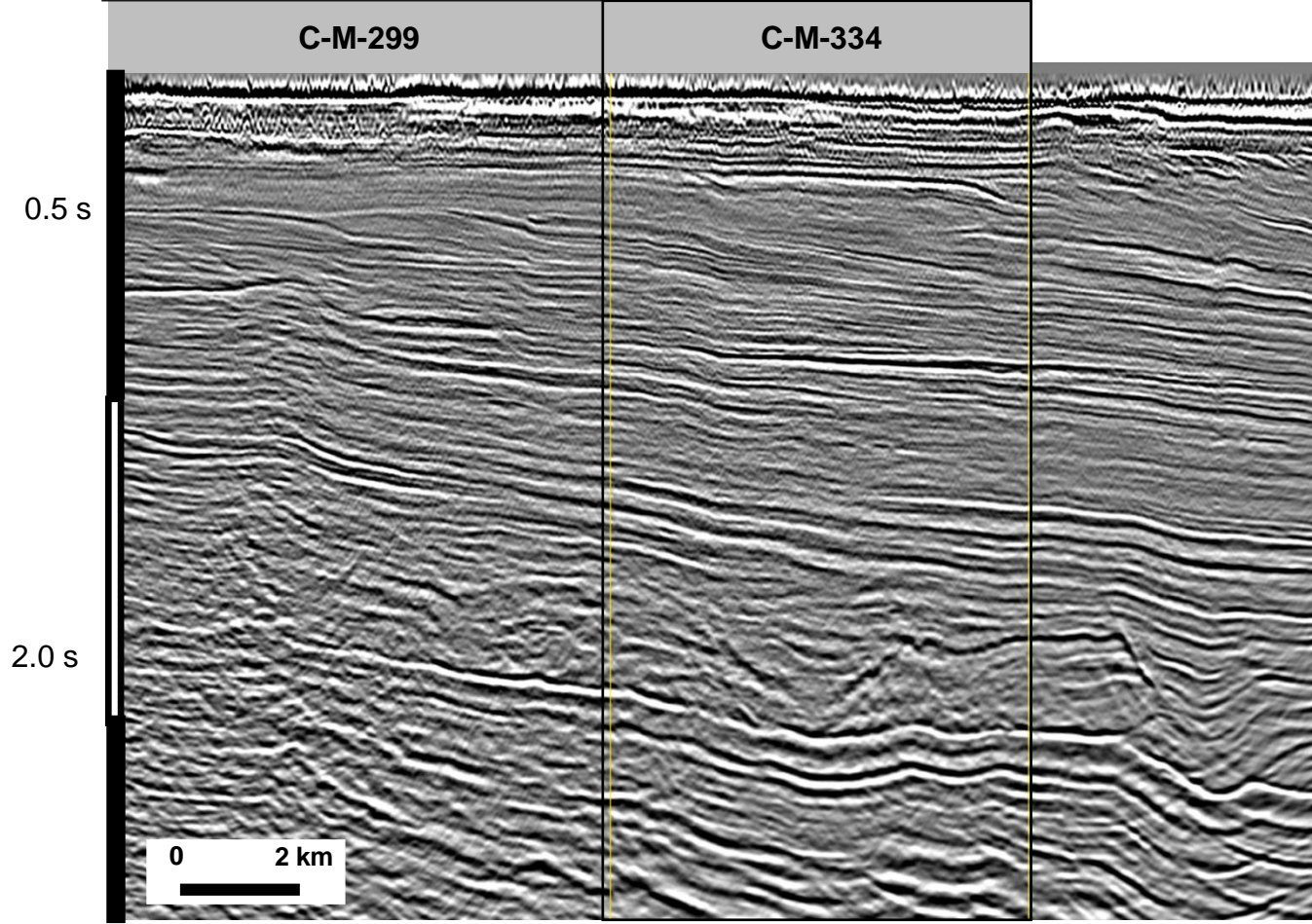


Campos Basin




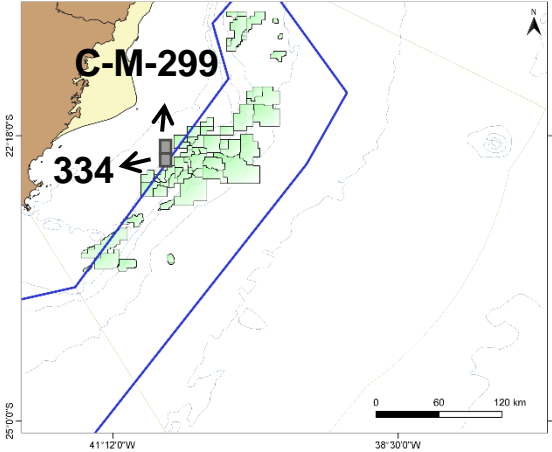
46 Blocks on Offer

Campos Basin

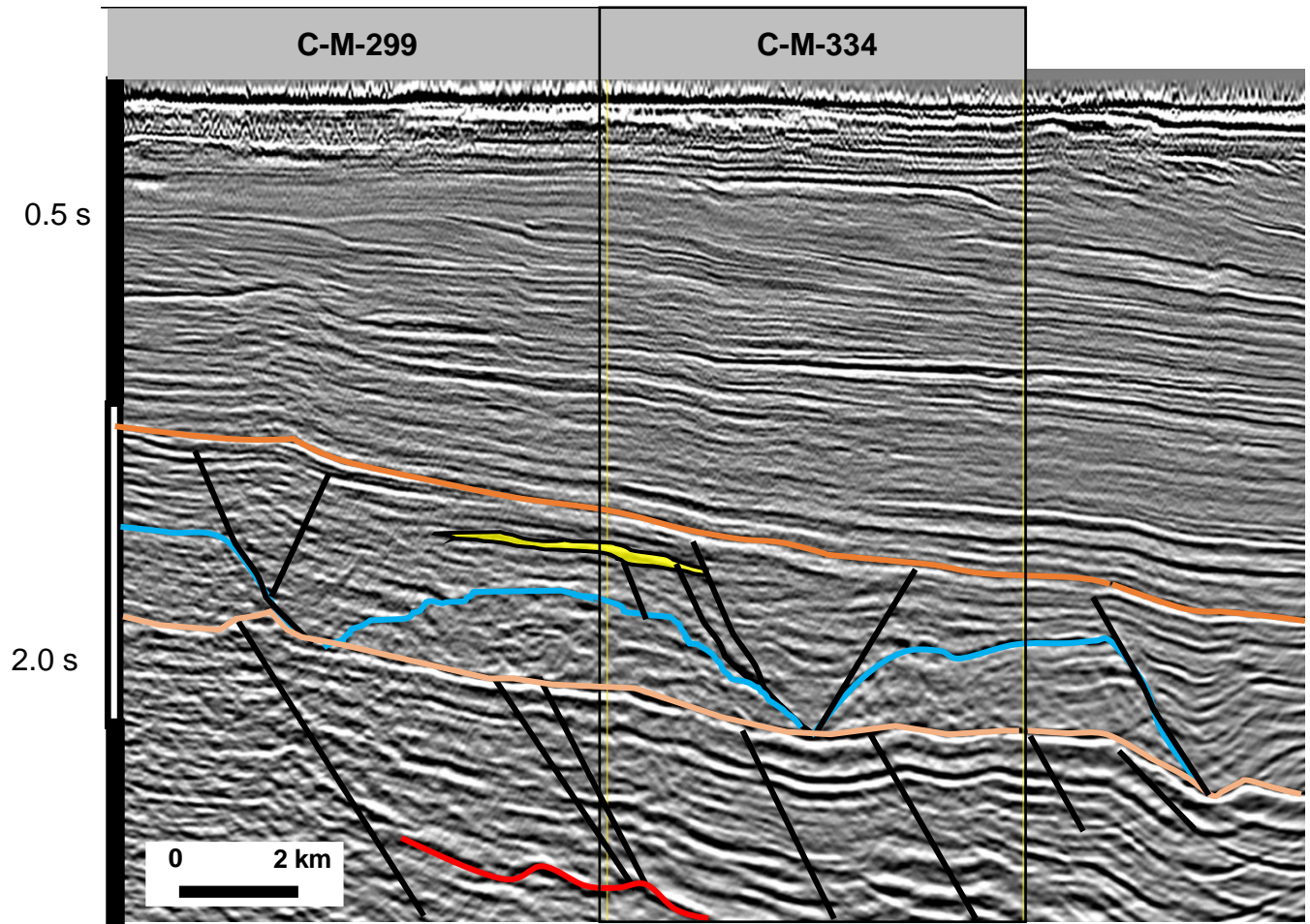


R0264_BM_C_28_PSDM


Blocks on Offer



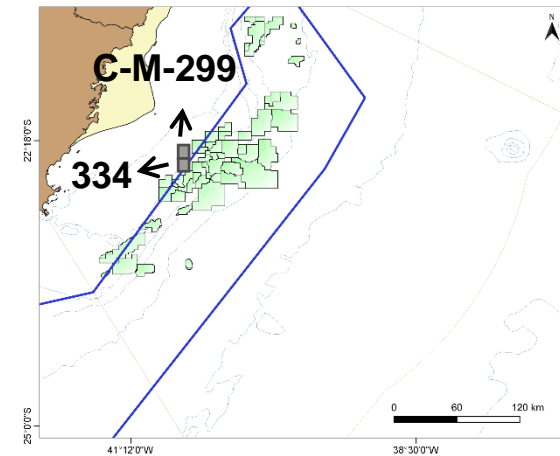
Campos Basin



R0264_BM_C_28_PSDM

- Top of Lower Oligocene
- Top of Carapebus Fm
- Top of Quissama Fm
- Top of Salt Equivalent
- Basement

