

The State of the Art of the Brazilian Pre-Salt Exploration

Marina Abelha
Eliane Petersohn



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Projections and future values are presented, but no representation regarding their accuracy or completeness is made.

Forward-looking statements regarding our intent, belief or current expectations may change without prior notice.



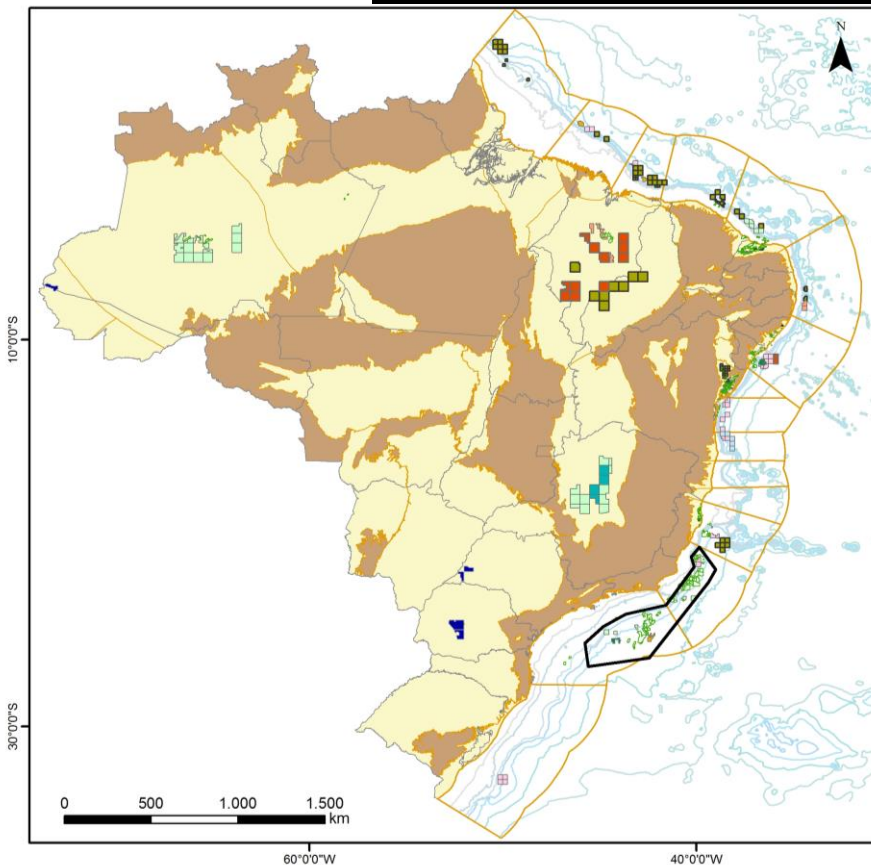
Outline

- 1 Brazil's Current State
- 2 The Pre-Salt Play
- 3 Next Pre-Salt Licensing Rounds: Giant Leads
- 4 Final Remarks



Brazil's Current State

Sedimentary Area: 7.5 million km²



Area under concession
~ 280,000 km²

324 Blocks

440 fields

Production
(Dez, 2018)

Oil 2.691 million barrels/d
Natural Gas 114 million m³/d

Proven Reserves
(Dez, 2017)

