

# Libra beyond the Mero field

## Geologic and stratigraphic aspects, Santos Basin – Brazilian Pre-salt Province

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# Outline

Introduction

The Mero Field

Mero & Libra Comparison

The Libra Block – Geological Assessment

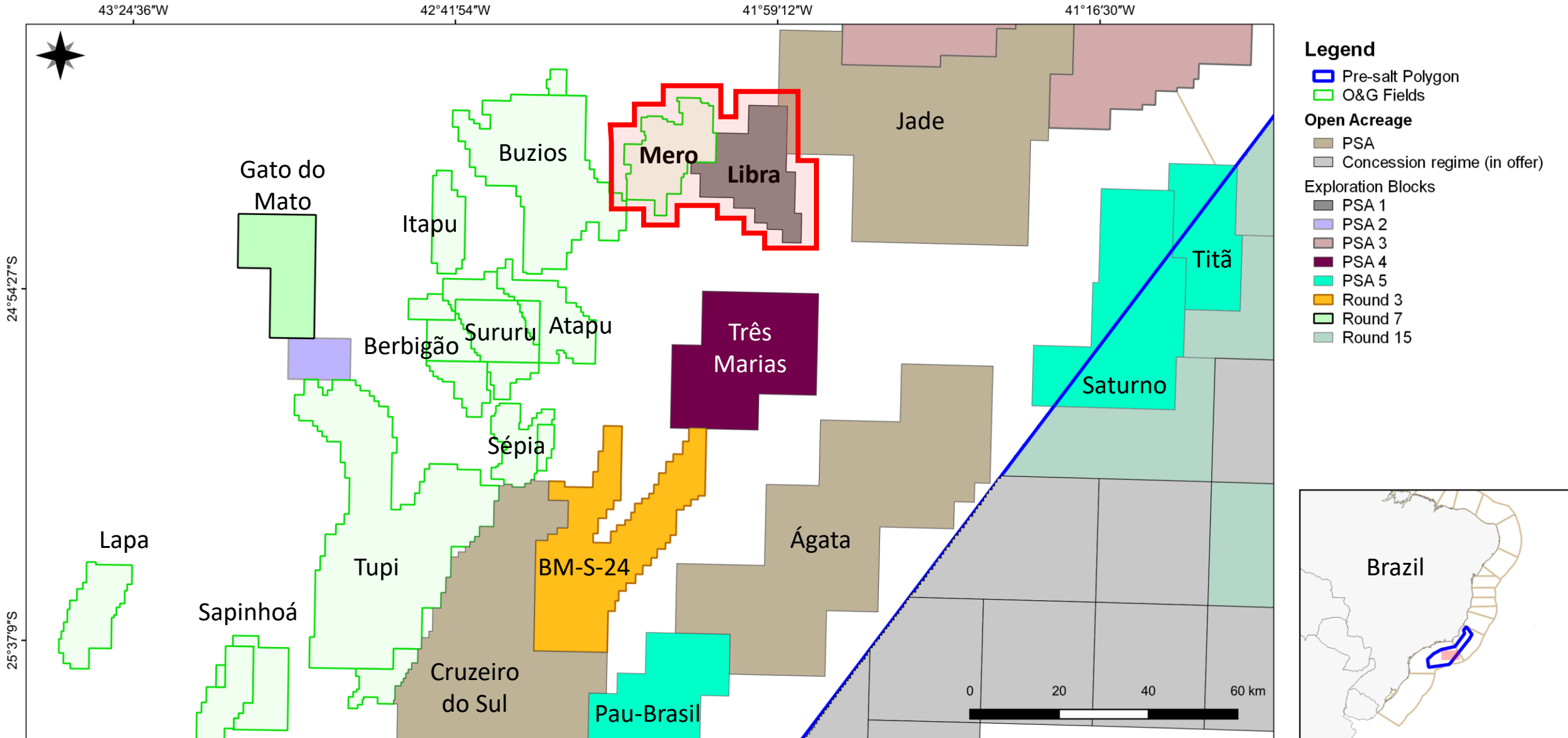
Remaining Challenges



#1

# Introduction

# Mero and Libra location



# The beginning...

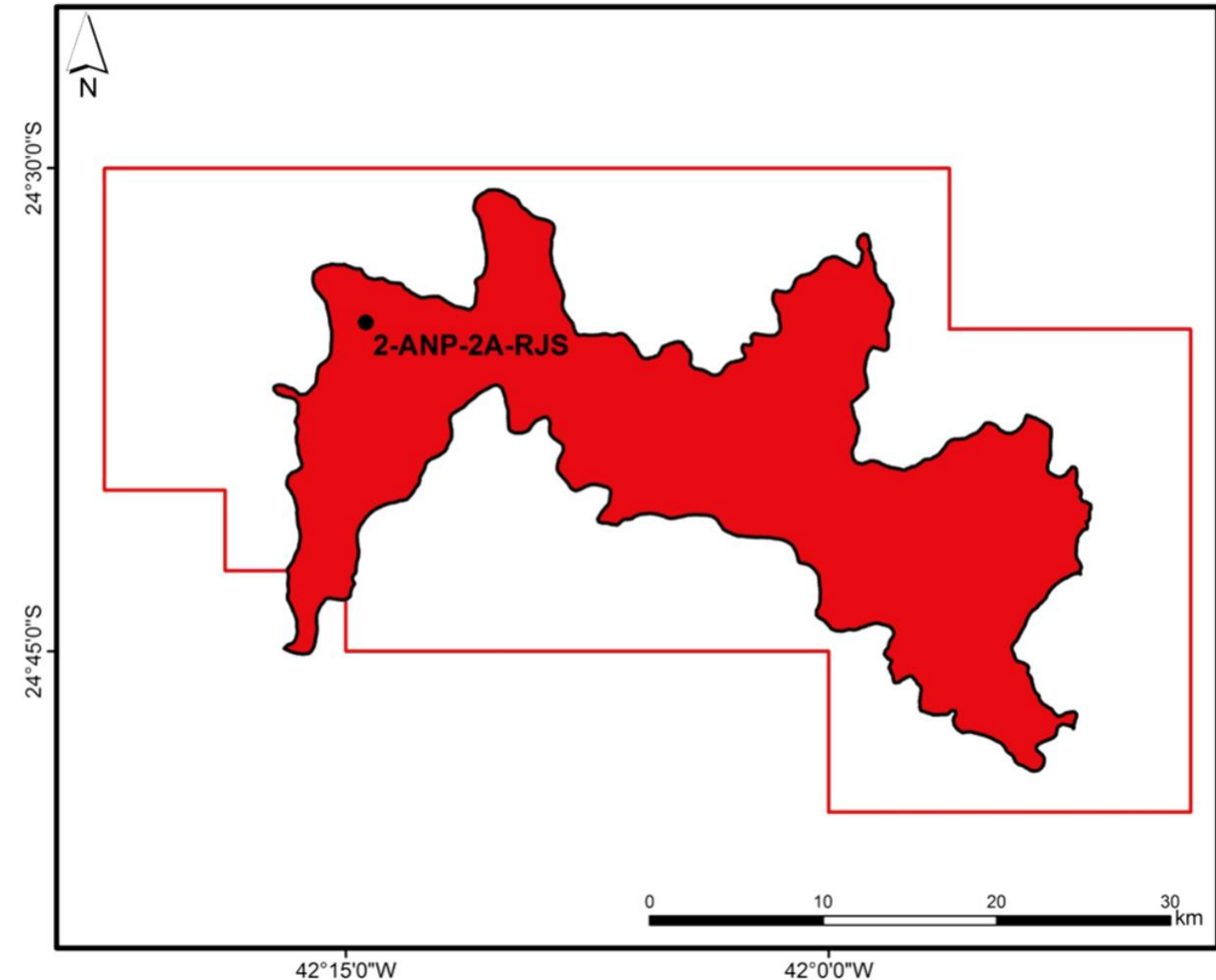
Libra Block was awarded in 2013 in the first bidding round executed by the Brazilian government under the new production sharing agreement for the pre-salt areas.

The winner consortium is formed by Petrobras Shell, Total, CNOOC, CNPC, and PPSA.