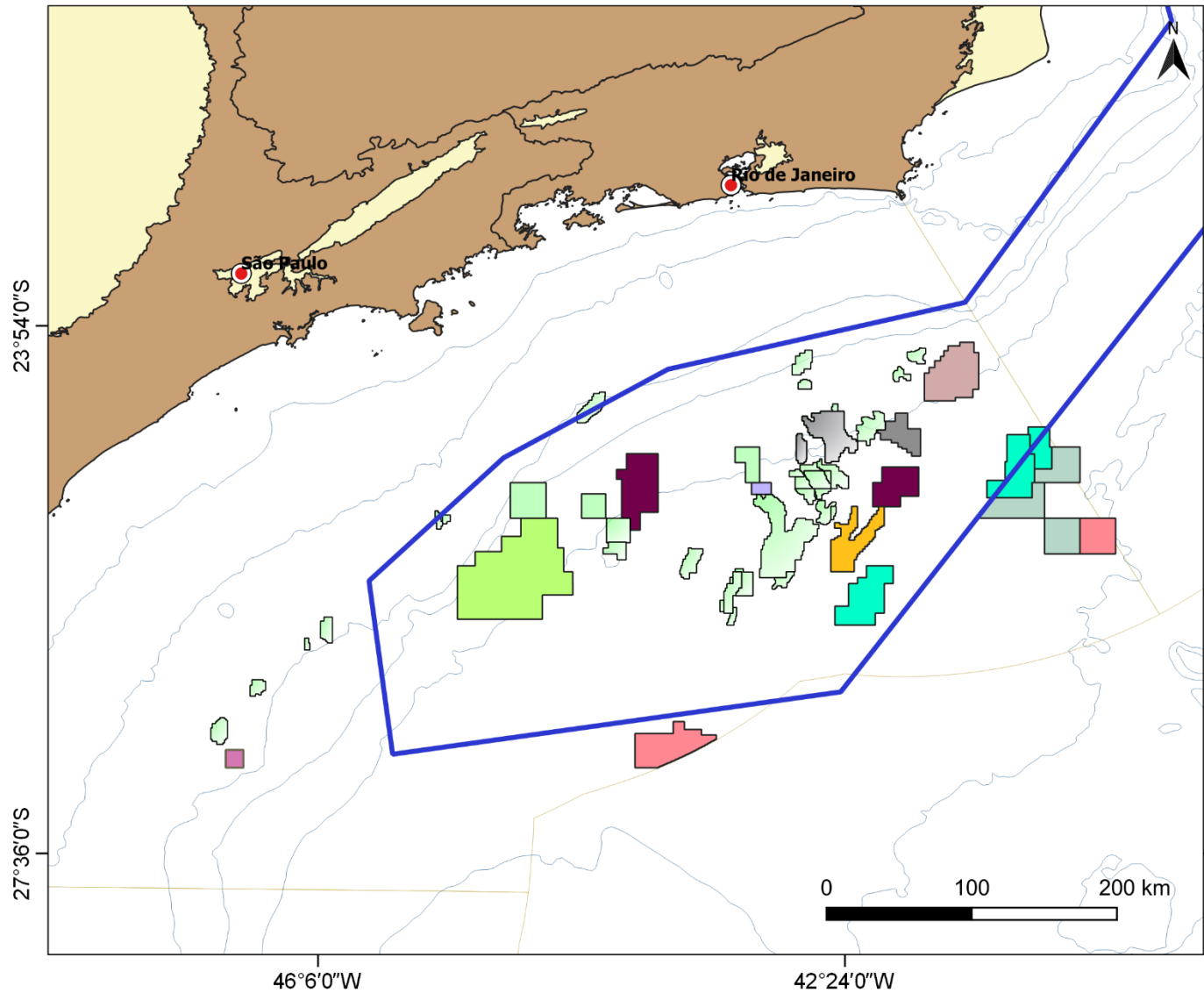
Blocks on Offer











Cretaceous Turbidites

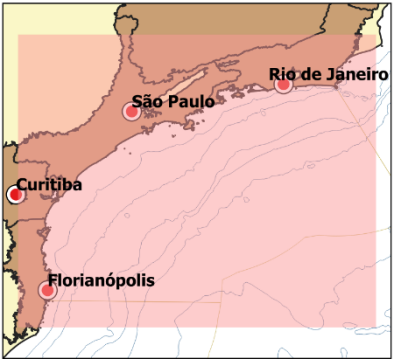
Albian Carbonates

Santos Basin

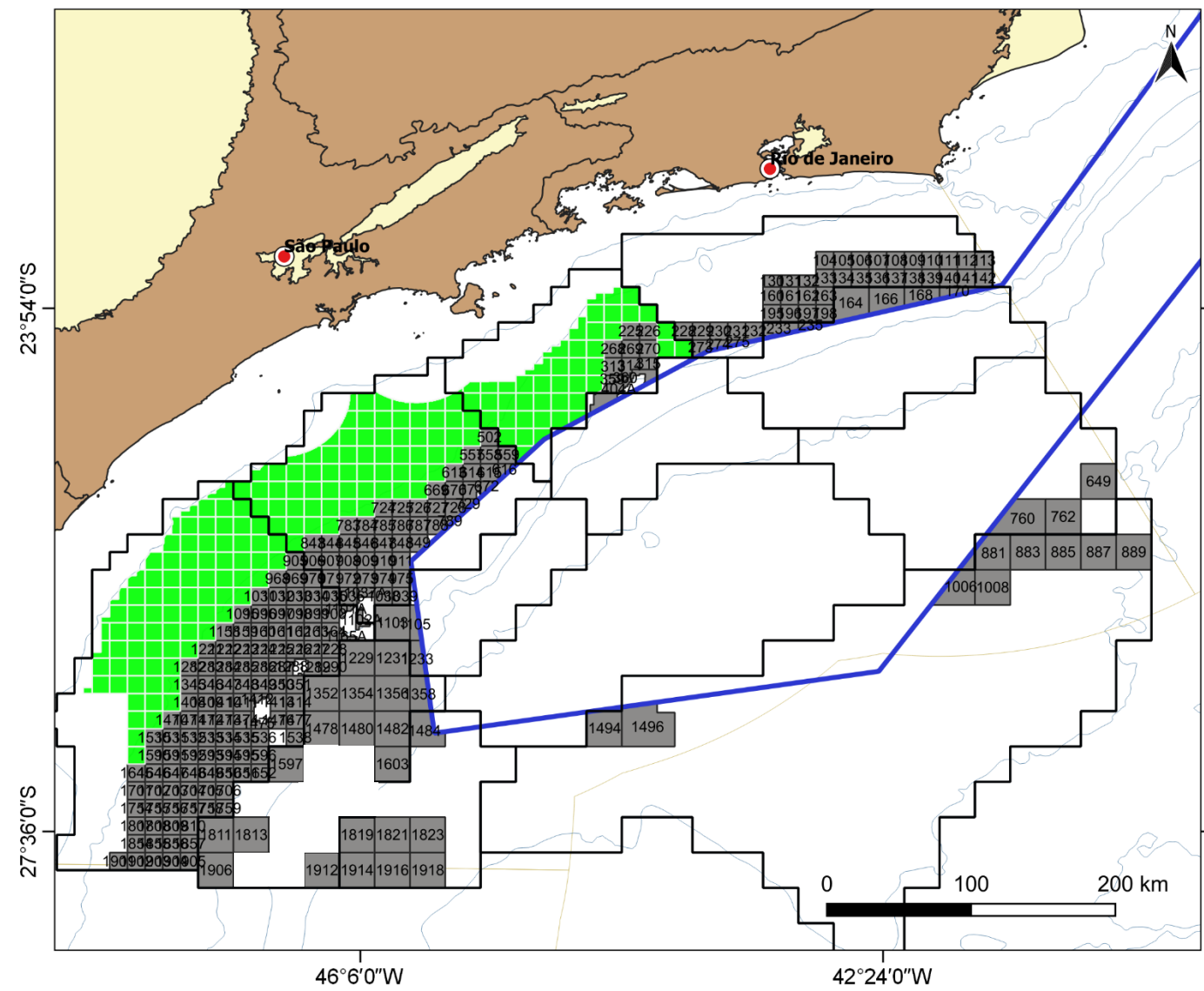


Exploration Blocks

	R3		Production Sharing 1
	R7		Production Sharing 2
	R14		Production Sharing 3
	R15		Production Sharing 4
	R16		Production Sharing 5
	Lveco		Production Sharing 6
	Fields		