Oil 12.8 billion barrels
Natural Gas 369 billion m³

**9th top oil producer in the world and
the largest in Latin America***

Proven Reserves

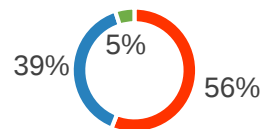
March, 2018

15 Billion boe

Oil
12.8
Billion bbl

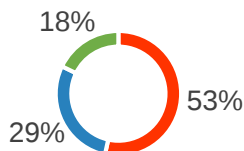
Gas
380
Billion m³

Oil Proven Reserves



- Pre-Salt
- Conventional Offshore
- Onshore

Gas Proven Reserves



- Pre-Salt
- Conventional Offshore
- Onshore

Pre-Salt



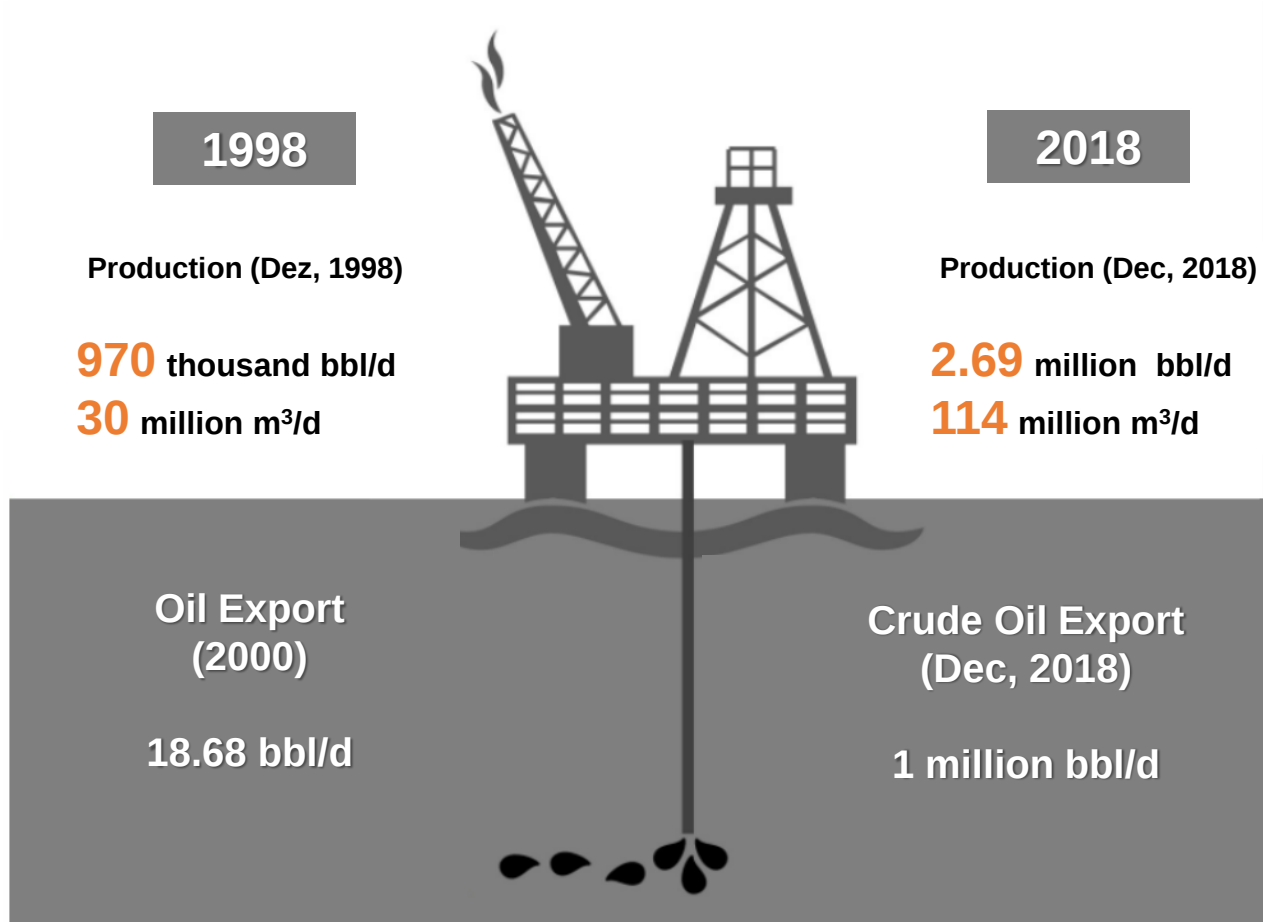
Conventional Offshore



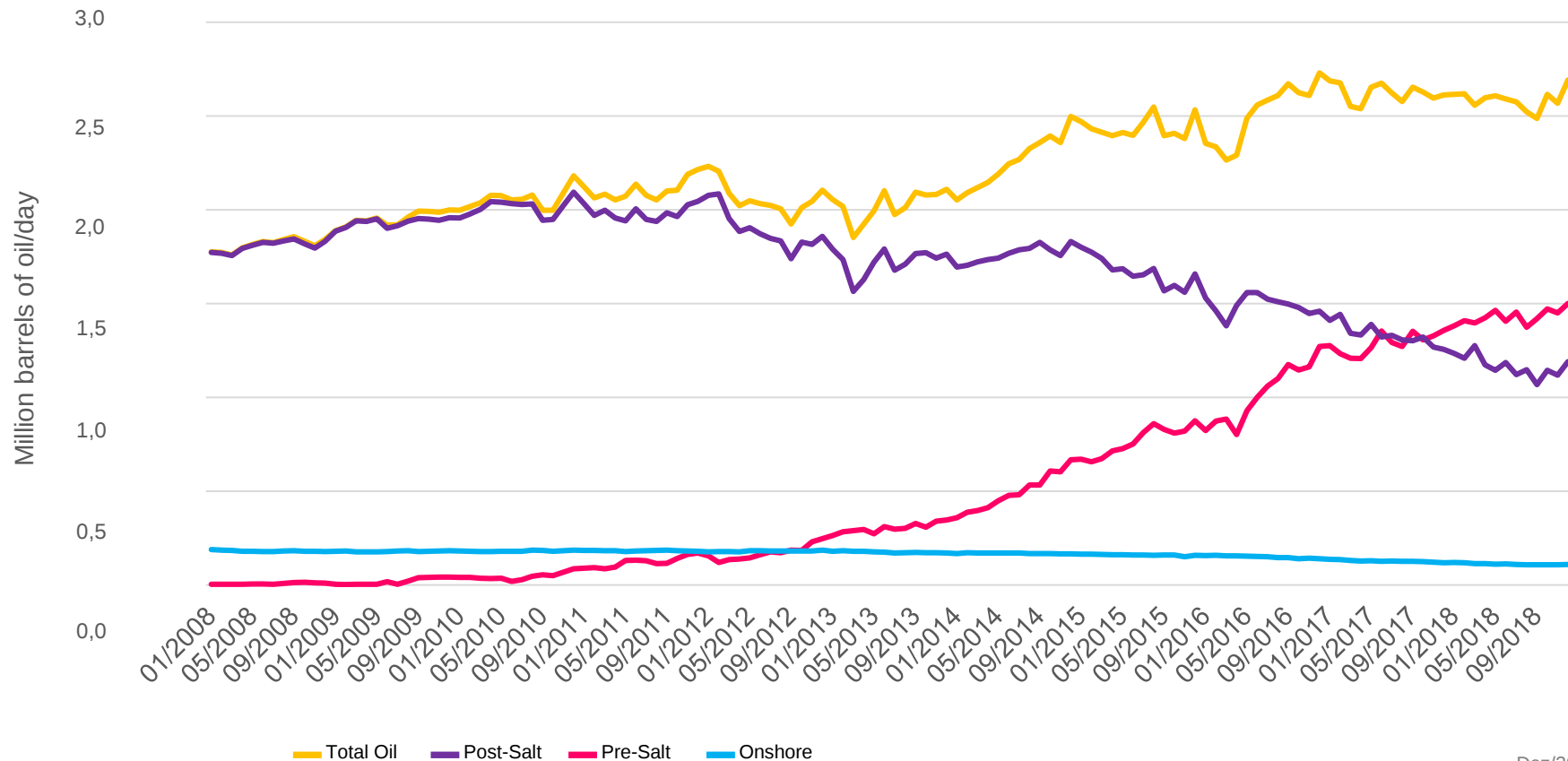
Onshore



Oil Production in Brazil



Oil Production in Brazil

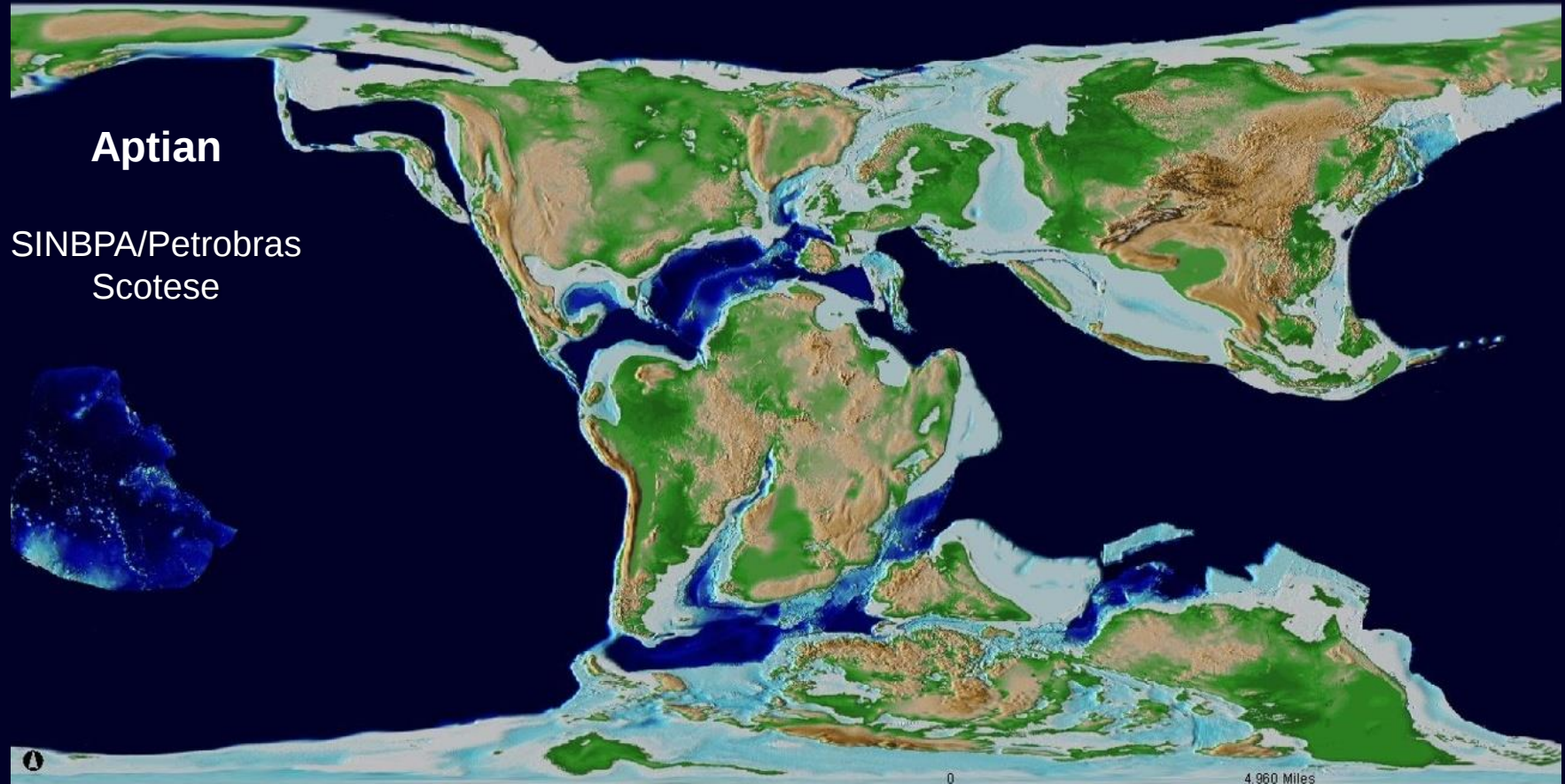


E&P Environments



		Average oil production per well
Pre-salt	High quality Carbonate Reservoirs underneath the salt layer High well productivity more than 30,000 bpd in the beginning of production Potential for giant or supergiant field discoveries	17,655 bpd 85 wells
Conventional Offshore	Eastern and Equatorial Margin Potential for oil discoveries from the Upper Cretaceous to Paleogene turbidite reservoirs	1,650 bpd 628 wells
Onshore	Mature Basins (Remaining Potential) New Frontier Basins Solimoes Basin: Potential for light oil accumulations Paleozoic and Proterozoic basins: gas prone	16 bpd 6,683 wells