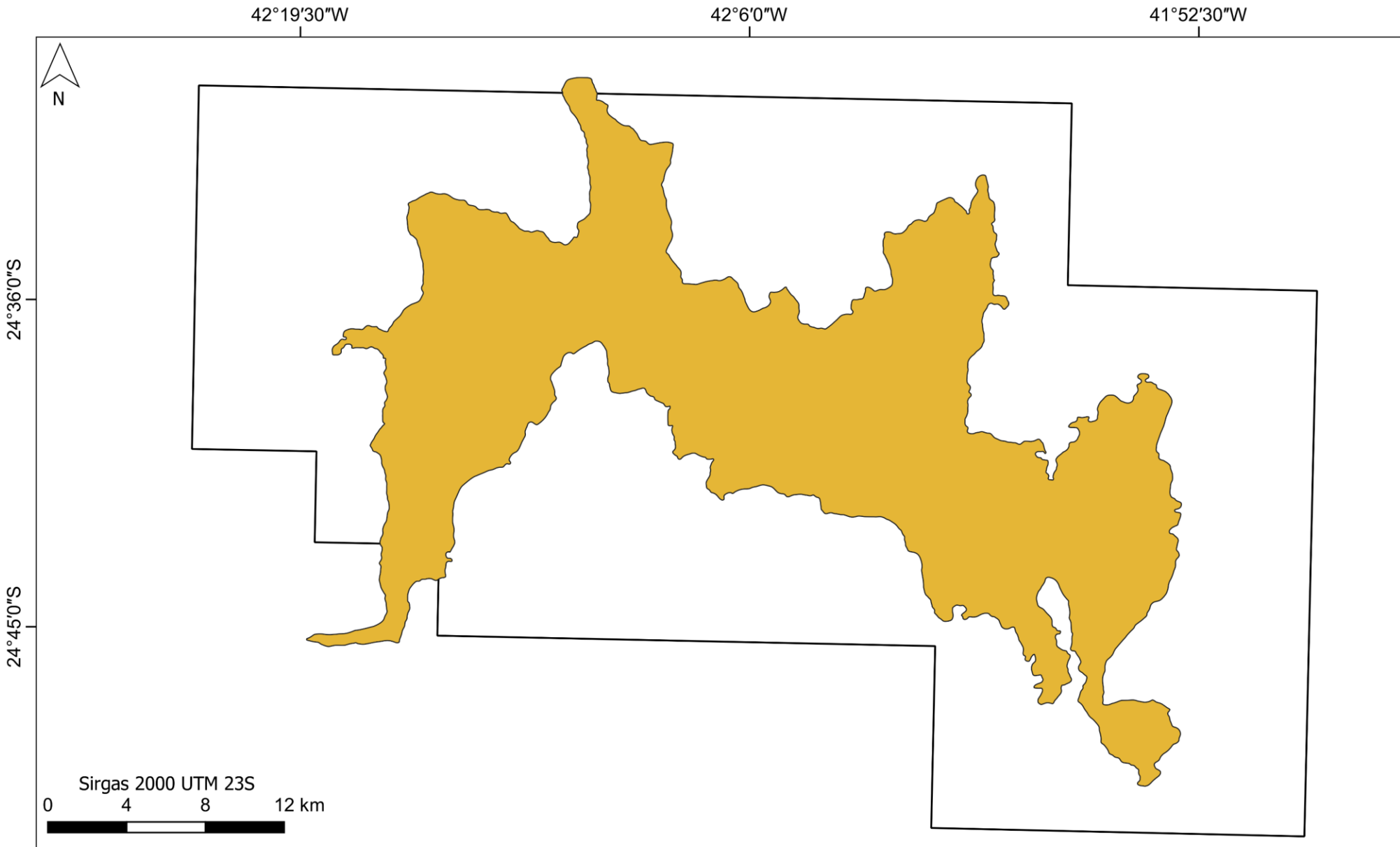
The Libra Consortium is led by Petrobras—with a 40% interest—in partnership with Shell (20%), Total (20%), CNPC (10%), and CNOOC Limited (10%).

Pré-Sal Petróleo S.A. (PPSA) represents the Brazilian Federal Government on production sharing agreements.

The Libra block is spread over 1,548 km<sup>2</sup> in approximately 2,100m deep water.