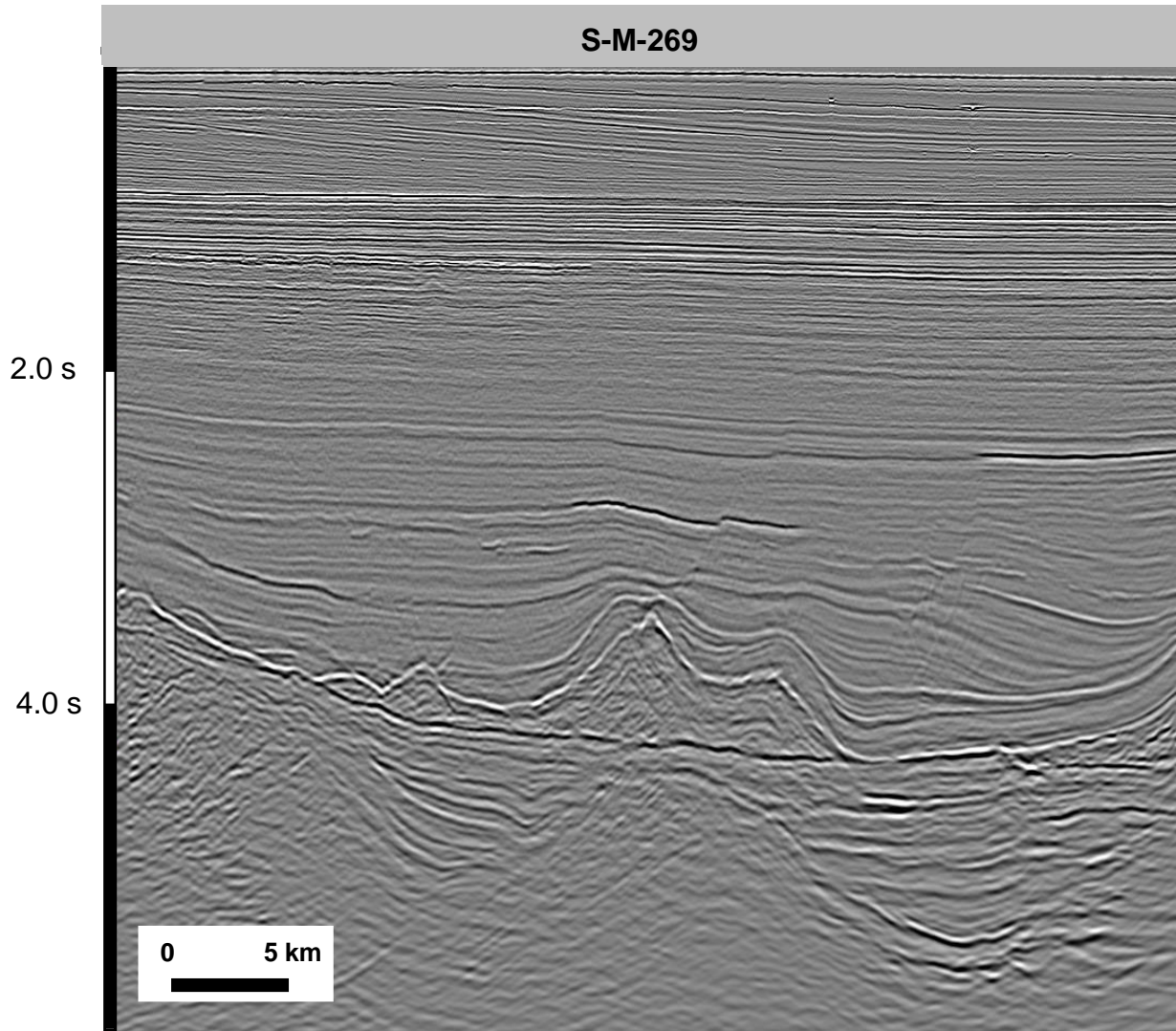


Santos Basin



260 Blocks on Offer

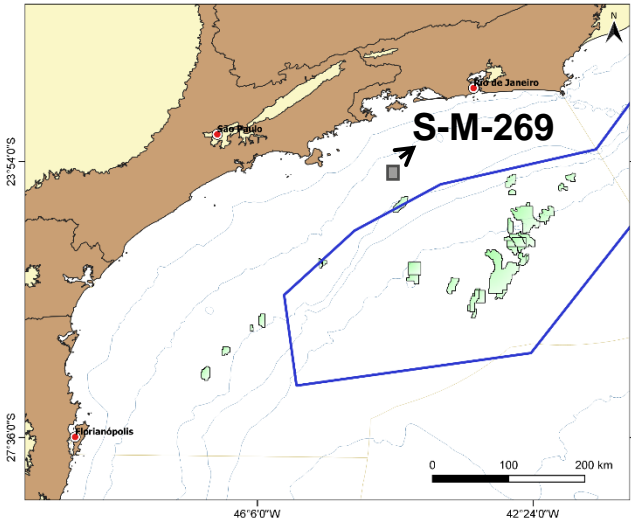
Santos Basin



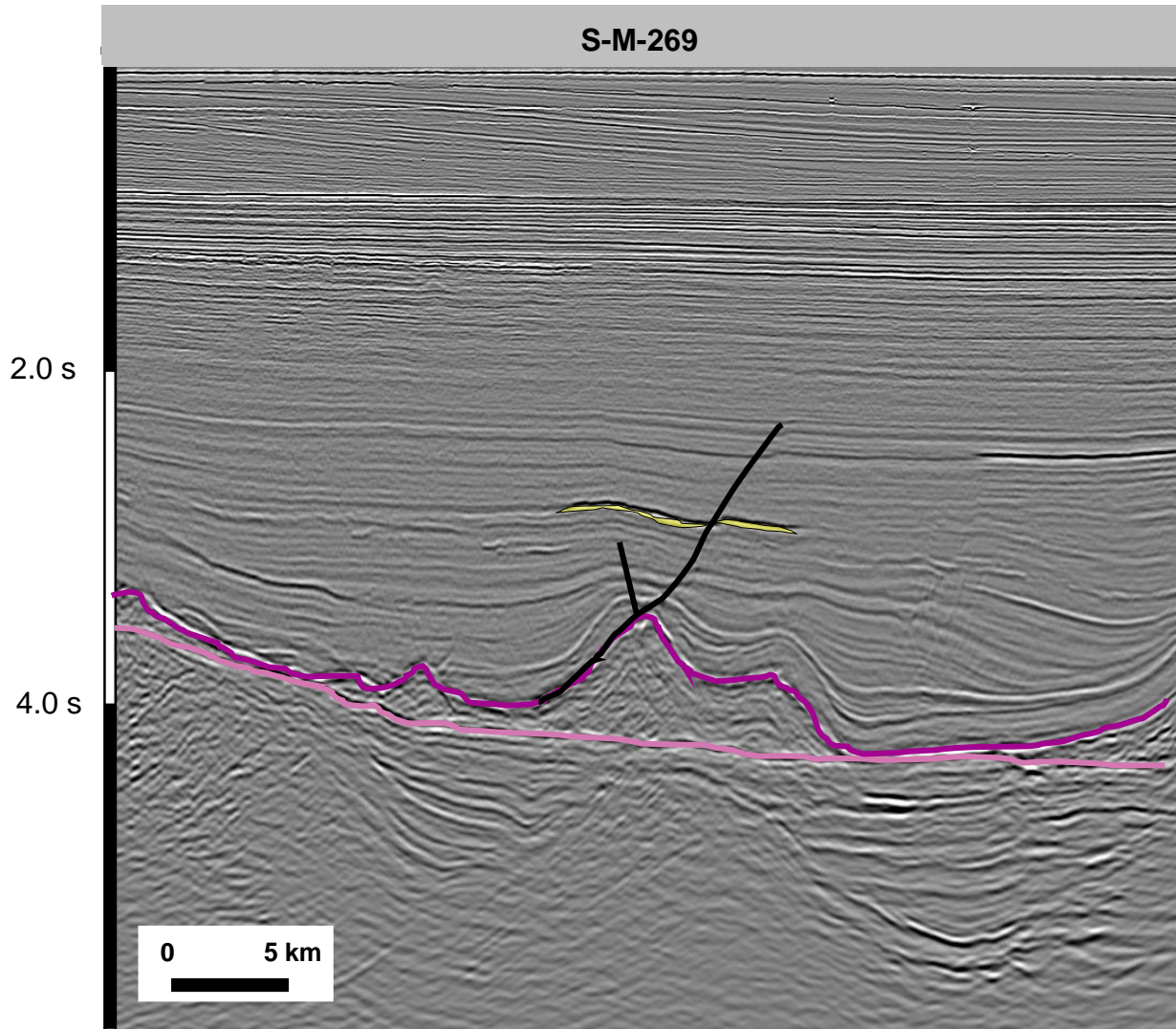
0282_BM_S_14



Block on Offer



Santos Basin

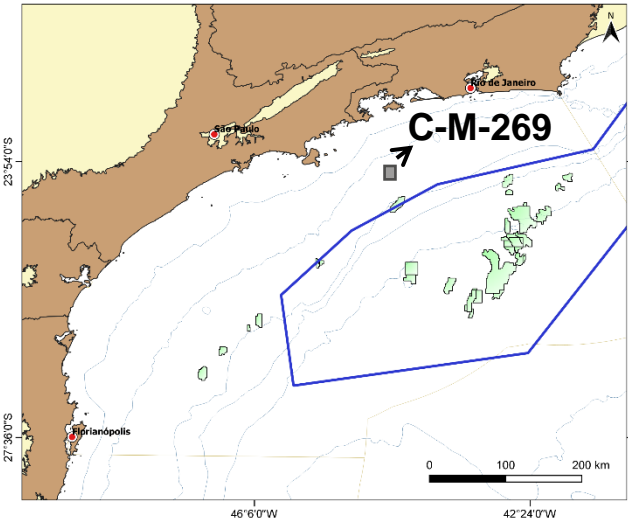


0282_BM_S_14

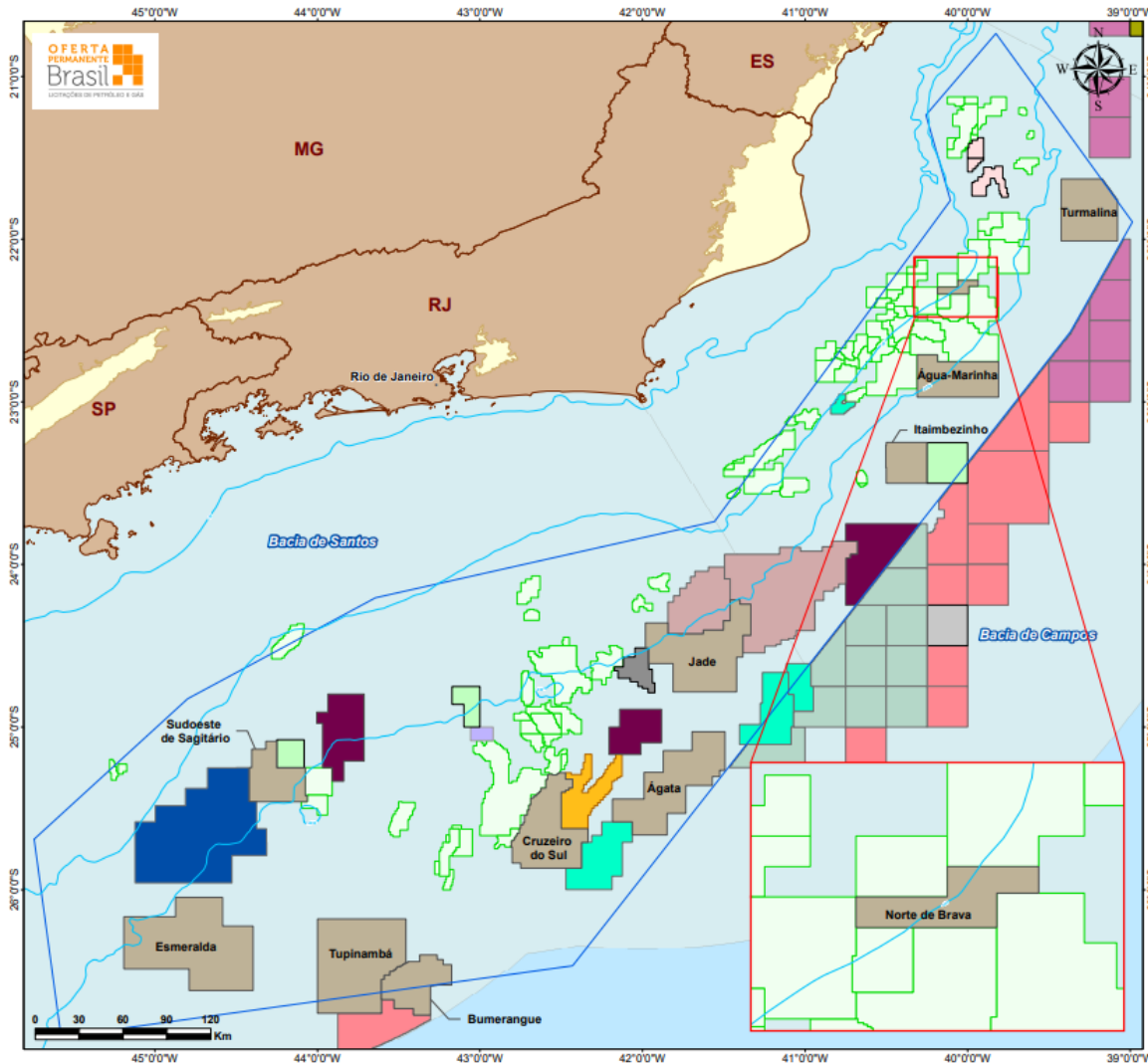
— Top of Salt — Base of Salt ● Lead



Block on Offer



Pre-salt Opportunities Open Acreage