The Pre-Salt Play

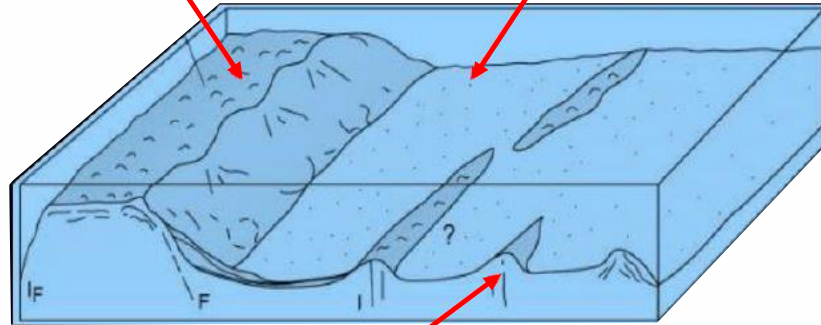


The Pre-salt Play

Depositional Model

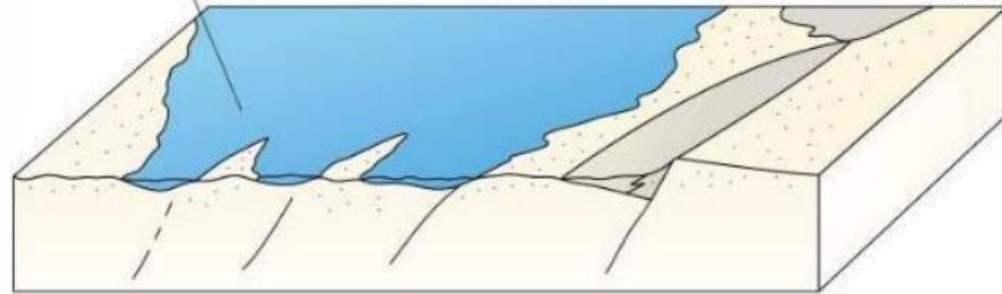
differentiated
microbial platforms

deep (>300m)
lake



Linear ridges and
cone-like buildups

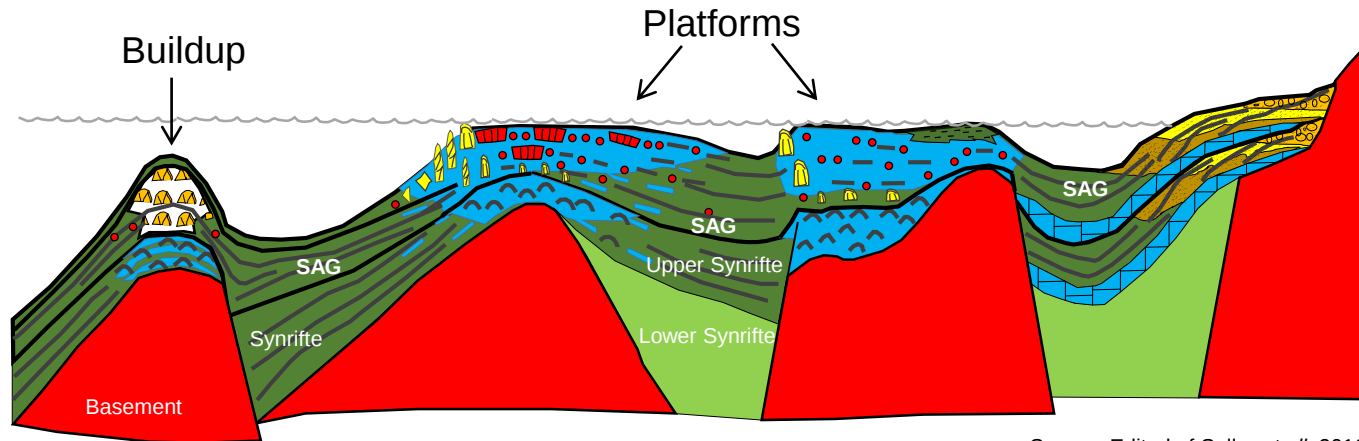
shallow evaporitic alkaline lake



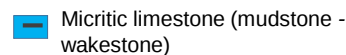
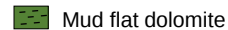
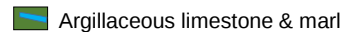
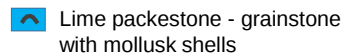
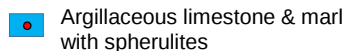
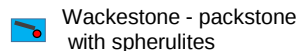
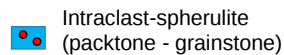
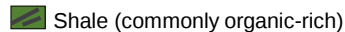
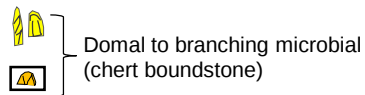
Low gradiente ramp-like deposition

The Pre-salt Play

Depositional Model



Source: Edited of Saller *et al*, 2016.



The Pre-salt Play

Depositional Model

Pyramid Lake, Nevada

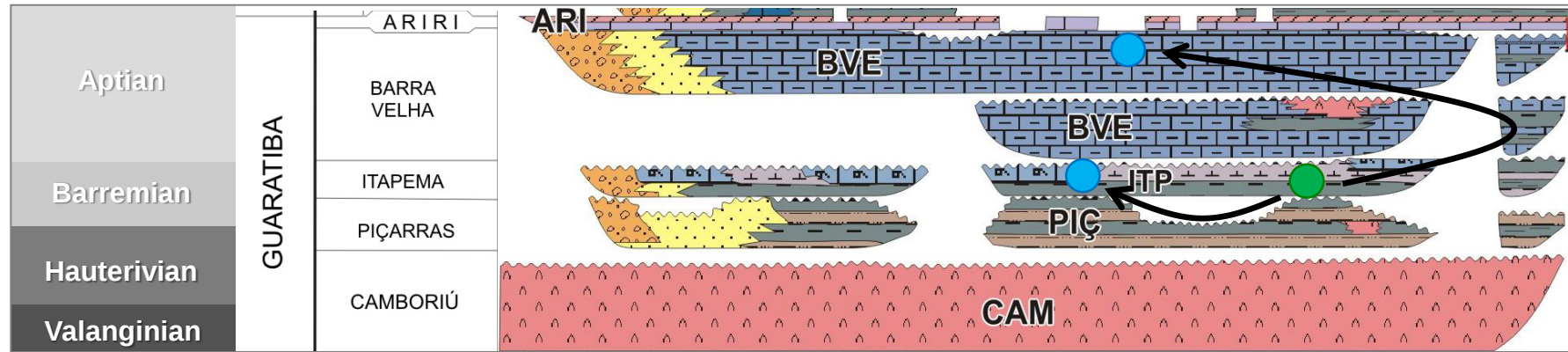


Large sub-lacustrine spring mounds develop in perennial lakes – they need the space (depth) in which to grow