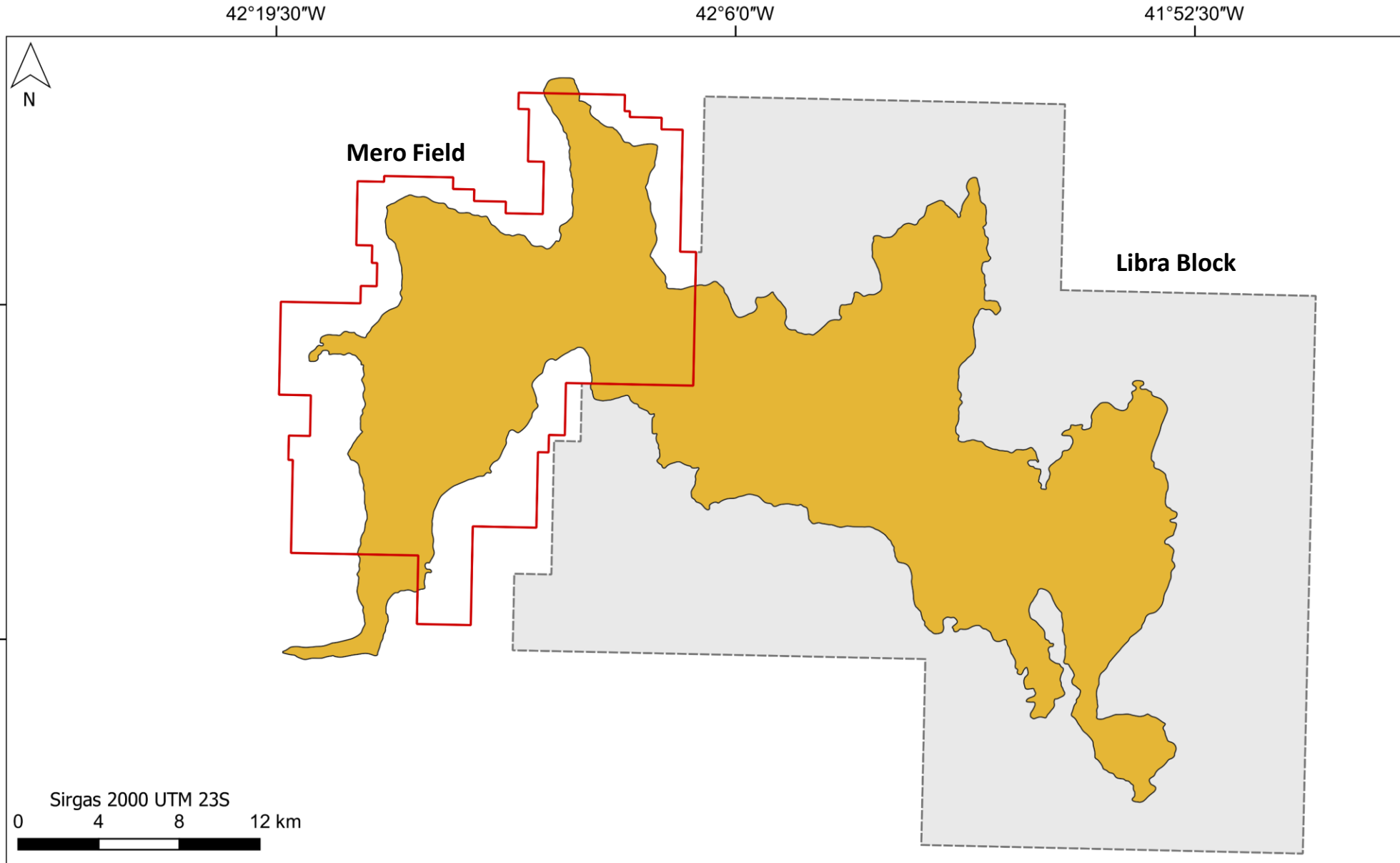


# Original Libra Block as offered in the 1<sup>st</sup> Production sharing bidding round

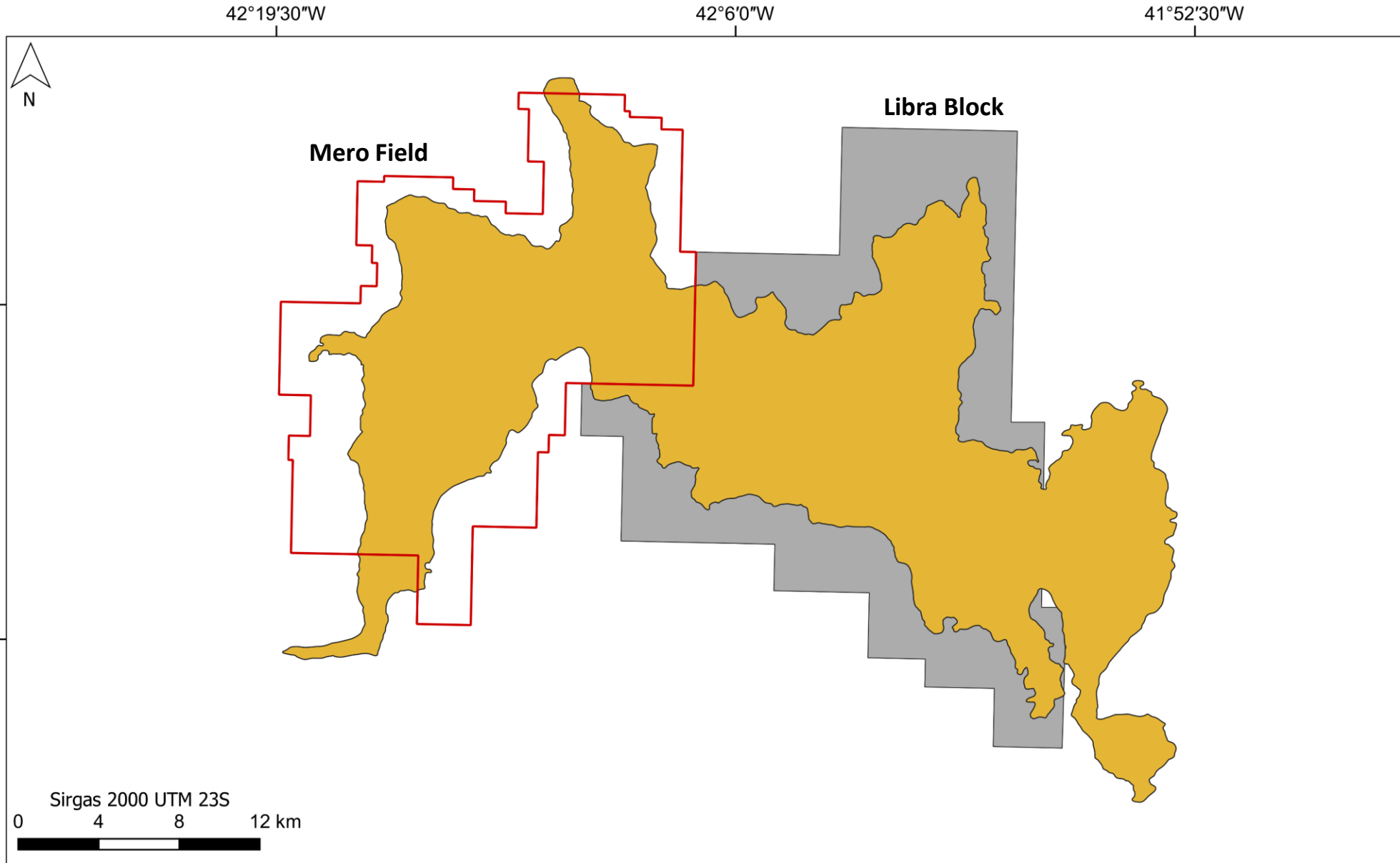


# Libra Block after Mero field declaration of commerciality

The Mero Field was declared commercial in 2017



# Current state of Libra Block



In 2021 the Libra Consortium has relinquished the southeast area of the block

It was considered as an area of low potential by the consortium





#2

# The Mero Field

# The Mero Field

Mero is the third-largest Pre-salt field behind Buzios and Tupi.

Mero means a large saltwater fish of the genus *Epinephelus*. It may reach more than 2 meters long and 400 kg in weight.<sup>[1]</sup>

It was discovered by the 2-ANP-2A-RJS, appraisal well that was drilled in 2010 by Petrobras in partnership with ANP.

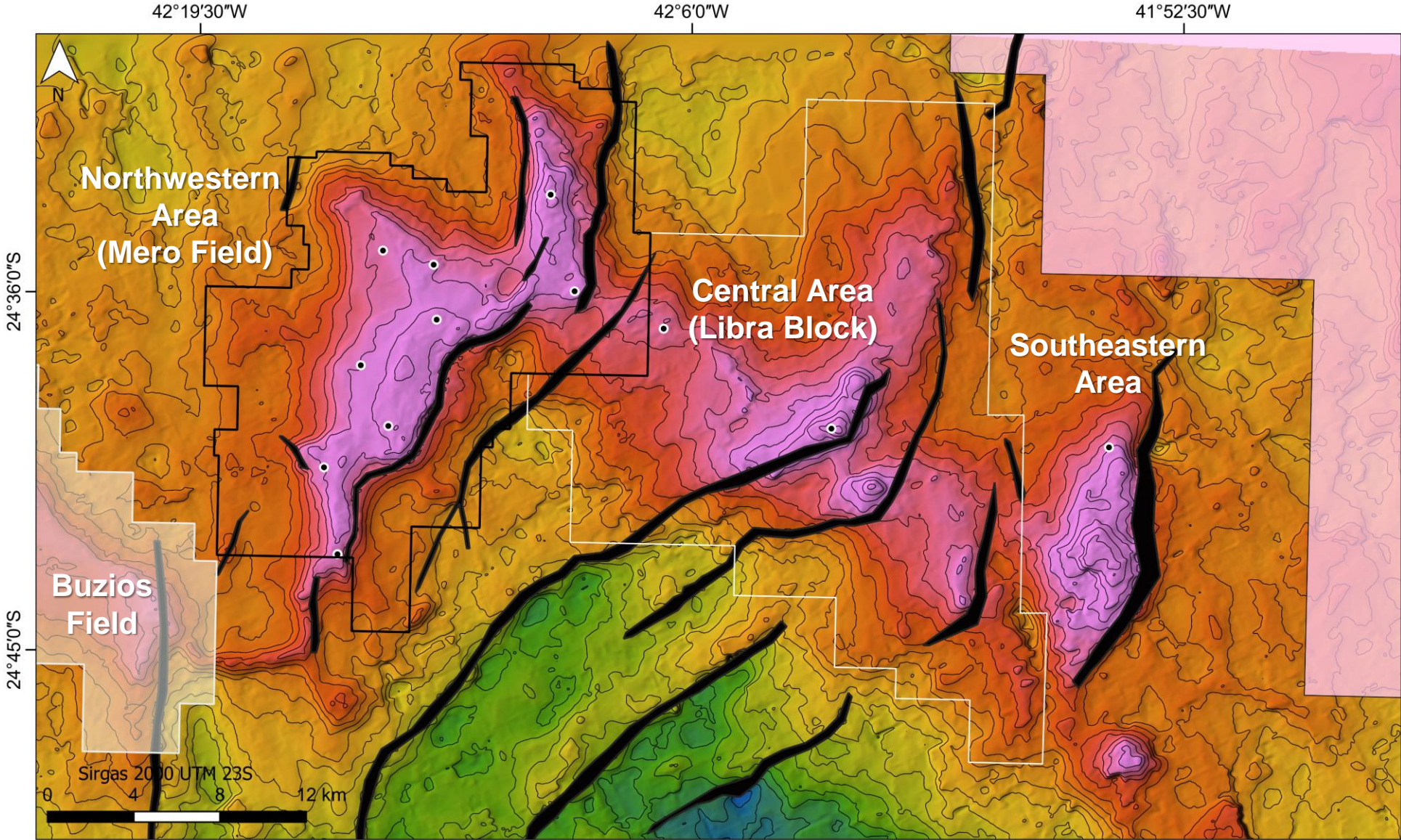
Petrobras is the operator of the Libra Consortium – with a 40% interest – in partnership with Shell (20%); Total (20%); CNPC (10%) and CNOOC (10%). PPSA manages the Libra Production Sharing Contract.

Mero has reservoirs with good quality oil and high commercial value – 29° API

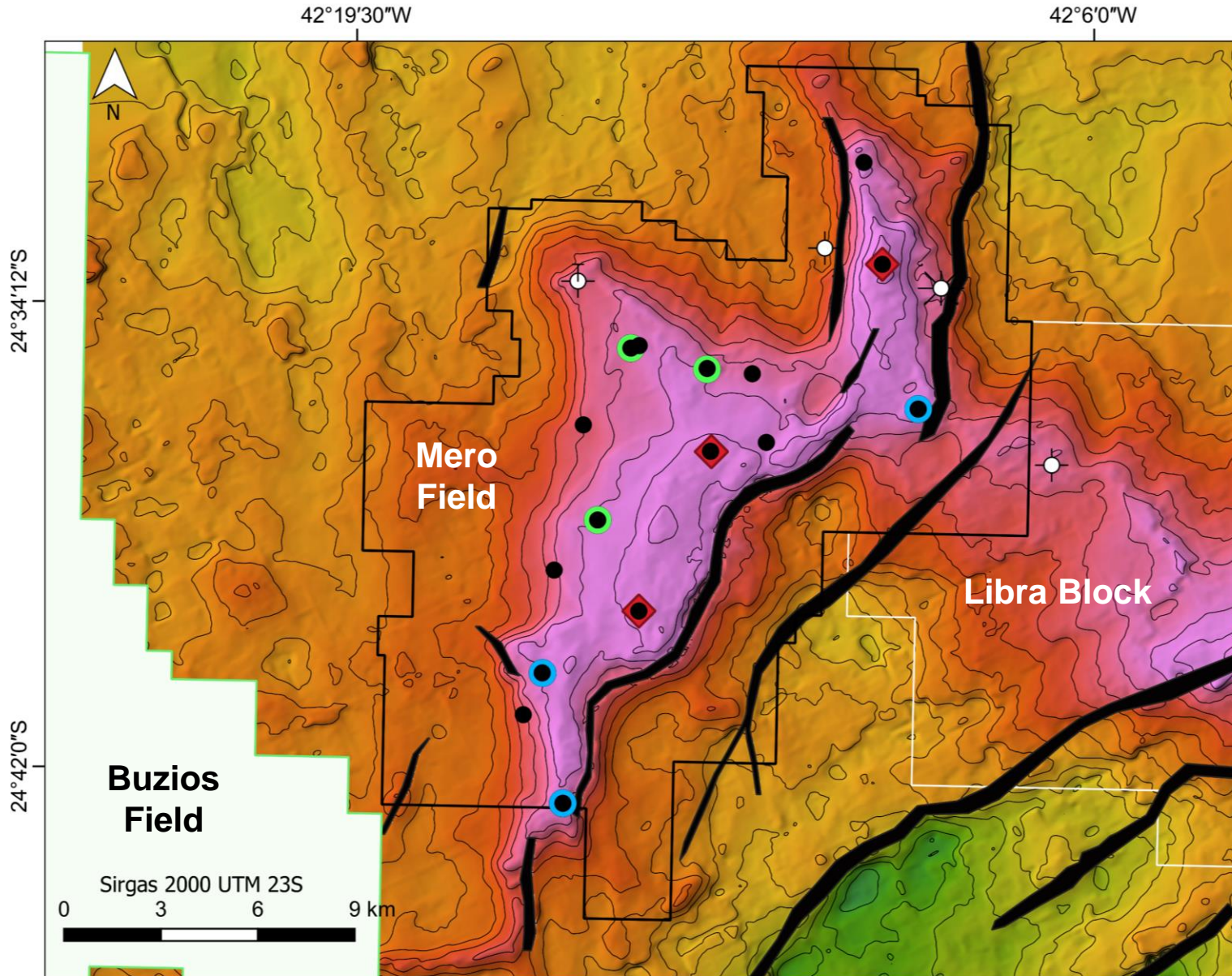
The field's total recoverable volume is estimated by Petrobras at 3.3 billion barrels of oil (Offshore Energy, 2017).