11 Blocks

Agata
 Agua Marinha
 Bumerangue
 Cruzeiro do Sul
 Esmeralda
 Itaimbezinho
 Jade
 N of Brava
 SW Sagitario
 Tupinamba
 Turmalina



Brazil

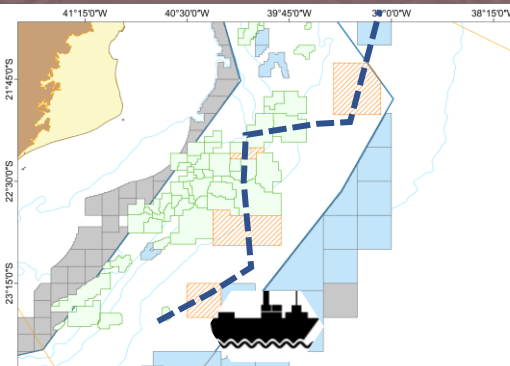
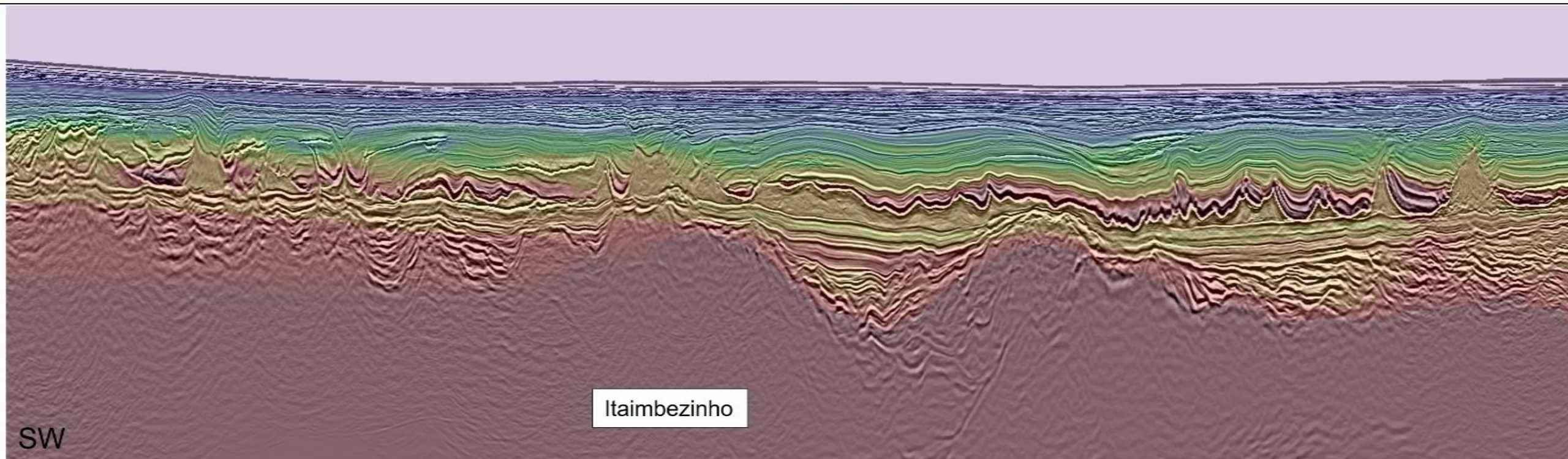
OIL | GAS | ENERGY 2022

Production Share in Permanent Offer **Geological and Economic Approach**

Ronan Ávila

26th May, 2022

Campos Basin (Itaimbezinho, Água Marinha, Norte de Brava e Turmalina)