The Pre-salt Play

Petroleum System

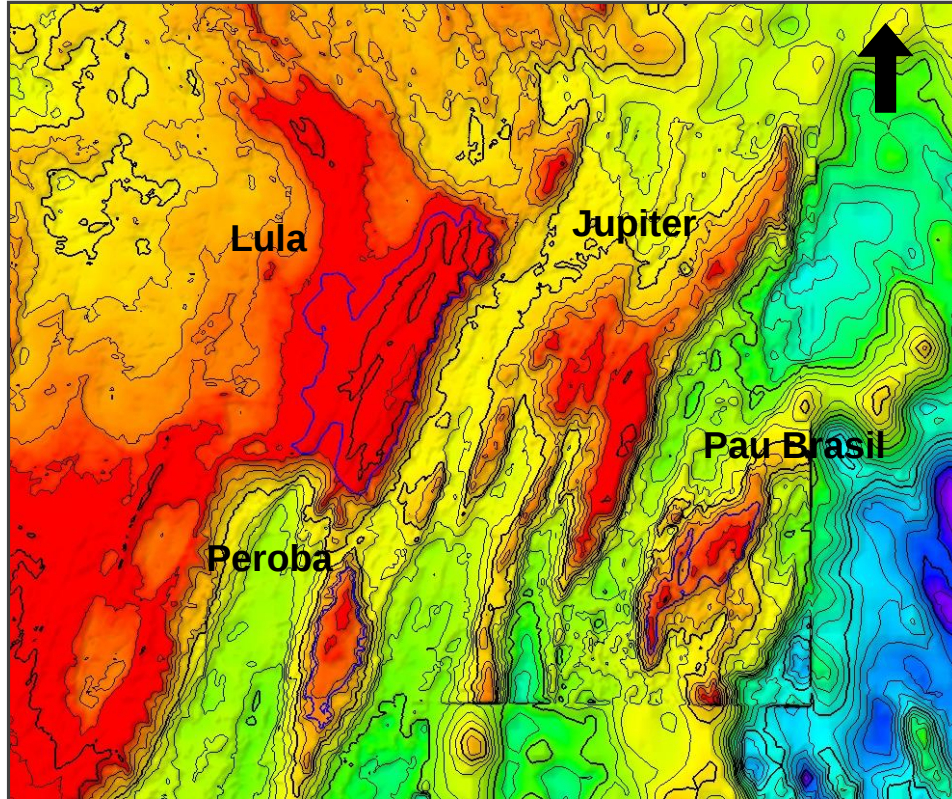
Itapema – Itapema/Barra Velha



Stratigraphic chart: Moreira *et al.*, 2007

The Pre-salt Play

Structural traps

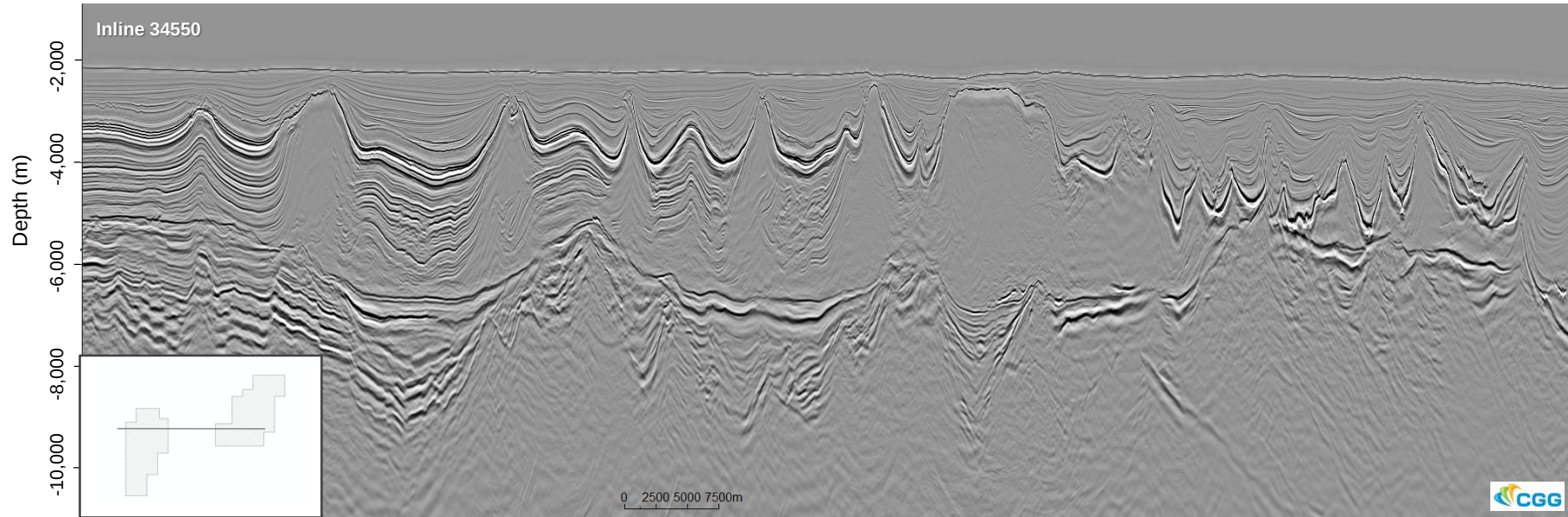


The classic pre-salt play comprises prominent four way closure structures

The Pre-salt Play



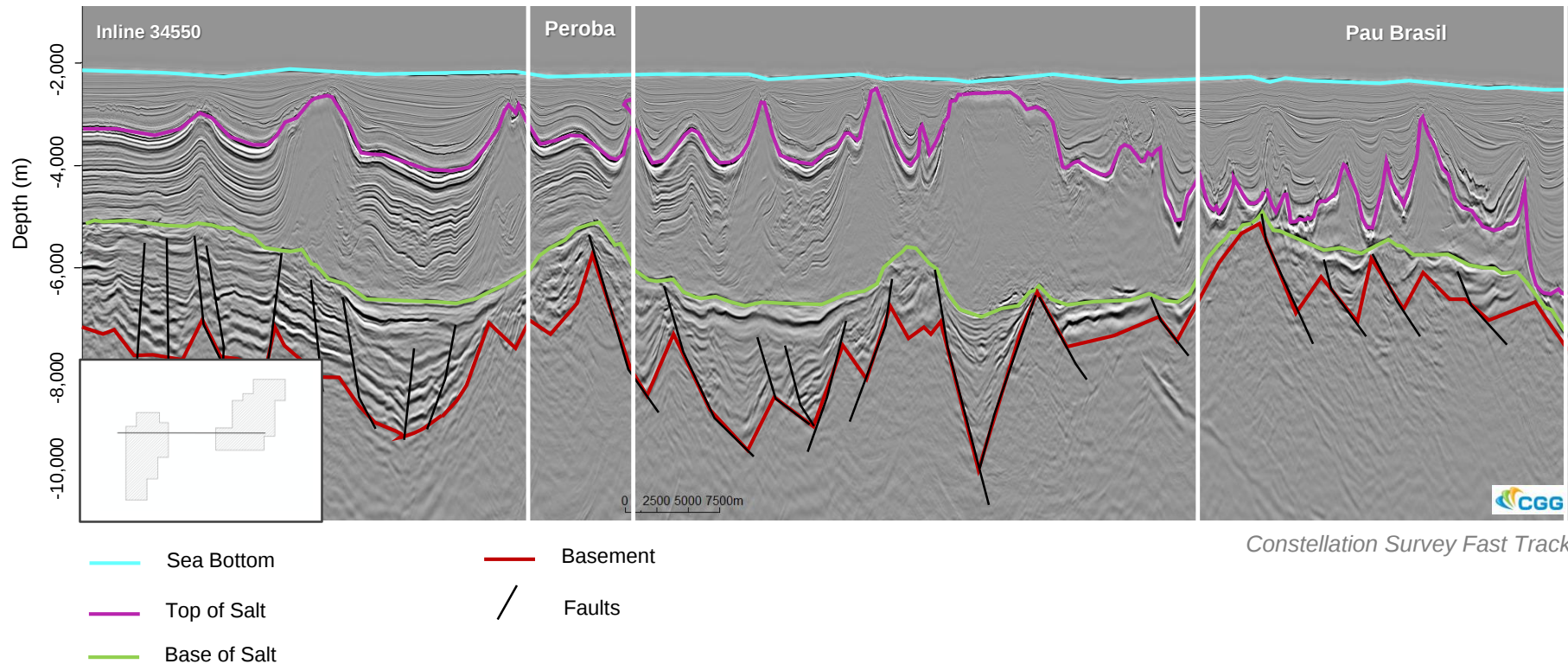
Seismic



Constellation Survey Fast Track

The Pre-salt Play

Seismic



Constellation Survey Fast Track

The Pre-salt Play

High porosity and permeability



3.0 cm

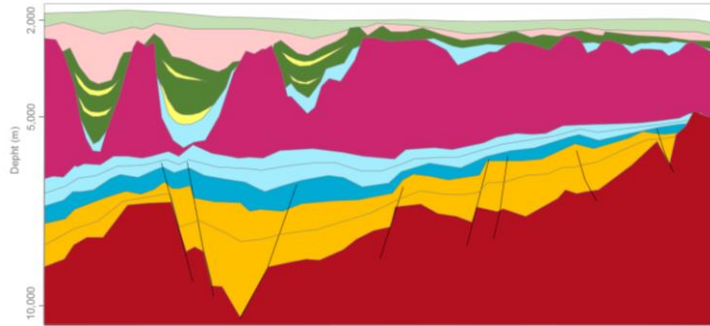


4.0 cm



2.0 cm

Pre-salt Prospectivity