# The Mero field



# The Mero field

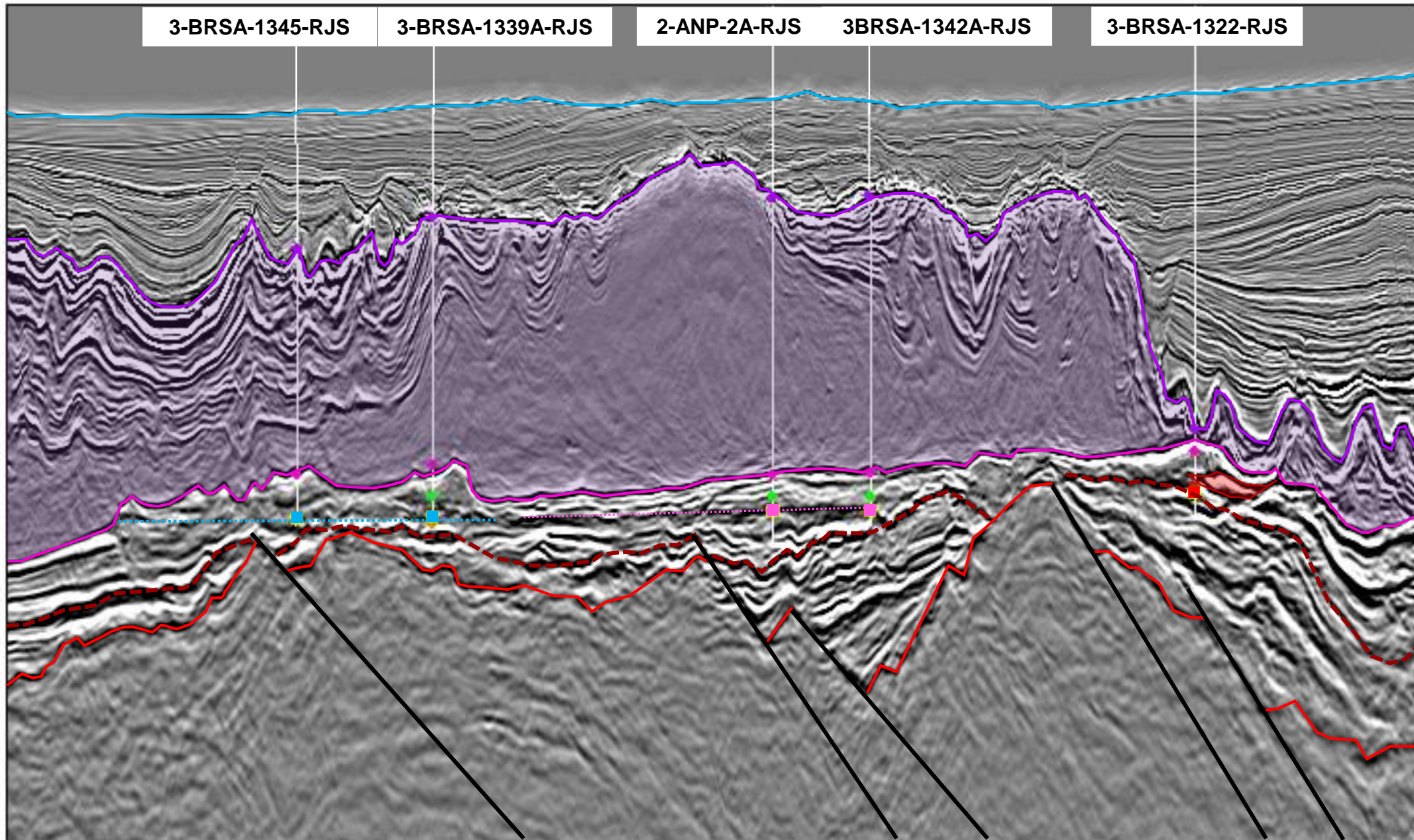


Mero is still under the early production system

The processing capacity of the FPSO is 50,000 barrels per day (bpd) of oil and 4 million m<sup>3</sup>/d of gas.

Petrobras expects starting production by 2022. FPSO Guanabara, which will be the first definitive system to operate in Mero has just arrived in the field.

The FPSO will be connected to the wells and subsea equipment and final tests will be carried out ahead of the first production scheduled to occur in the first half of the year.



- Sea Bottom
- Top of Evaporites
- Top Reservoir
- - - Top Camboriu
- Top Basement
- / Fault

**#3**

# Mero & Libra Comparison

# Mero Field & Libra Block Comparison

## **Mero field**

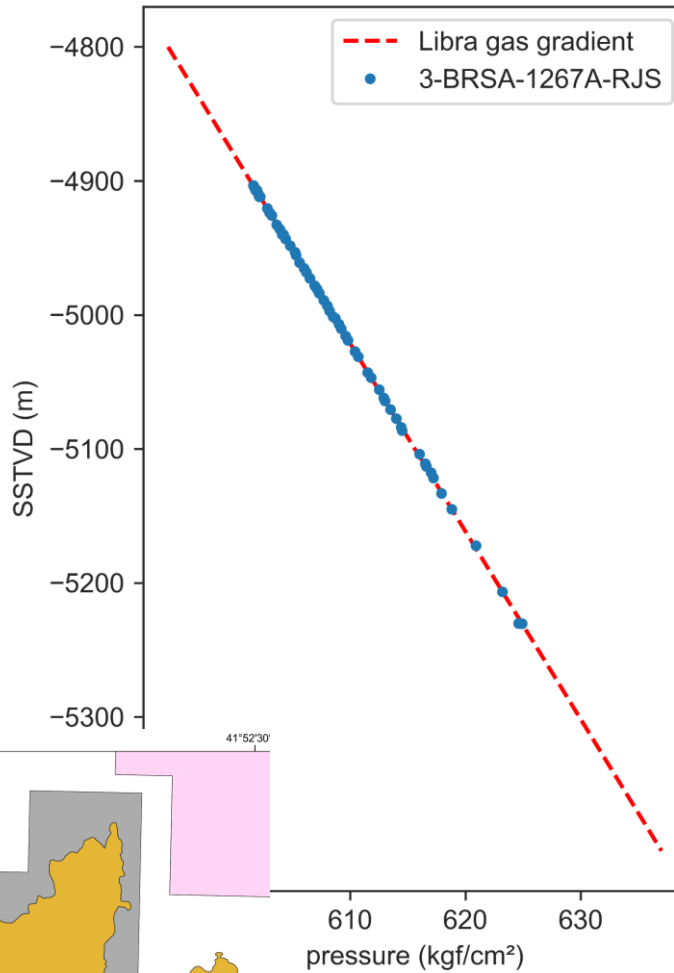
- Fluid is oil, 27 – 30° API
- GOR 360 – 438 m<sup>3</sup>/m<sup>3</sup>
- CO<sub>2</sub> 5 – 46%
- At least 2 OWC identified

## **Libra block**

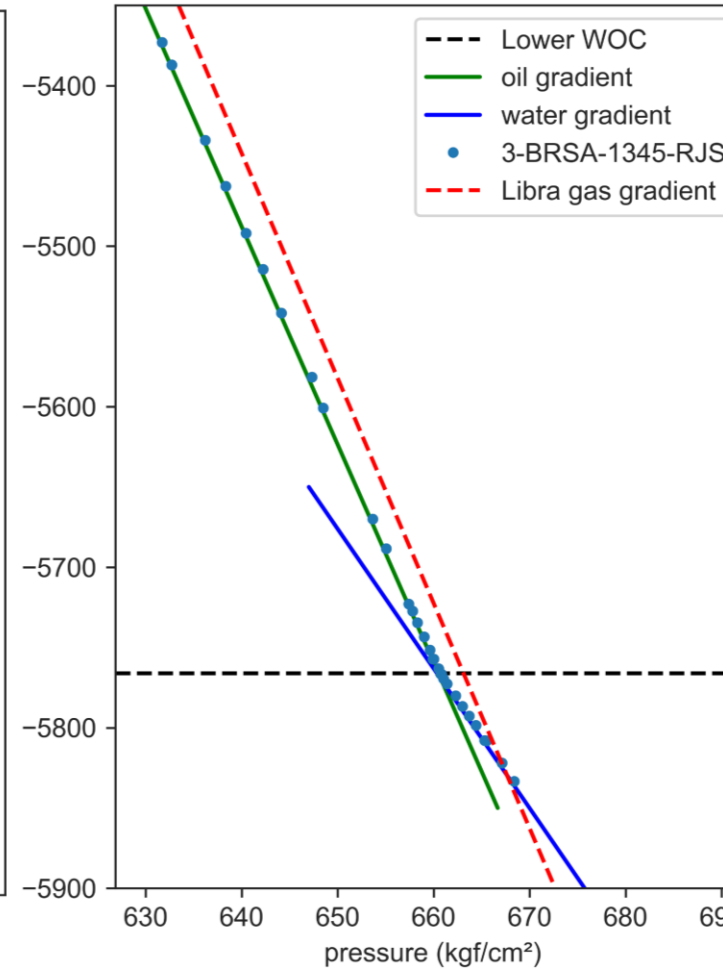
- Well 3-BRSA-1267A-RJS – gas condensate
- CO<sub>2</sub> up to 67%
- Fluid contact has not been identified
- Distinct pressure gradient from Mero