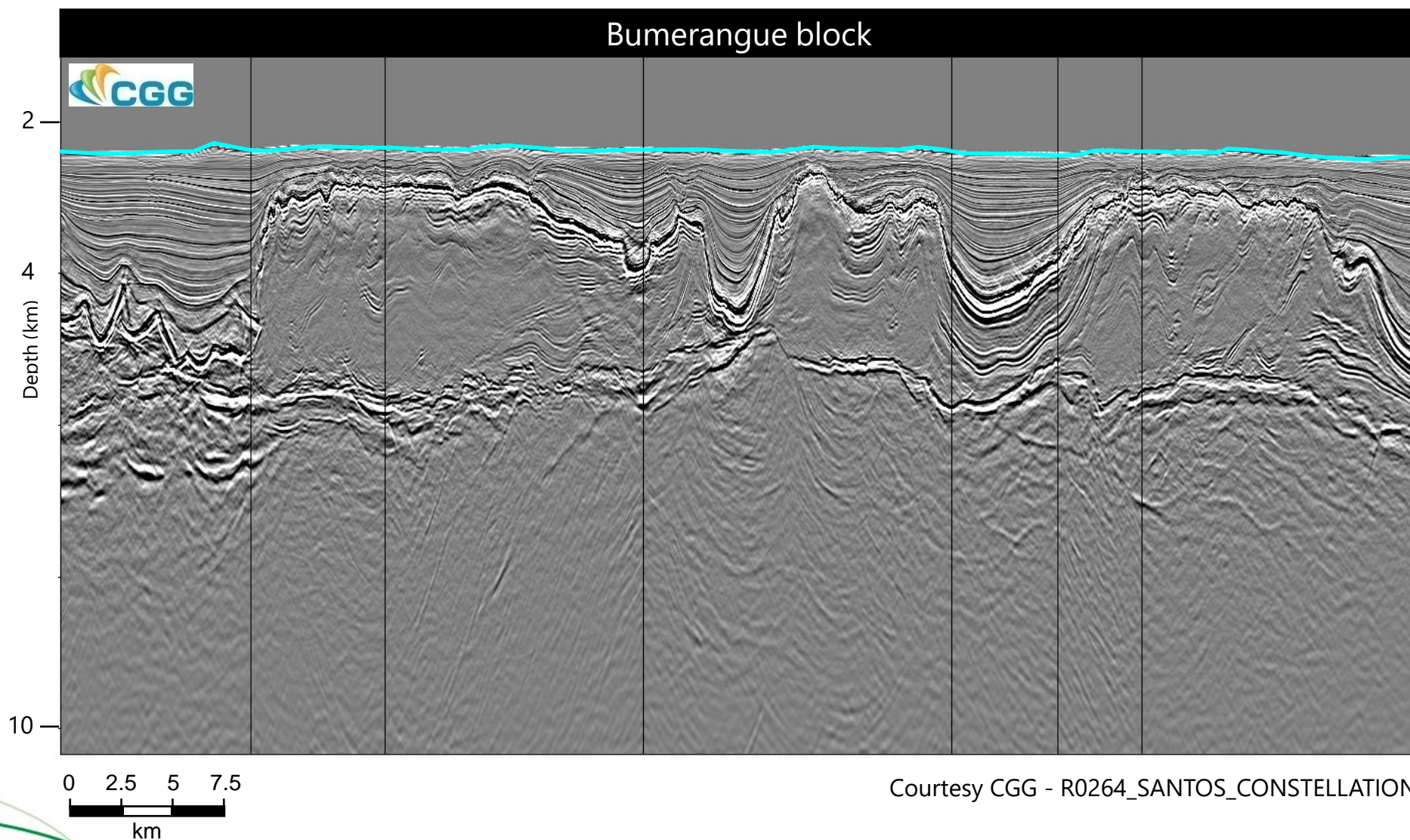


Courtesy ION Geophysical: Picanha 3D RTM + Velocity Model

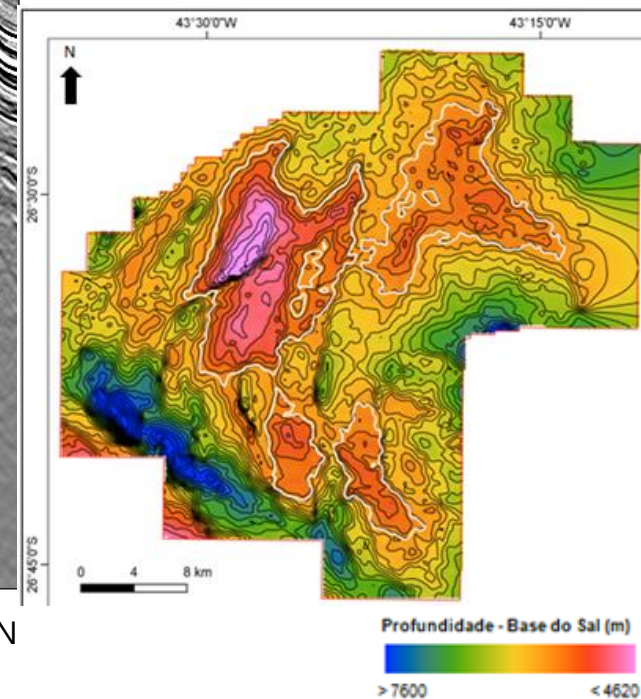
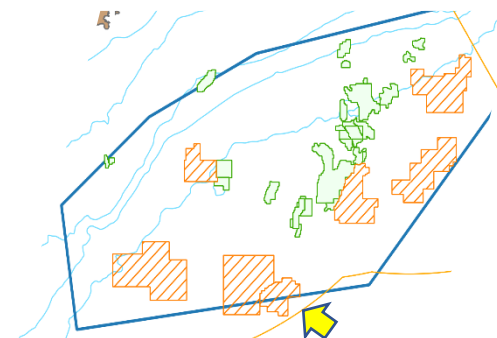
ion

Source: Production Share in Permanent Offer Geological and Economic Approach (Avila, 2022)

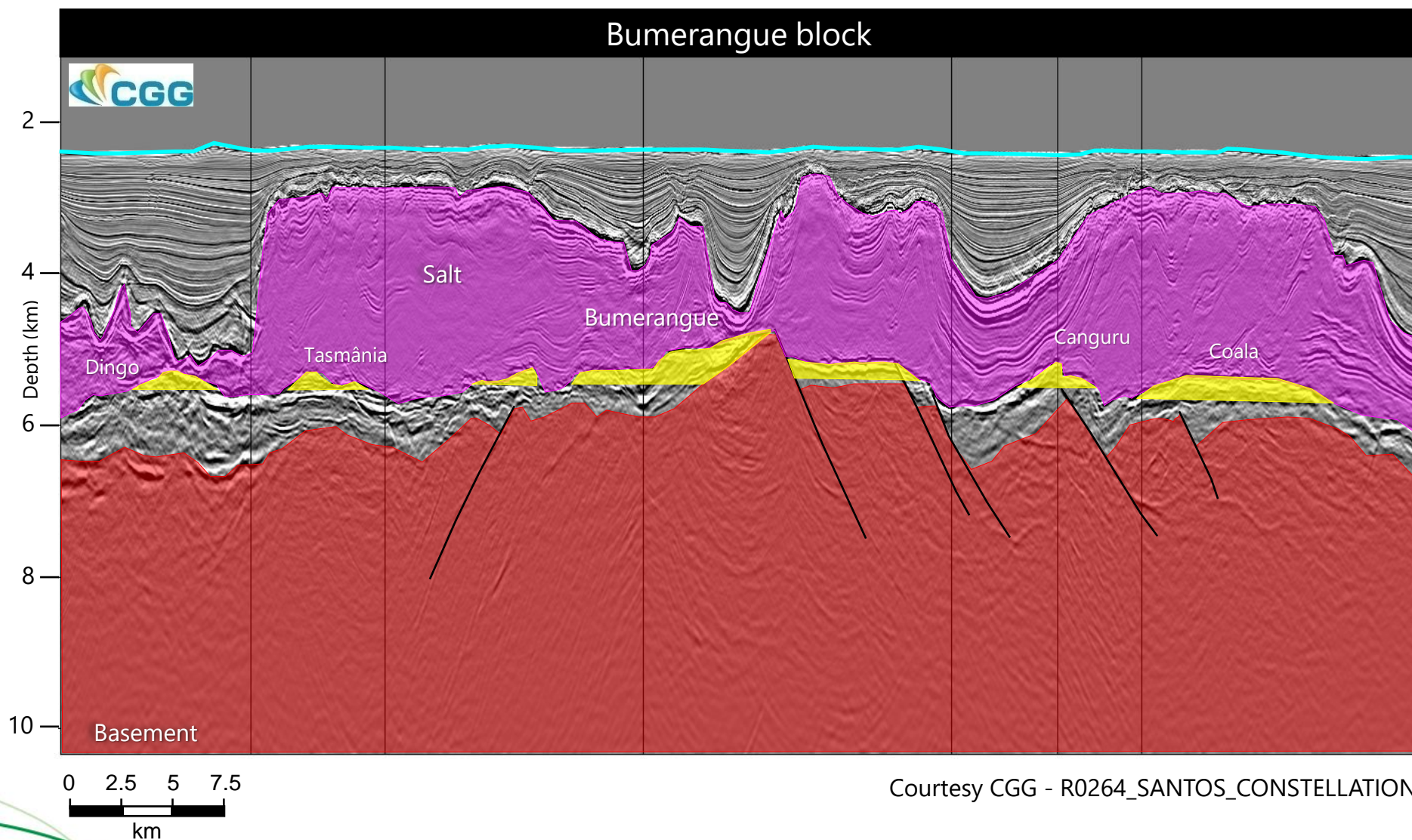
Santos Basin – Bumerangue Block



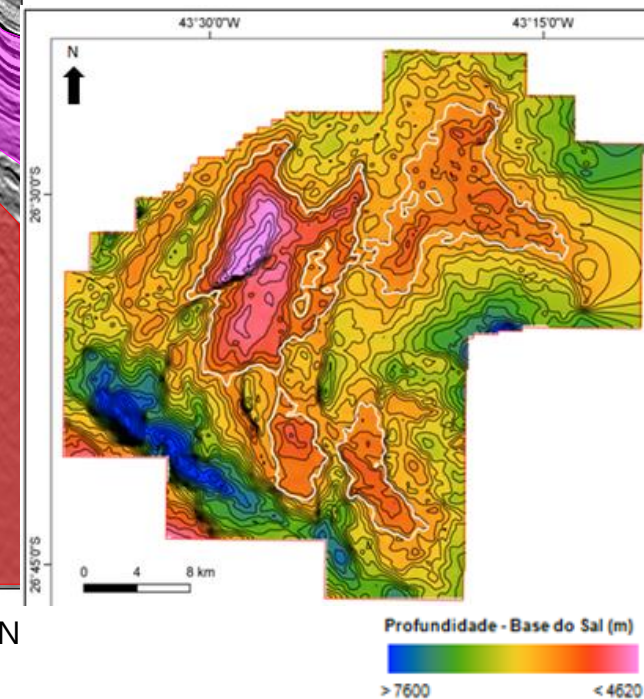
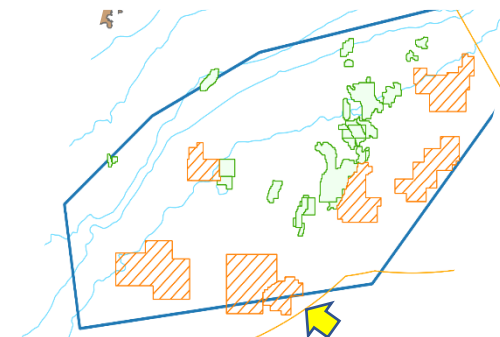
Courtesy CGG - R0264_SANTOS_CONSTELLATION



Santos Basin – Bumerangue Block



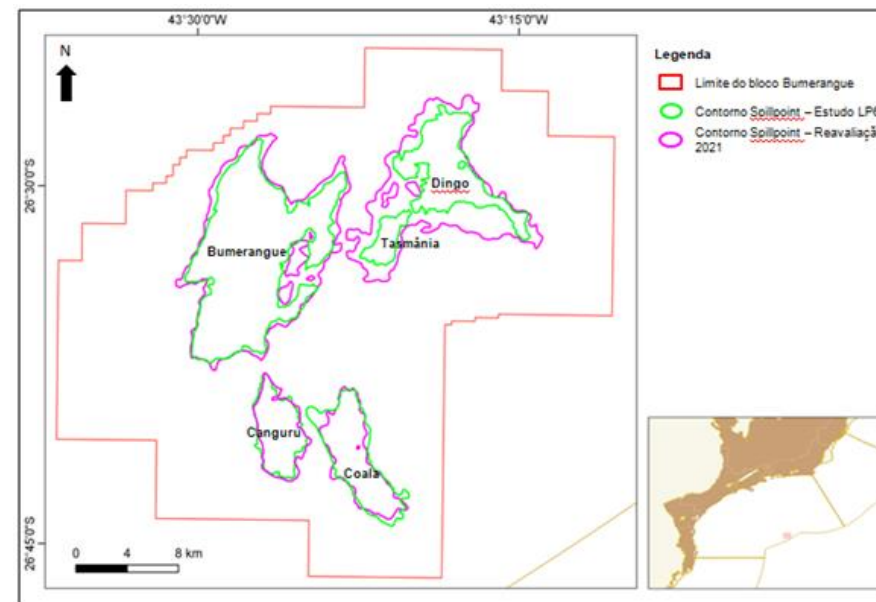
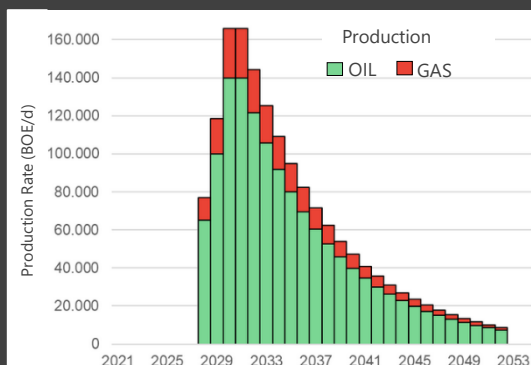
Courtesy CGG - R0264_SANTOS_CONSTELLATION