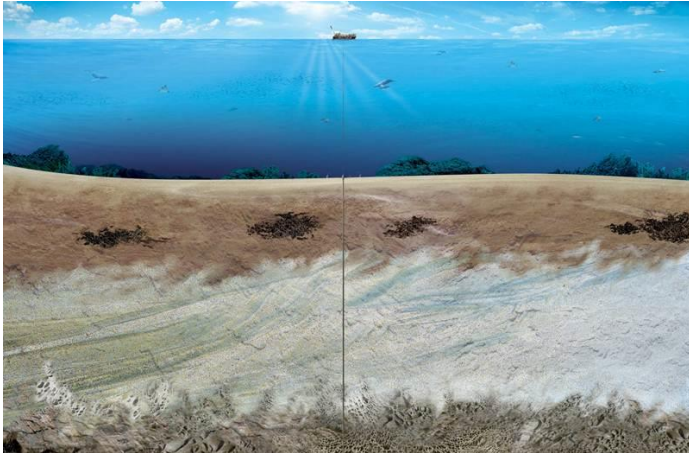


After Formigli, 2007

The Pre-Salt comprises huge accumulations underneath the salt layers;

Light Oil with excellent quality accumulations and high commercial values;

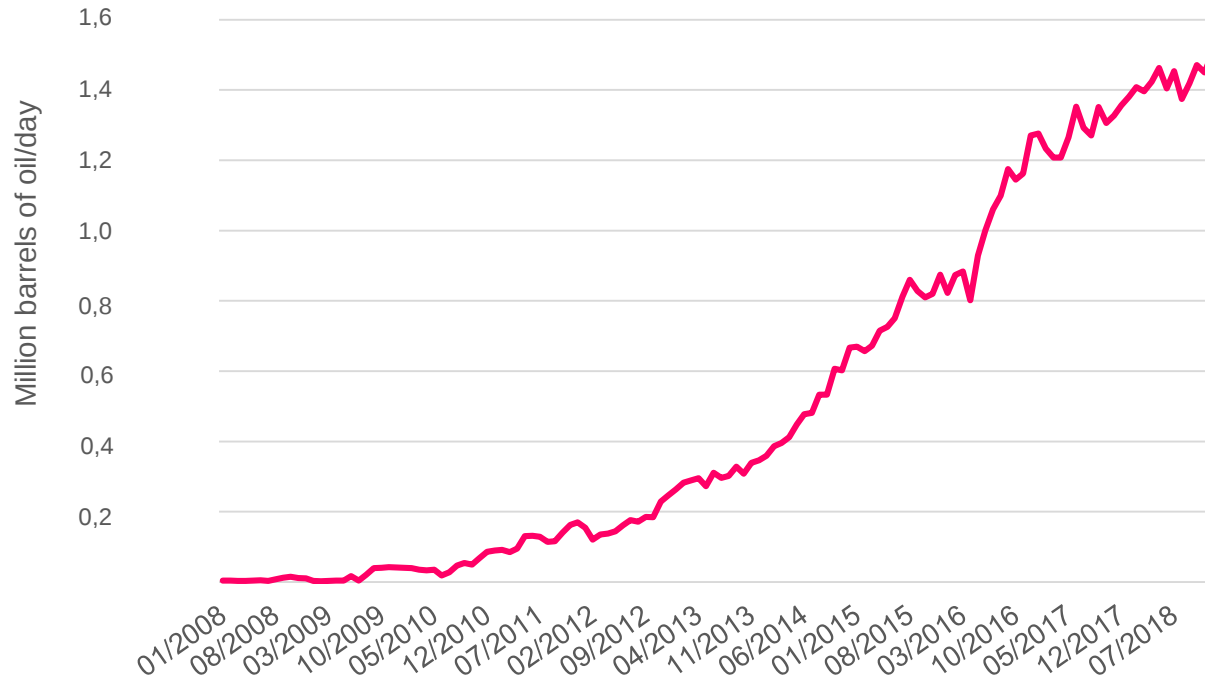
- 1) Great prospectivity, potential for giant and supergiant oil fields;
- 2) High wells productivity related to high quality carbonate reservoirs and extensive and thick production zones.



Source: Petrobras

Pre-salt Production

~1.5 million barrels of oil/day



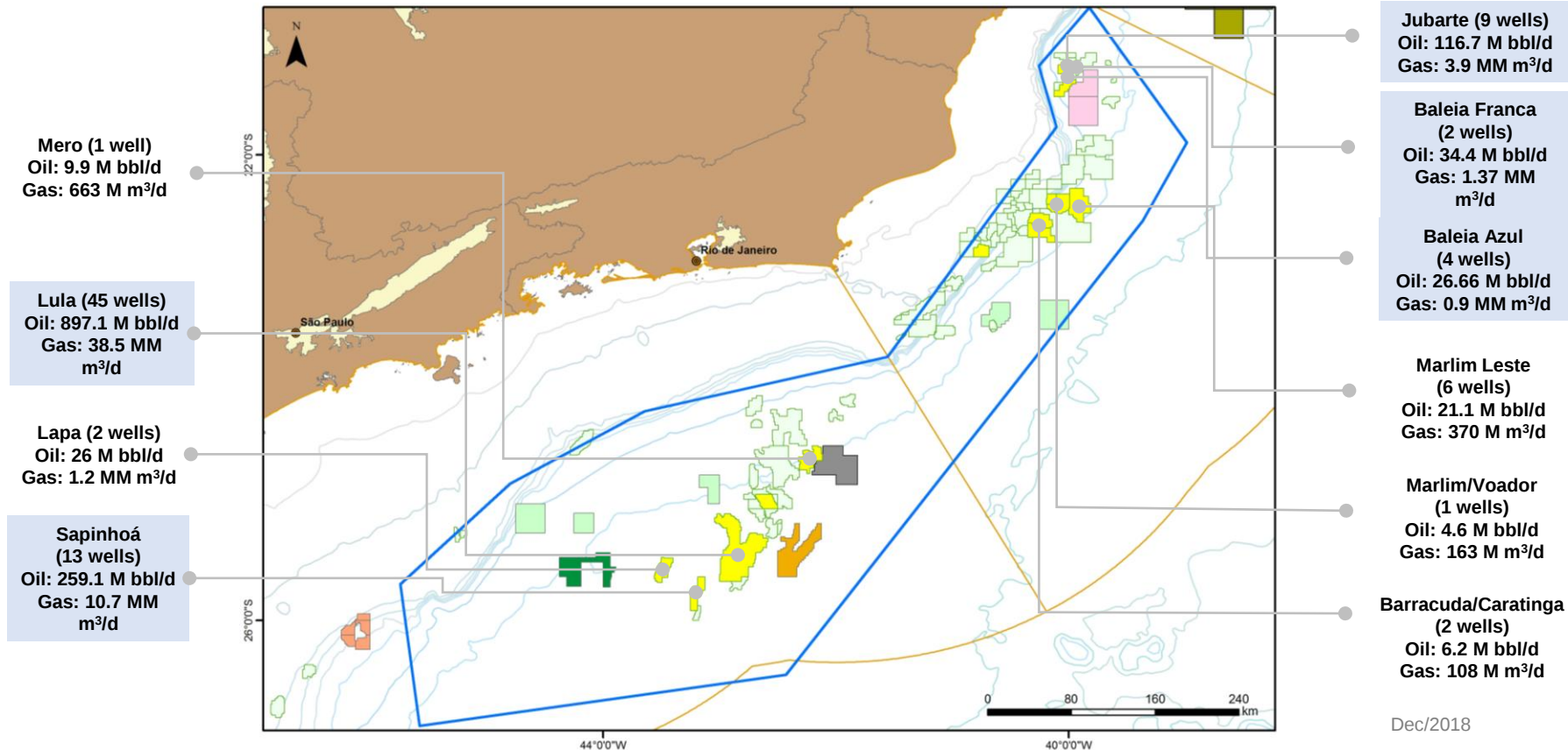
The Pre-Salt production comes from 85 wells:

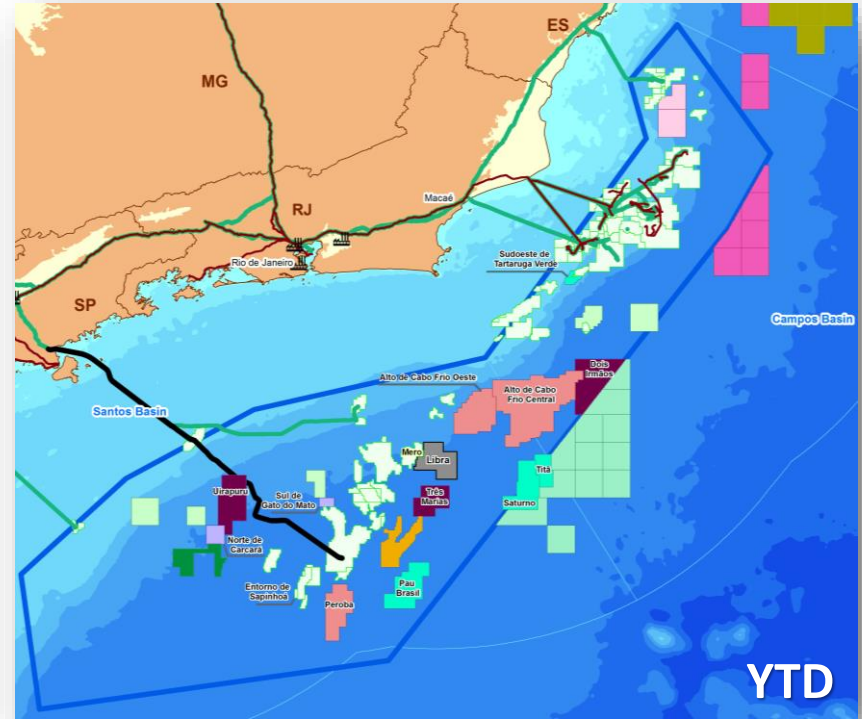
60 in Santos Basin
25 in Campos Basin



The Pre-salt Play Production

~1.5 million barrels of oil/day (10 fields)