# Mero Field & Libra Block Comparison

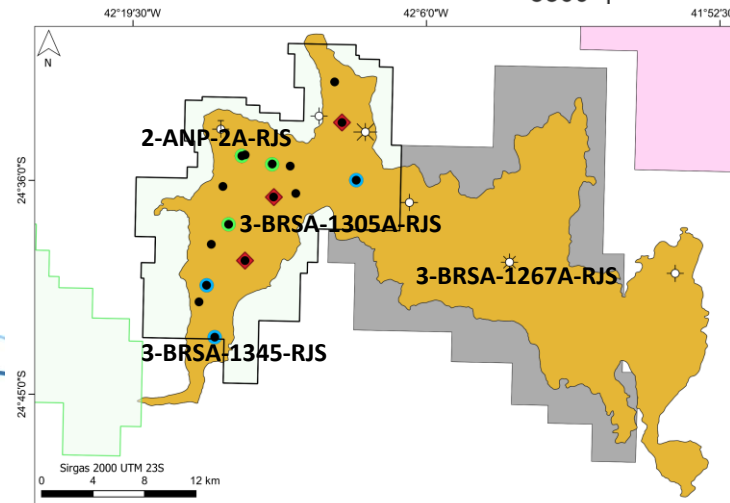
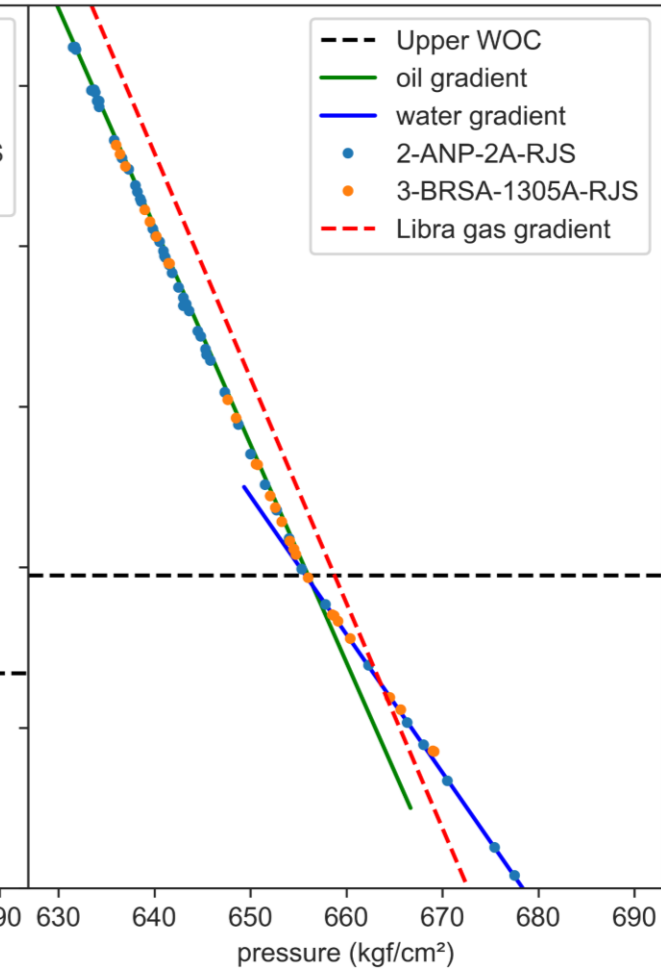
Central Libra gas gradient