Santos Basin – Bumerangue Block

Project (Hypothetical)

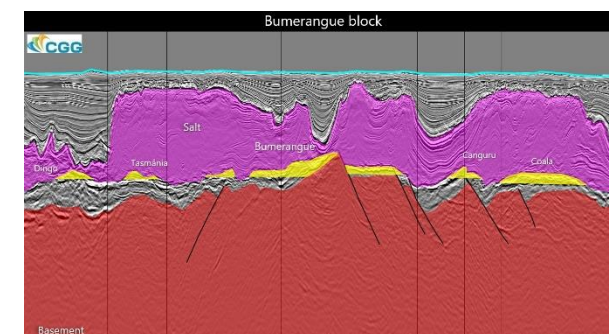
- Bumerangue Prospect 2,453 MSTB
- Recovery Factor ~ 20%
- UEP (150,000 bbl/d)
- 6 production wells
- 6 injection wells



Block Area 1,118 Km²

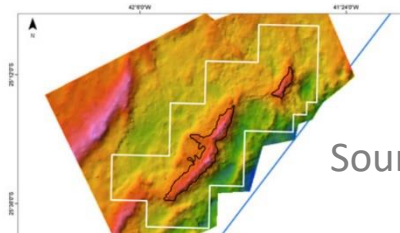
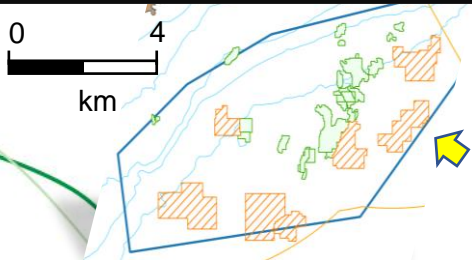
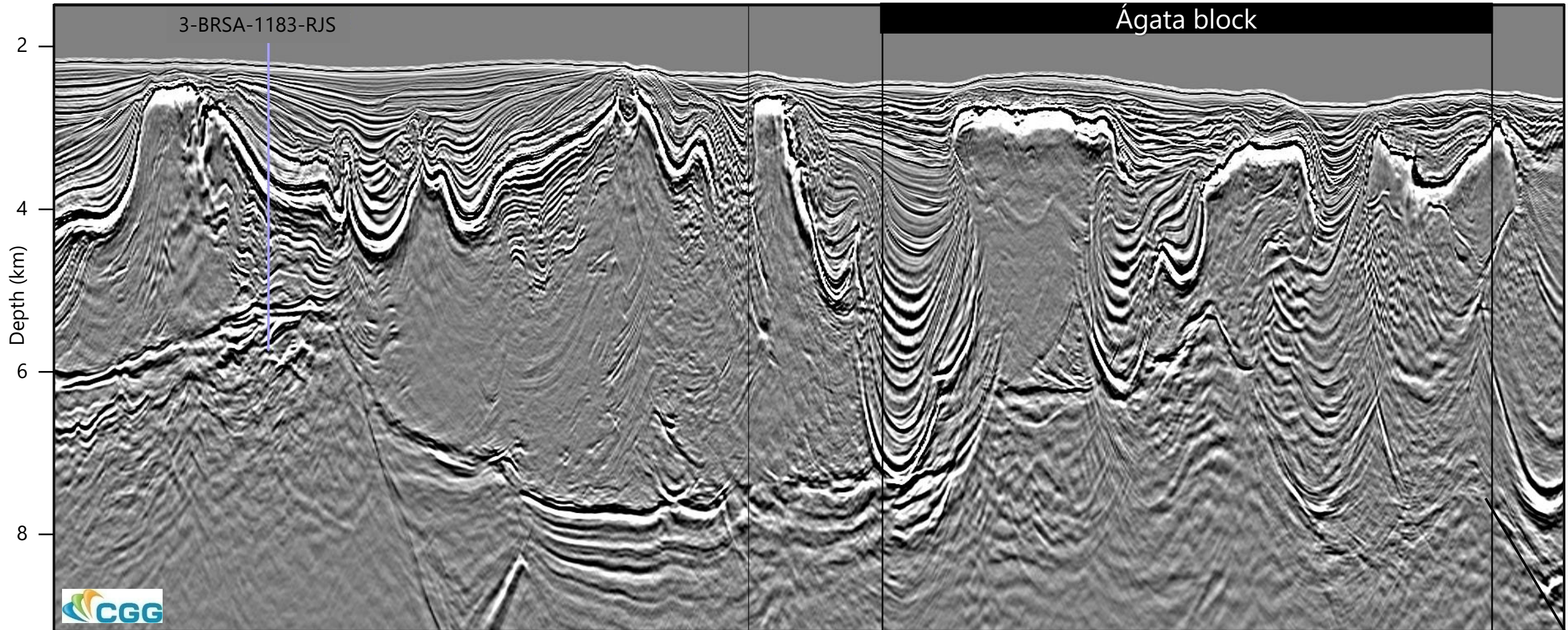
Block VOIP 2,453 MSTB

Water Depth 2,300 m / Coastline distance 380 Km



Prospect	Source	Migration	Reservoir	Seal	Trap	Synchronism	CSG
Bumerangue	50%	60%	60%	100%	90%	80%	13%
Up. Dingo-Tasm.	50%	60%	60%	30%	70%	80%	03%
Up. Coala	50%	60%	60%	100%	90%	80%	13%
Up. Canguru	50%	60%	60%	100%	90%	80%	13%

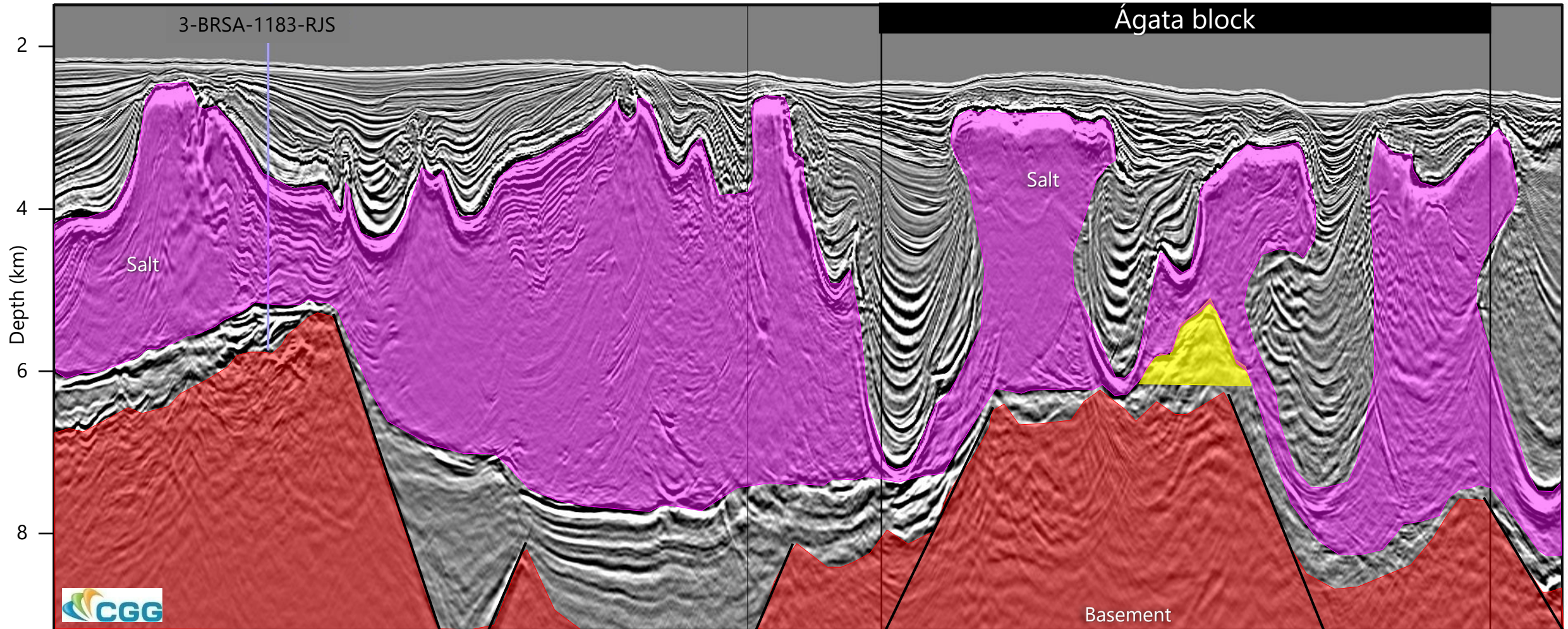
Santos Basin – Ágata Block



Courtesy CGG - 0264_BM_SANTOS_FASE_VIIB_RTM

Source: Production Share in Permanent Offer Geological and Economic Approach (Avila, 2022)