Bidding Rounds Schedule



OPEN
ACREAGE
Brazil
OIL AND GAS CONCESSIONS

1st Wave

November

2018

OPEN
ACREAGE
Brazil
OIL AND GAS CONCESSIONS

2nd Wave

1st Semester

2019

ROUND
Brazil 16
OIL AND GAS CONCESSIONS

PRE-SALT
Brazil 6
PRODUCTION SHARE

3rd Quarter

TRANSFER OF
RIGHTS SURPLUS
Brazil
PRODUCTION SHARE

October, 28th

PRE-SALT
Brazil 7
PRODUCTION SHARE

ROUND
Brazil 17
OIL AND GAS CONCESSIONS

To be
defined

2020

PRE-SALT
Brazil 8
PRODUCTION SHARE

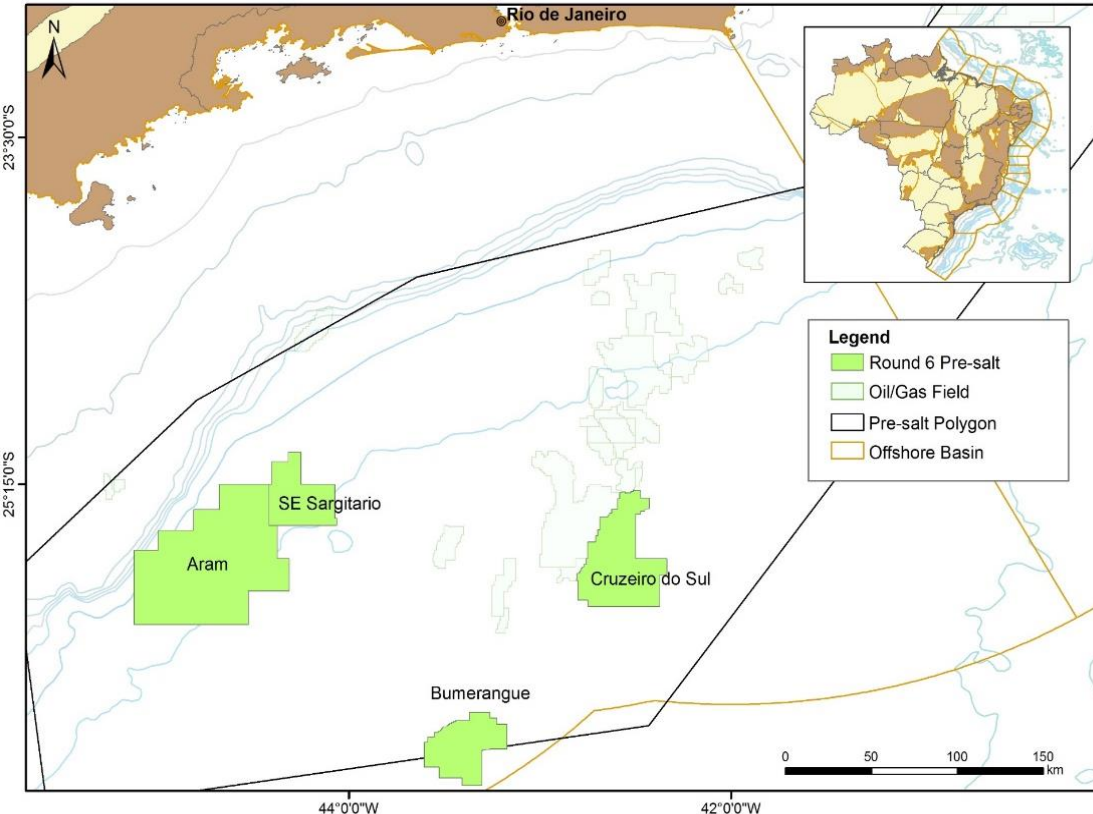
ROUND
Brazil 18
OIL AND GAS CONCESSIONS

To be
defined

2021

6th Pre-salt Bidding Round

PRE-SALT
Brazil 6
PRODUCTION SHARE

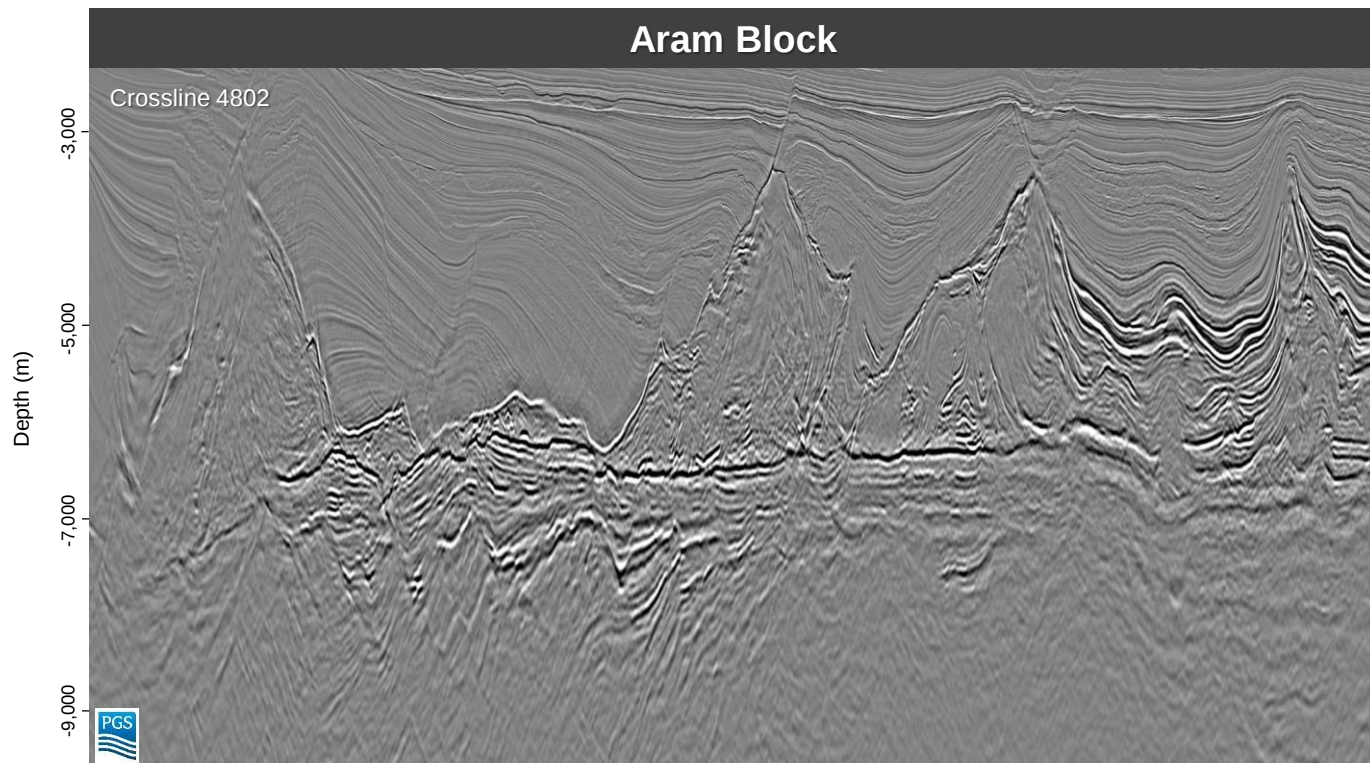


5
Areas

42B/bbl

*Estimated Unrisked Oil in
Place Volumes (P50)*

Blocks	Min. Oil Profit (%)	Sig. Bonus (R\$)
Aram	24,53	5.050.000.000,00
Bumerangue	26,68	550.000.000,00
Cruzeiro do Sul	22,87	1.150.000.000,00
Sudoeste de Sagitario	26,09	500.000.000,00
Norte de Brava	36,98	600.000.000,00
Total		7.850.000.000,00

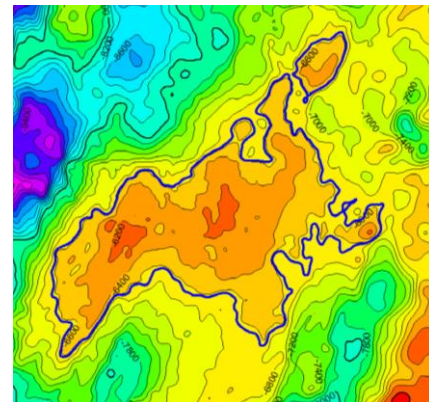


Prominent Basement High

Four-way Closure

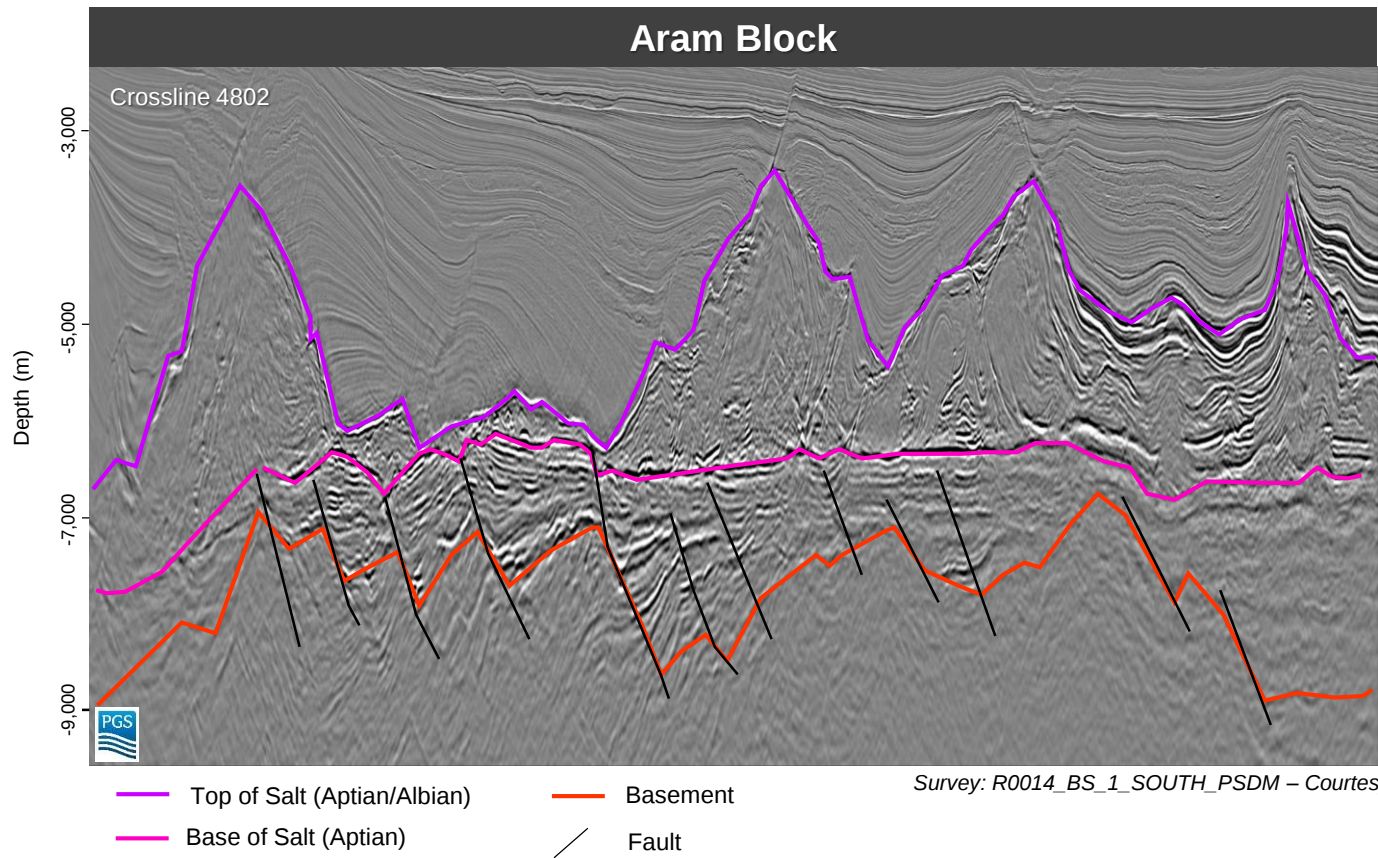
Amplitude Anomalies

Area: 1,500 km²



25 km

Survey: R0014_BS_1_SOUTH_PSDM – Courtesy of PGS



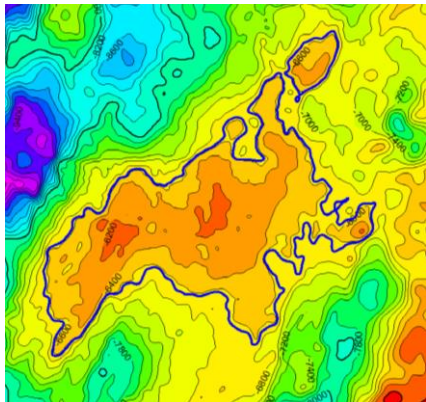
Survey: R0014_BS_1_SOUTH_PSDM – Courtesy of PGS