Lower WOC

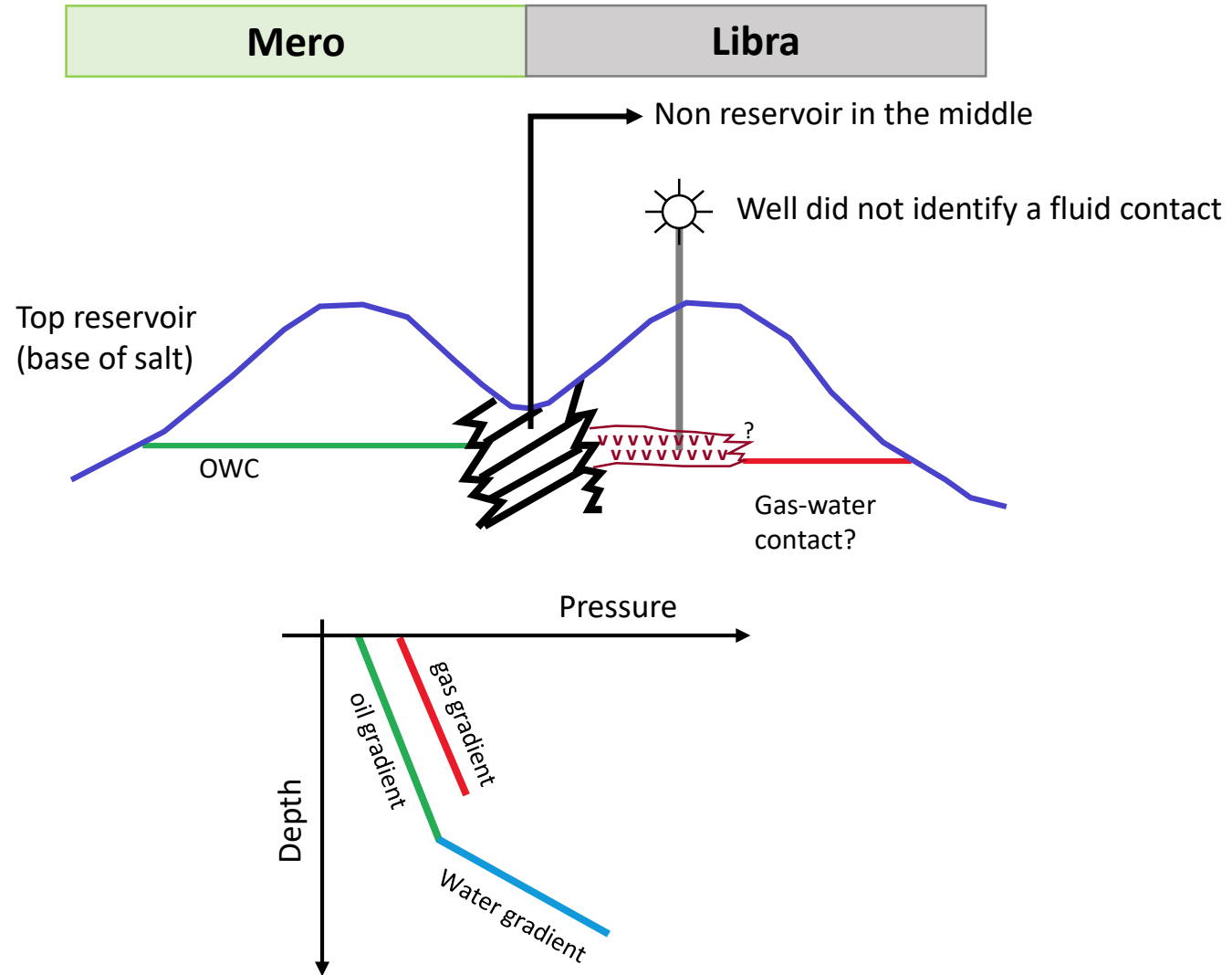


Upper WOC





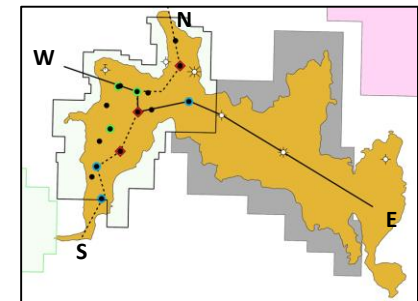
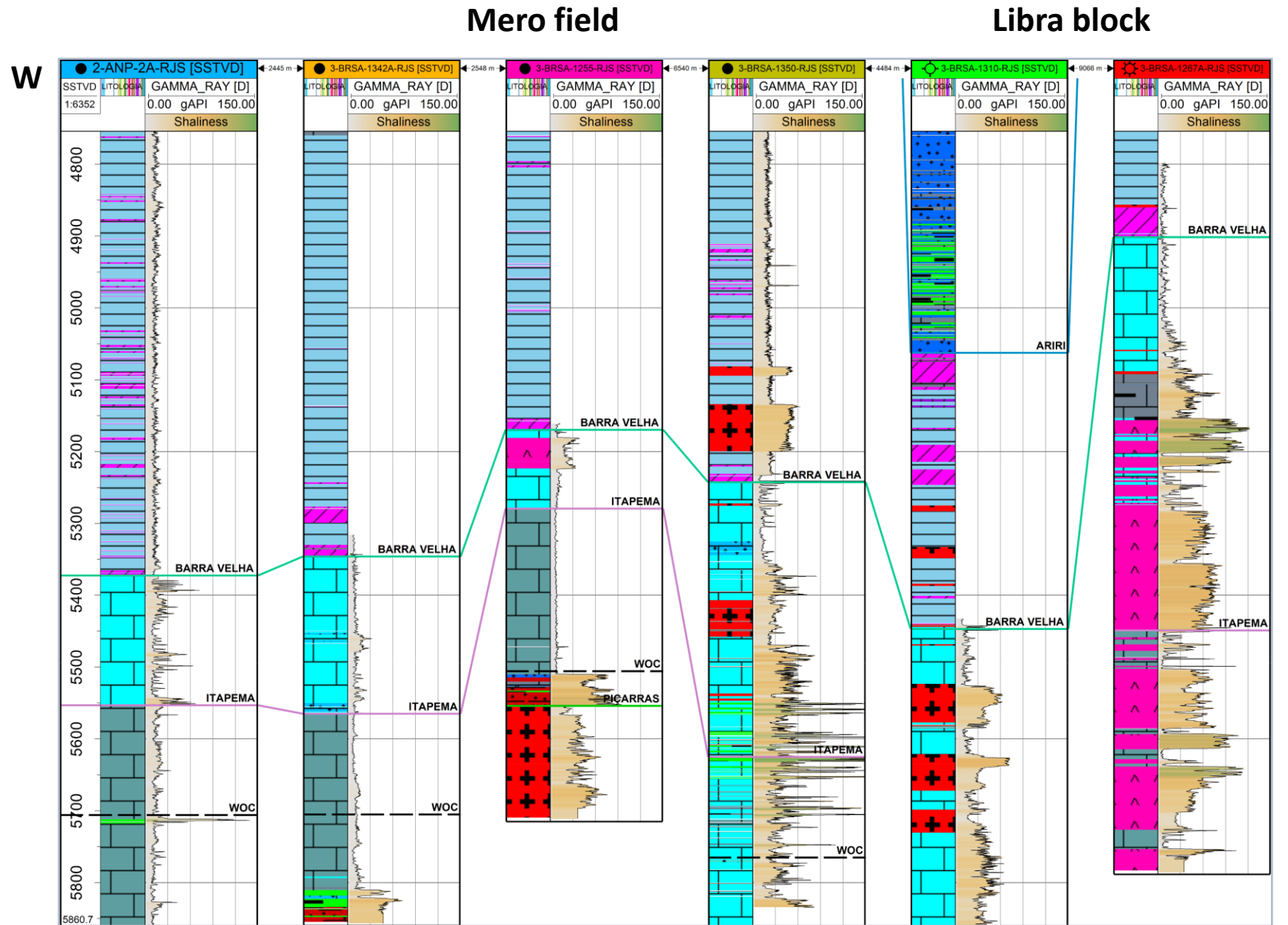
# Simplified schematic representation