Santos Basin – Ágata Block



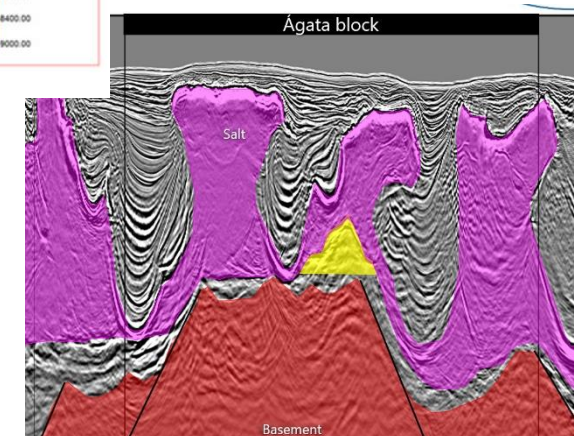
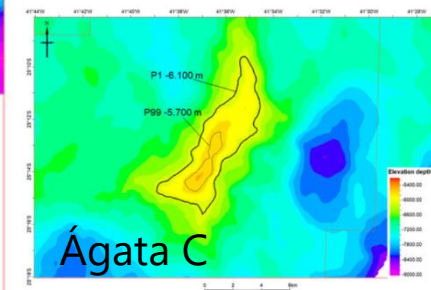
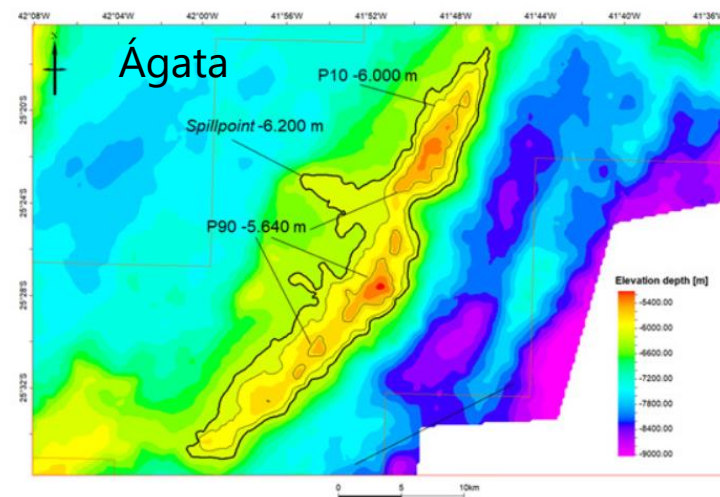
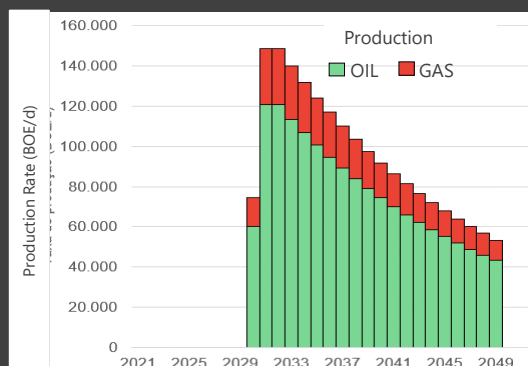
Courtesy CGG - 0264_BM_SANTOS_FASE_VIIB_RTM

Source: Production Share in Permanent Offer Geological and Economic Approach (Avila, 2022)

Santos Basin – Ágata Block

Project (Hypothetical)

- Ágata Prospect VOIP 2,820 MSTB
- Recovery Factor ~ 20%
- Oil - 1 FPSO (120,000 bbl/d)
- Gas - Pipeline (300 Km)
- 6 production wells
- 6 injection wells



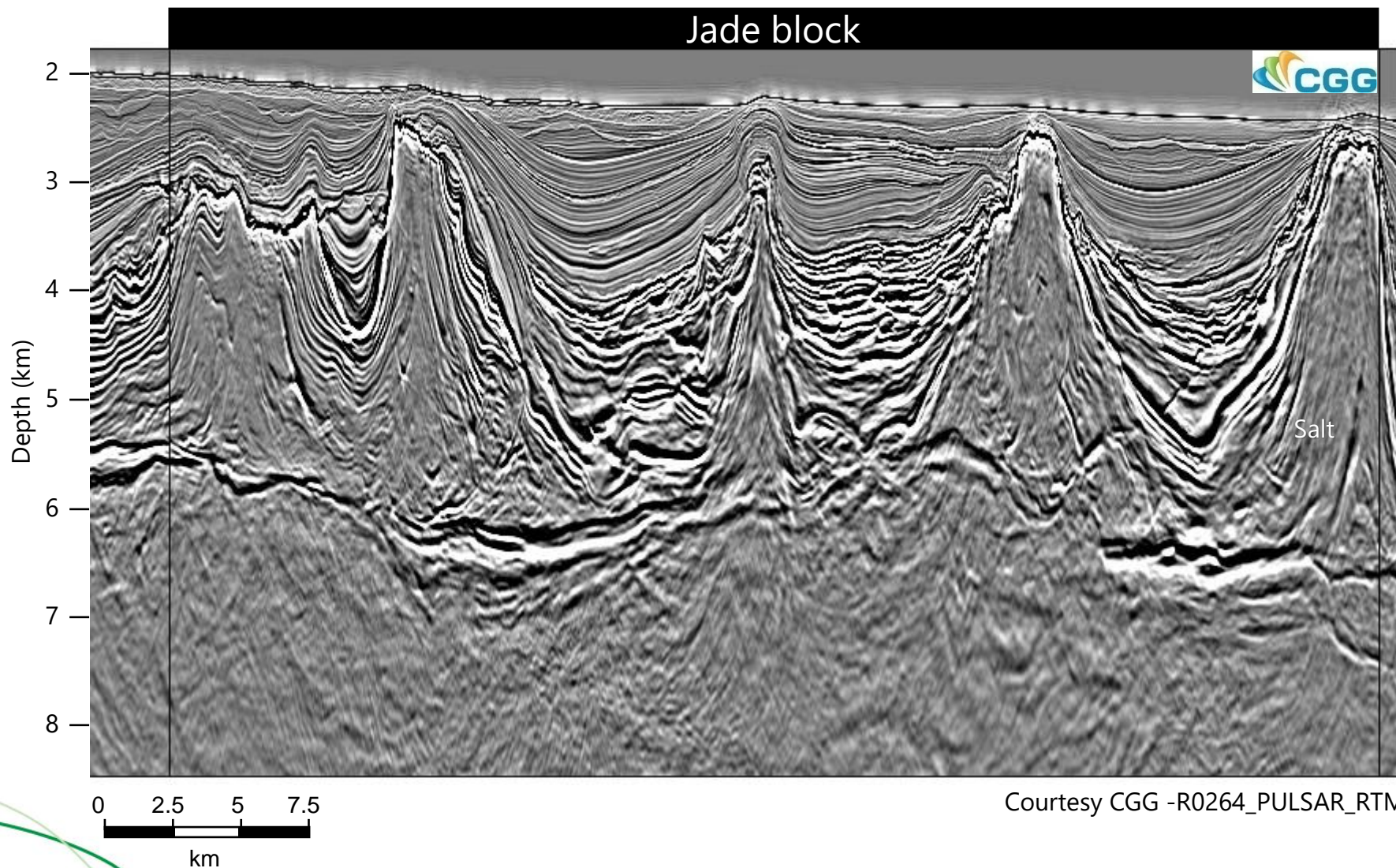
Block Area 2,283.276 Km²

Block VOIP 3,190 MSTB

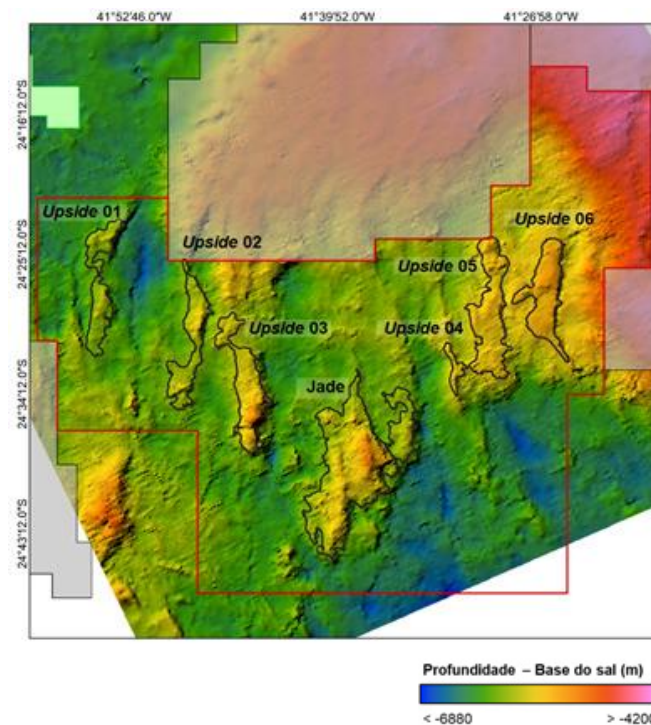
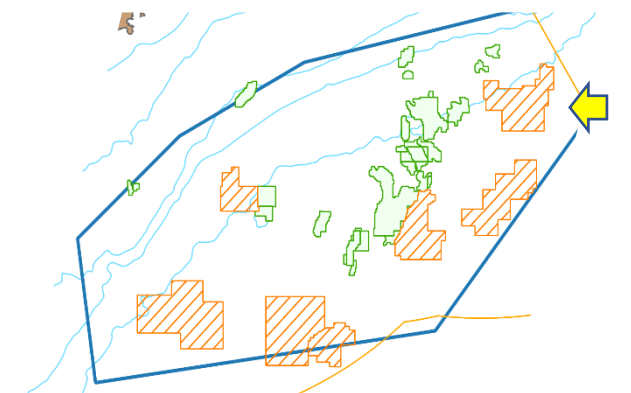
Water Depth 2,000 m / Coastline distance 300 Km

Prospect	Source	Migration	Reservoir	Seal	Trap	Synchronism	CSG
Ágata	60%	80%	60%	80%	90%	100%	21%
Ágata C	60%	80%	60%	80%	90%	100%	21%