Prominent Basement High

Four-way Closure

Amplitude Anomalies

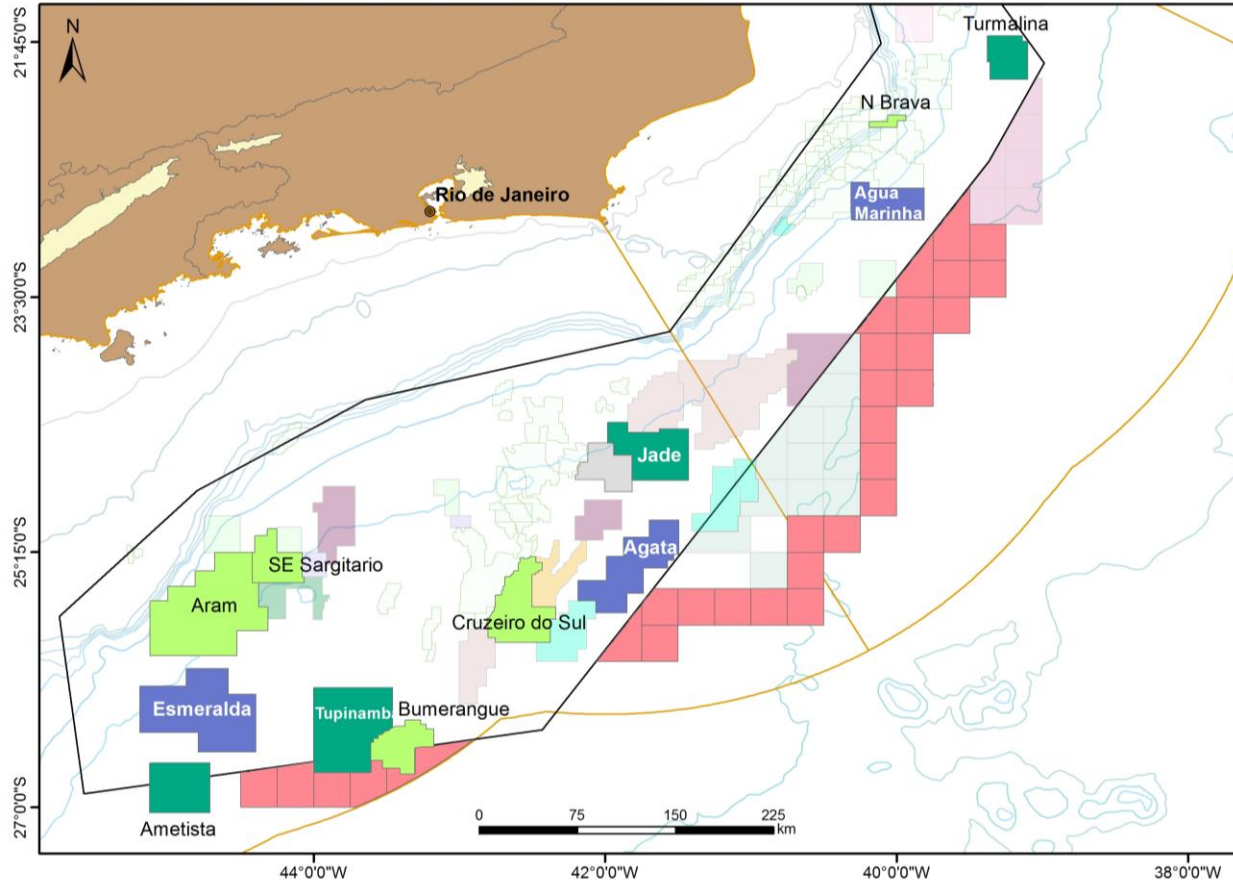
Area: 1,500 km²



25 km

Next Pre-salt Bidding Rounds

PRE-SALT Brazil 6 PRE-SALT Brazil 7 PRE-SALT Brazil 8 ROUND Brazil 16
PRODUCTION SHARE PRODUCTION SHARE PRODUCTION SHARE OIL AND GAS CONCESSIONS



Several blocks in
the Pre-Salt play
including **giant** leads

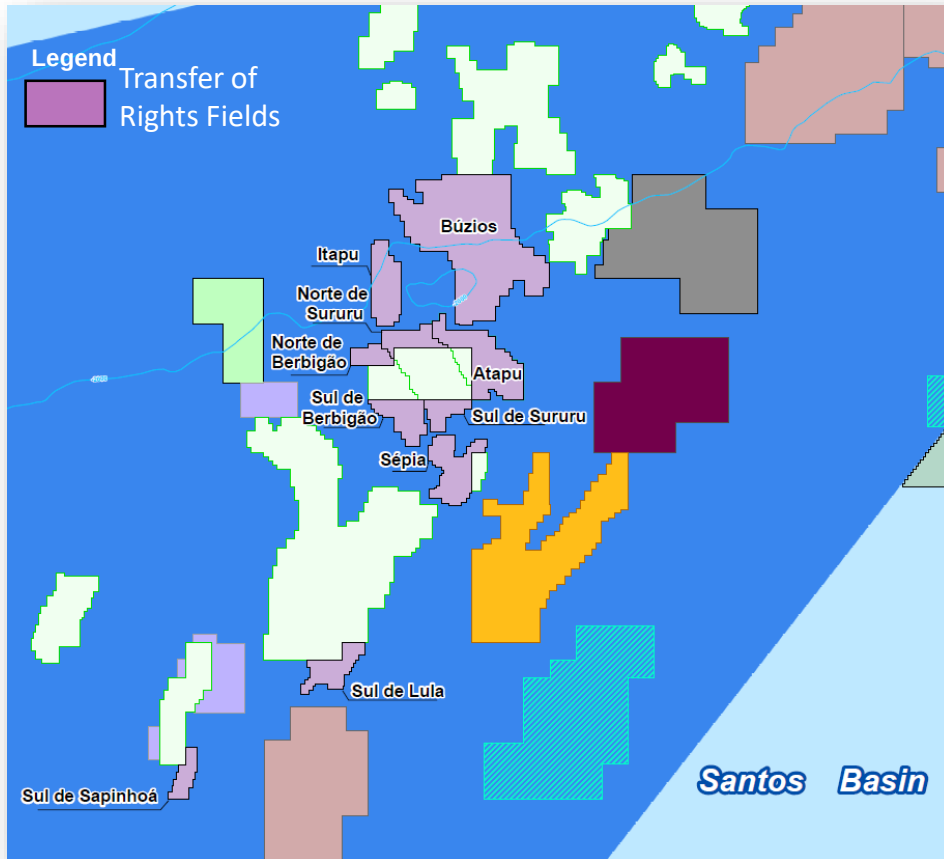
Legend

- Round 16
- Round 6 Pre-salt
- Round 7 Pre-salt
- Round 8 Pre-salt
- Oil/Gas Field
- Pre-salt Polygon
- Offshore Basin



Transfer of Rights Surplus Opportunities

TRANSFER OF
RIGHTS SURPLUS
Brazil
PRODUCTION SHARE



October, 28th



4

Fields

Atapu, Itapu,
Buzios and
Sepia

Final Remarks



The Pre-salt play is comprised of highly productive Aptian carbonate reservoirs in structural traps sealed by thick salt layers;

Currently, there are 10 fields producing from the Pre-salt layers in Brazil. The Pre-salt play is responsible for more than half of the Brazilian oil production;

World class leads will be up for offer on the 6th, 7th and 8th Pre-Salt Licensing Rounds and on the 16th Bidding Round.

National Agency of Petroleum, Natural Gas and Biofuels

ANP

Marina Abelha
Deputy Superintendent of Exploration
mabelha@anp.gov.br

Additional Information

<http://rodadas.anp.gov.br/en/>

www.anp.gov.br