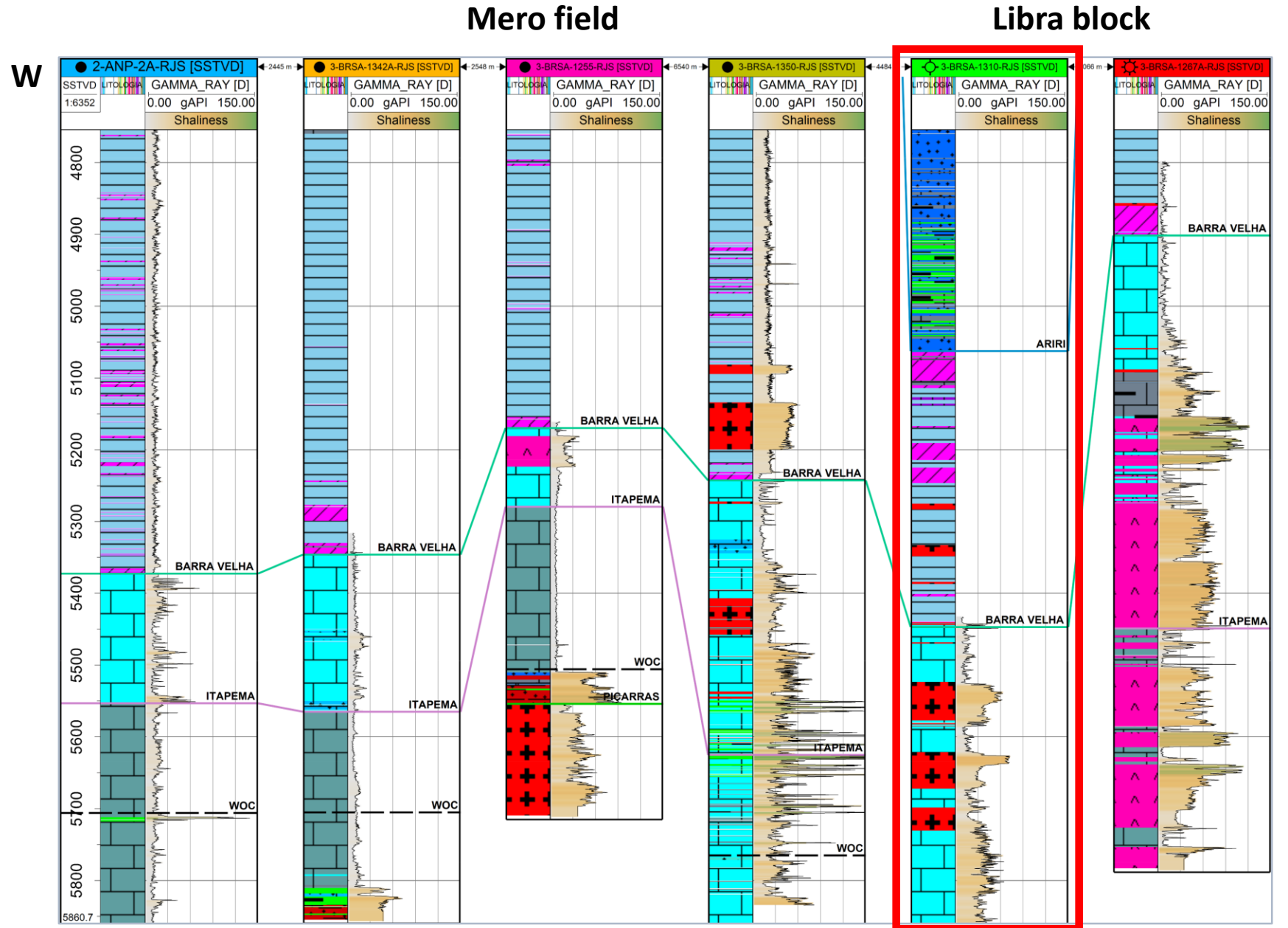




**#4**

# The Libra Block – Geological Assessment

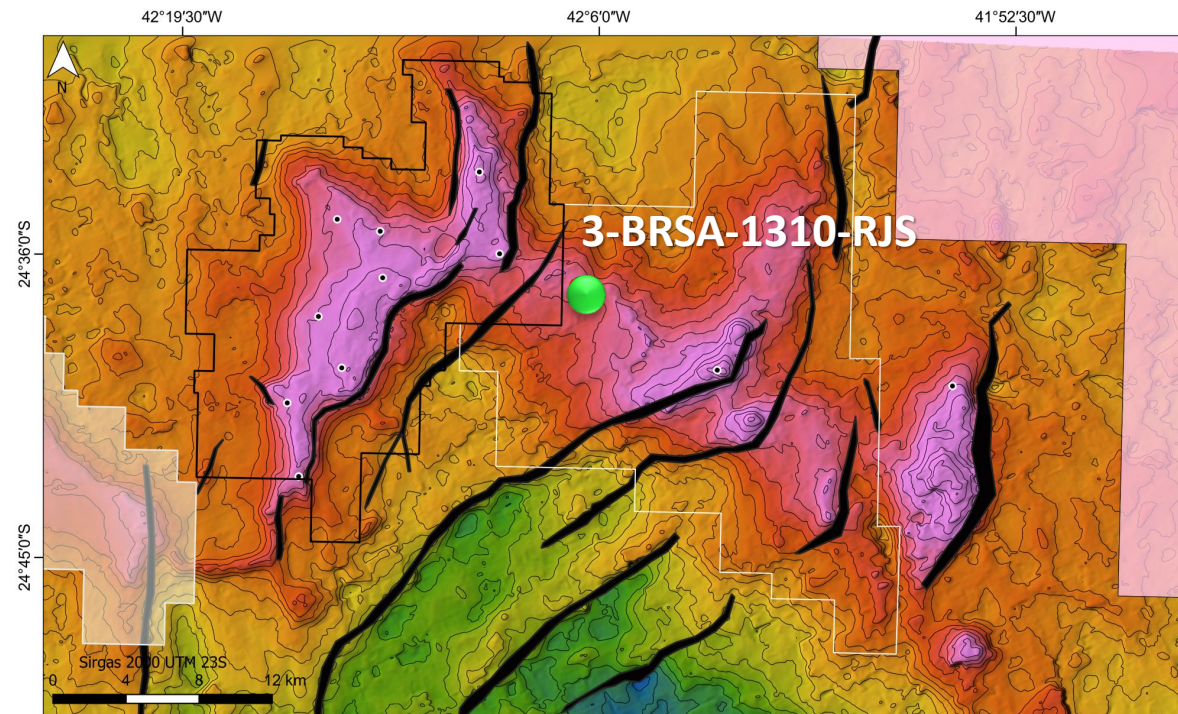




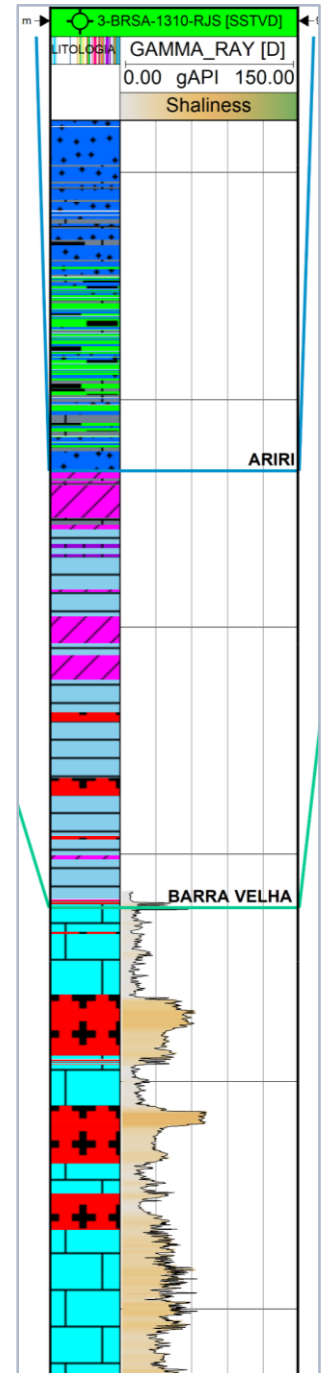
# The Libra Block – Geology

## Well 3-BRSA-1310-RJS

- Drilled in a saddle between the Mero field and the Libra high
- K44, K46, and K48 sequences
- Intercalation with igneous rocks
- Intense recrystallization
- No reservoir

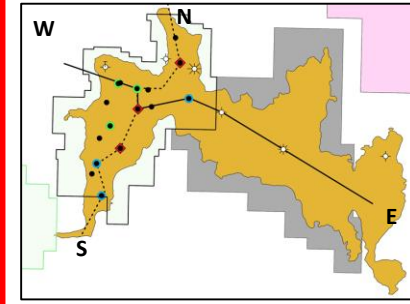
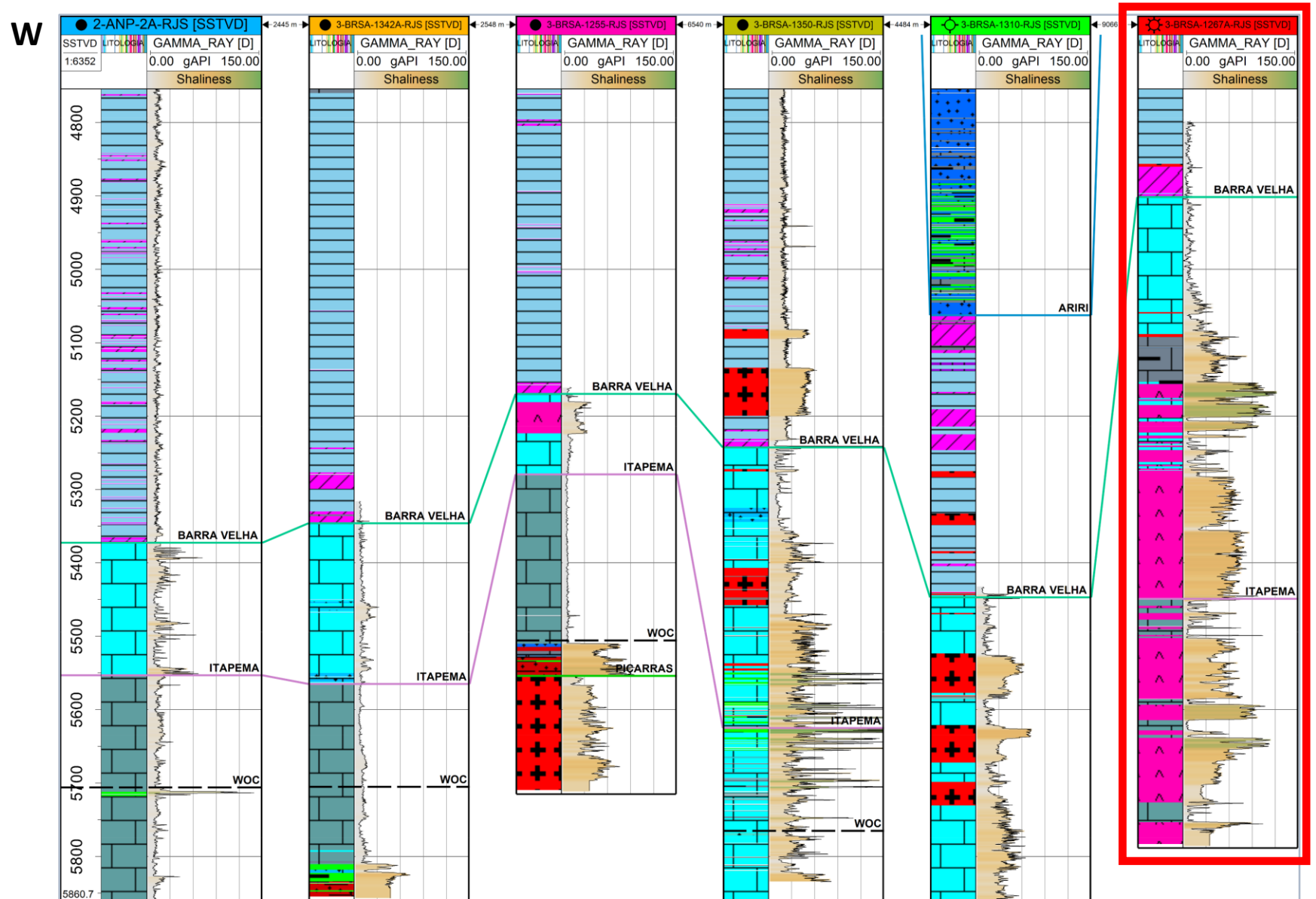


Petersohn et al. 2021



## Mero field

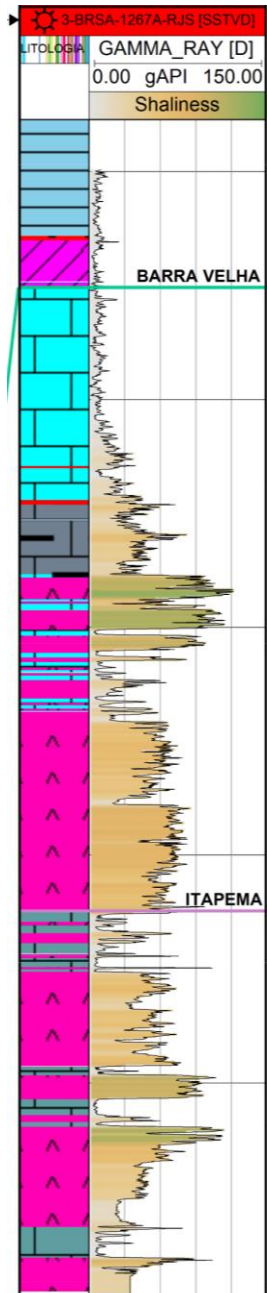
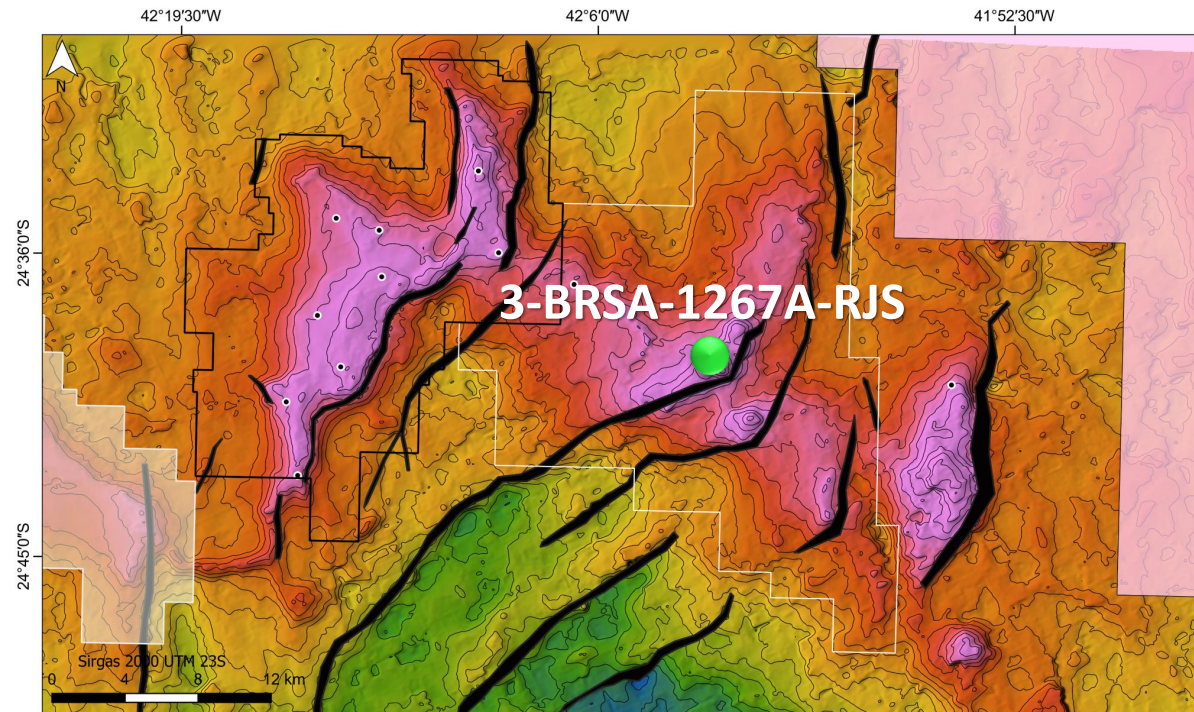
## Libra block