Santos Basin – Jade Block

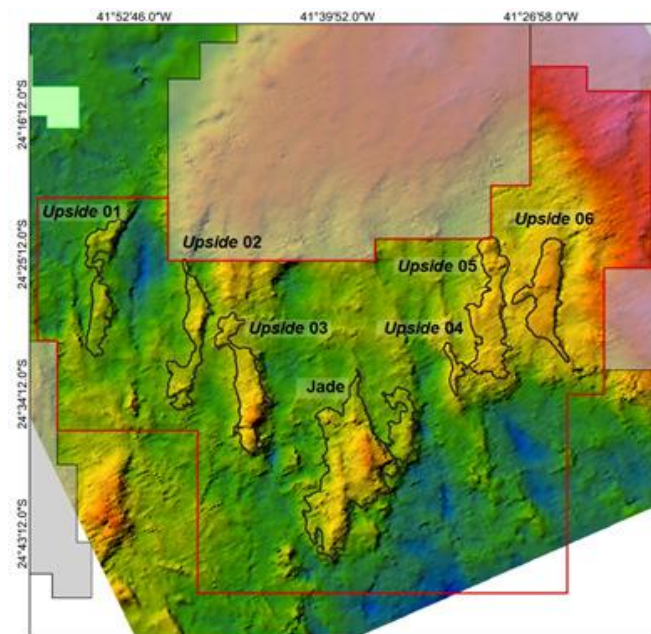
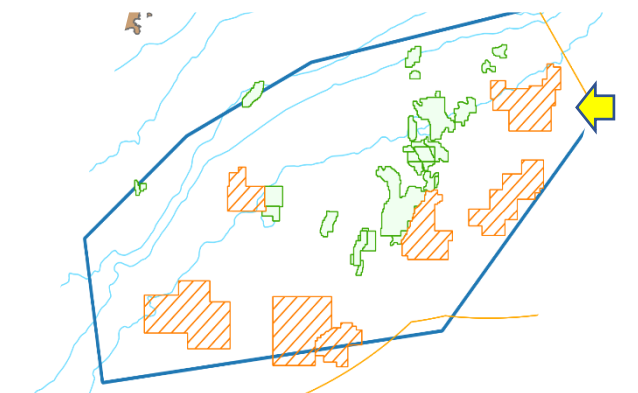
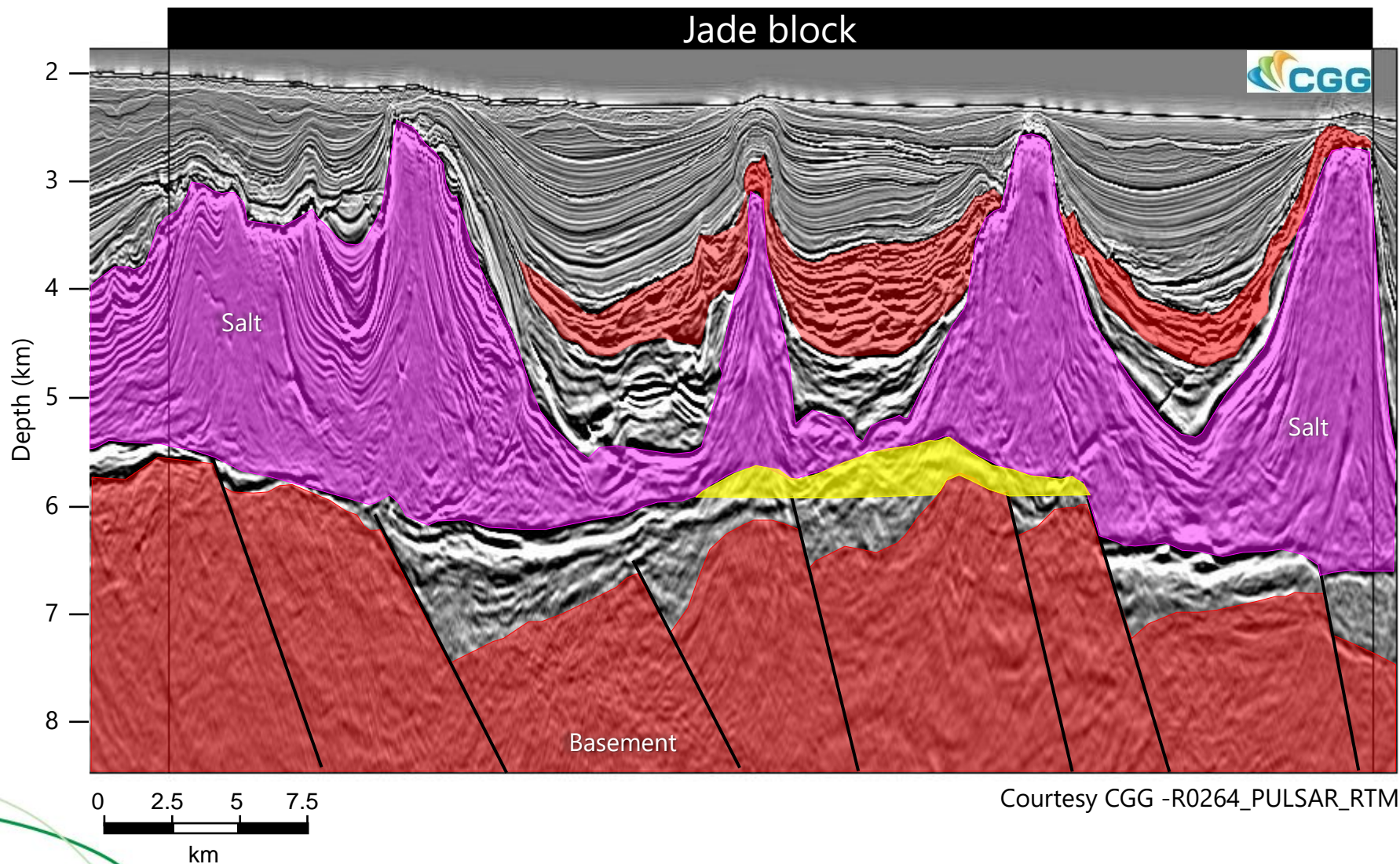


Courtesy CGG -R0264_PULSAR_RTM



Source: Production Share in Permanent Offer Geological and Economic Approach (Avila, 2022)

Santos Basin – Jade Block

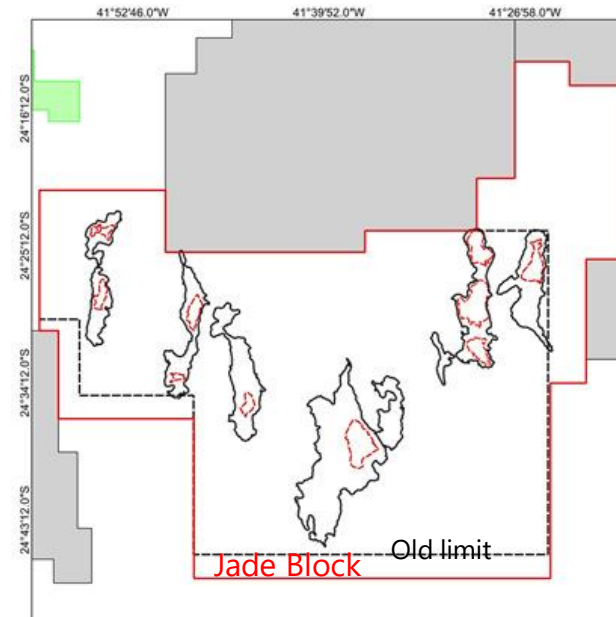
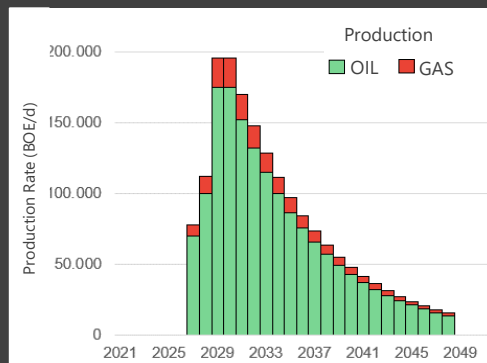


Source: Production Share in Permanent Offer Geological and Economic Approach (Avila, 2022)

Santos Basin – Jade Block

Project (Hypothetical)

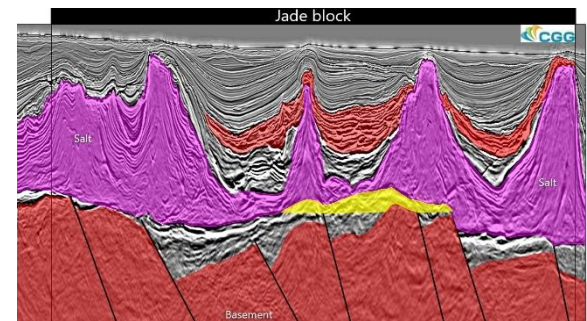
- Jade Prospect 2,909 MSTB
- Recover Factor ~ 20%
- Oil - 1 FPSO (180,000 bbl/d)
- Gas - Pipeline (196 Km)
- 7 production wells
- 7 injection wells



Block Area 2,397 Km²

Block VOIP 7,113 MSTB

Water Depth 2,300 m / Coastline distance 196 Km



Prospect	Source	Migration	Reservoir	Seal	Trap	Synchronism	CSG
Jade	90%	80%	70%	70%	90%	80%	25 %
Upside 01	90%	90%	80%	80%	80%	80%	33 %
Upside 02	90%	90%	70%	80%	80%	80%	29 %
Upside 03	90%	80%	70%	70%	90%	80%	25 %
Upside 04	90%	70%	70%	90%	70%	100%	27 %
Upside 05	90%	70%	70%	90%	70%	100%	27 %
Upside 06	90%	70%	70%	90%	80%	100%	31 %

The background features several thin, flowing green lines that create a sense of movement and elegance. These lines are in various shades of green, ranging from a light sage to a deeper forest green. They curve and swirl across the slide, with one prominent line forming a large, open loop on the right side.

#3

Final Remarks

Brazil: in our coast lies great opportunities



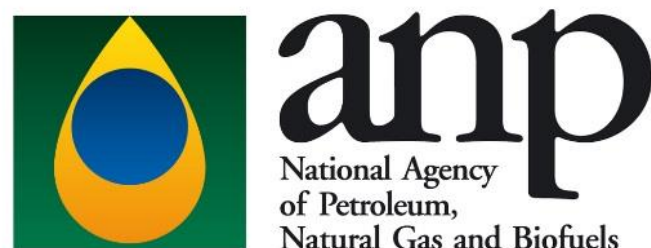
Our Strengths

Sanctity of Contract

Great Geological potential

Pre-salt: world-class assets that are already a reality

Great opportunities in the Equatorial Margin – Could our Equatorial Margin repeat or even exceed the great discoveries in Guiana?



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Res_Nominacao@anp.gov.br

Av. Rio Branco 65, 21st floor - Rio de Janeiro – Brazil
Phone: +55 21 2112-8100