# The Libra block - Geology

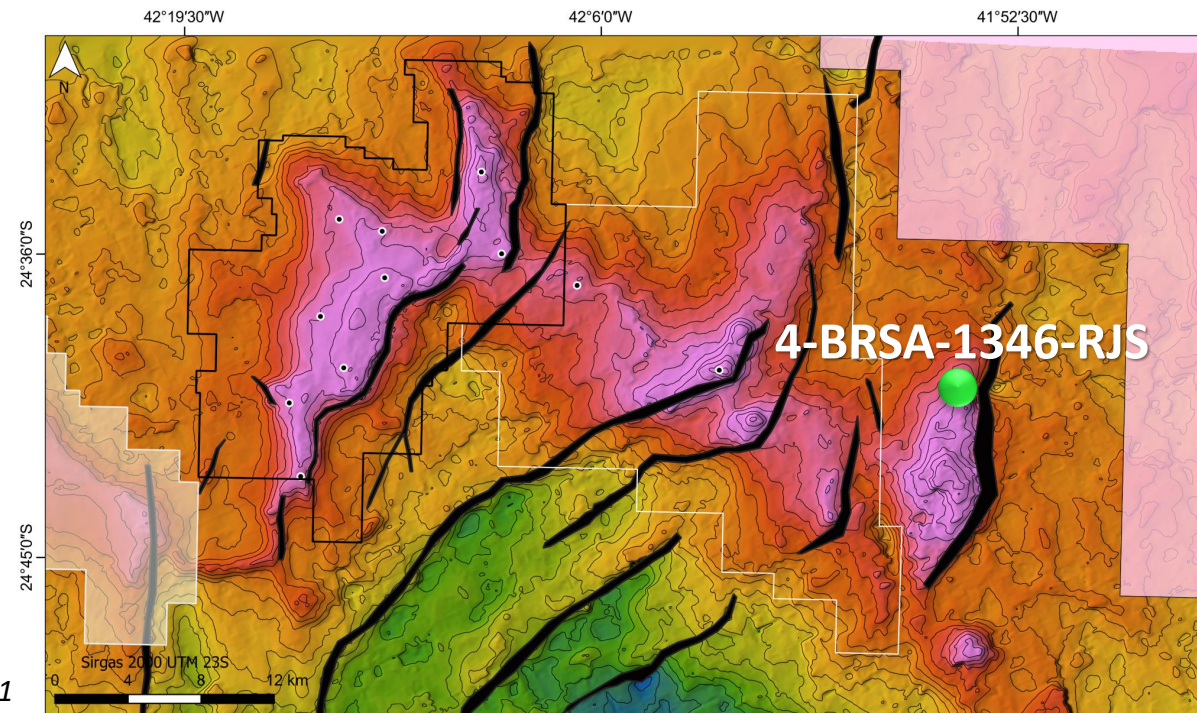
## Well 3-BRSA-1267A-RJS

- Drilled in the Libra structural apex
- Resulted in gas condensate
- K44, K46, and K48 sequences intercalated with igneous rocks
- K38 sequence – coquinas interspersed with mudstones
- Predominance of igneous rocks
- No fluid contacts



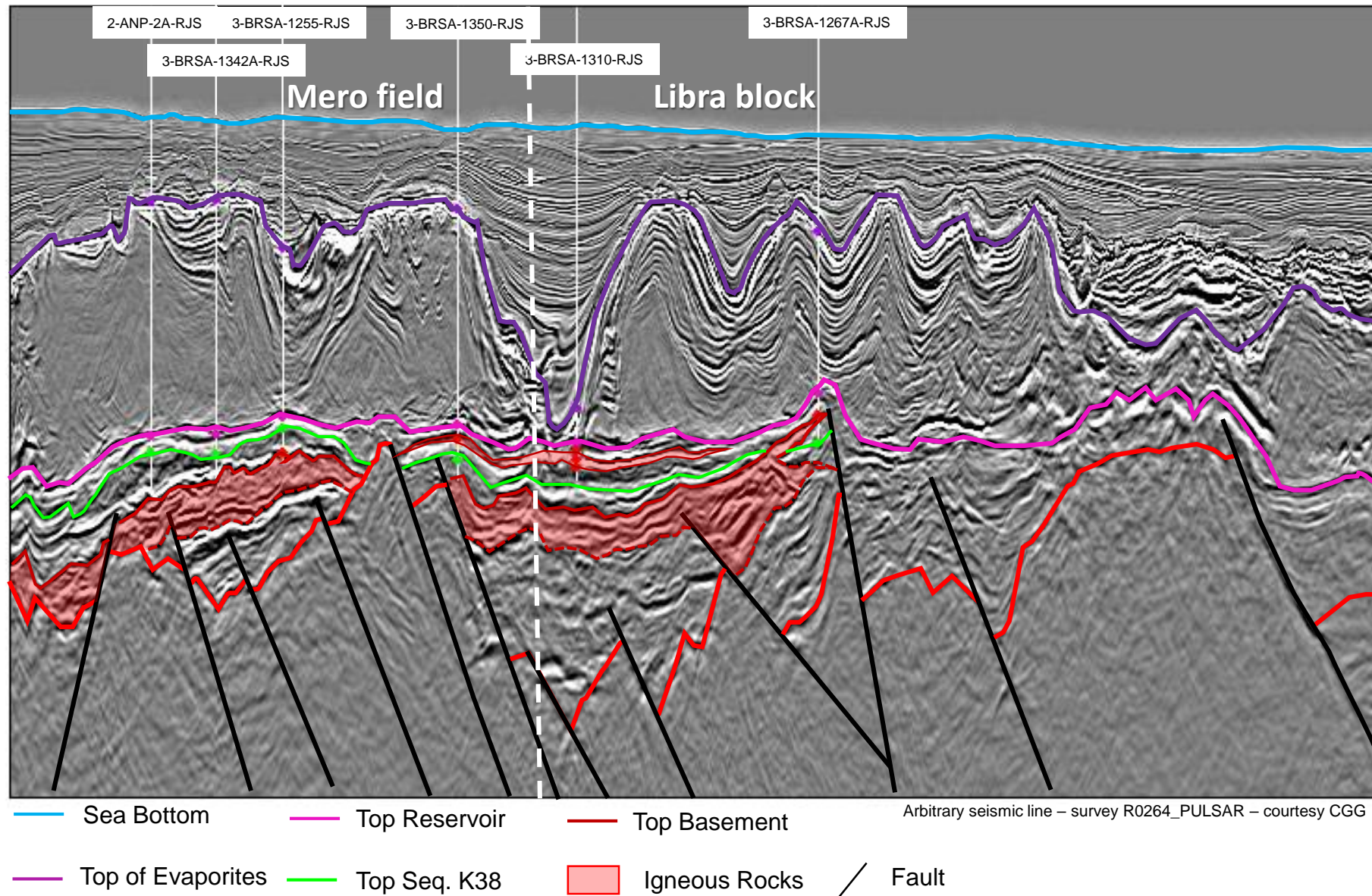
## Well 4-BRSA-1346-RJS

- Drilled on the flank of the Southeastern high
- Same stratigraphic sequences
- Predominance of laminites/mudstones
- Absence of hydrocarbon shows





# The Libra block - Geology





**#5**

# The Remaining Challenges

# The Libra block – Remaining challenges

- **Identification of fluid contacts**

  - Fluid nature – gas condensate or huge gas cap with oil layer like the Jupiter prospect?

- **Low-sampled fluid volume relative to the reservoir size**

  - Condensate to Gas Ratio?

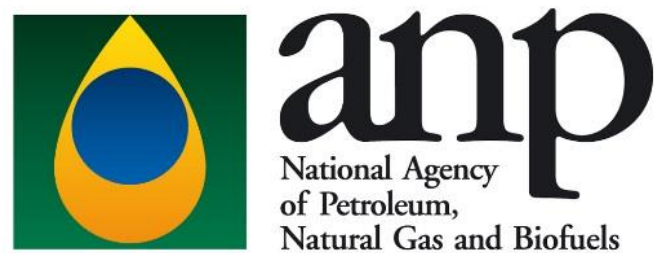
  - Total condensate in place?

- **Development challenges**

  - Heavy CO<sub>2</sub> contamination

  - Reservoir quality – effects of thermal recrystallization

- **Need for additional fluid sampling and appraisal wells**



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