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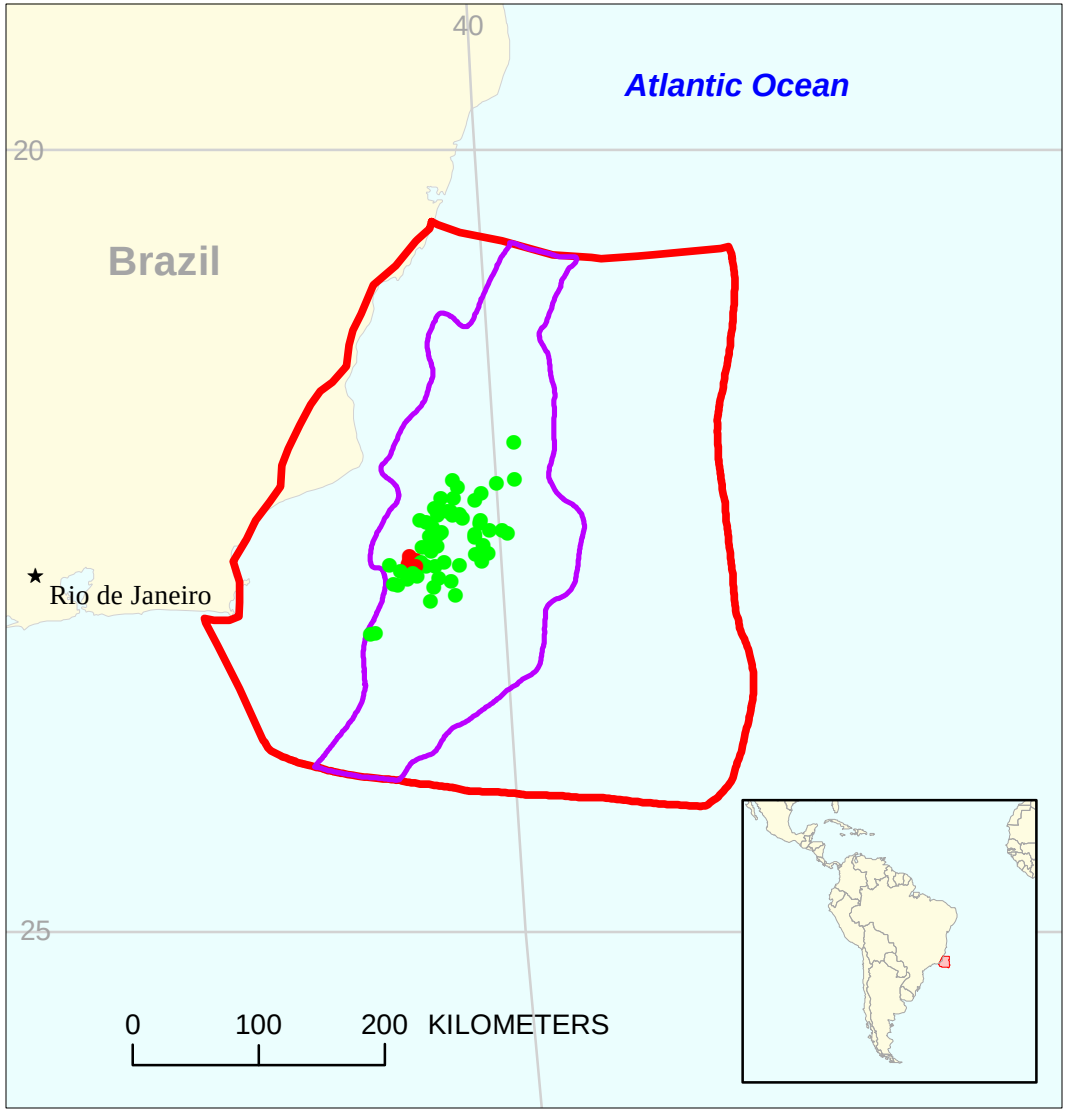
Late Cretaceous-Tertiary Turbidites Assessment Unit 60350101



Late Cretaceous-Tertiary Turbidites Assessment Unit 60350101

Campos Basin Geologic Province 6035

Geologic Summary

Detailed map of this assessment unit

Exploration/Discovery-History Data

- Plots of Known Field Sizes
- Plots of Grown Resources
- Tables

Assessment Input Data

Assessment Results

- Assessment Unit Summary
- Detailed Assessment Results
- Undiscovered Field-Size Distributions

USGS PROVINCE: Campos Basin (6035) **GEOLOGIST:** C.J. Schenk

TOTAL PETROLEUM SYSTEM: Lagoa Feia-Carapebus (603501)

ASSESSMENT UNIT: Late Cretaceous-Tertiary Turbidites (60350101)

DESCRIPTION: This assessment unit is defined by Late Cretaceous through Miocene turbidite sandstone reservoirs that occur between 200 m and 2200 m water depths in the Campos Basin, offshore Brazil.

SOURCE ROCKS: Geochemistry has demonstrated that the source rocks are lacustrine mudstones of the Neocomian Lagoa Feia Formation.

MATURATION: Lagoa Feia mudstones reached maturity in several grabens of the basin in the Miocene, and hydrocarbon generation continues to the present.

MIGRATION: Hydrocarbons migrated up listric faults through the Alagoas salt, and into the turbidite reservoirs.

RESERVOIR ROCKS: Major reservoirs are Late Cretaceous through Miocene slope-channel and basin-floor turbidites. Several giant fields have been discovered in turbidites in this assessment unit.

TRAPS AND SEALS: Traps are mainly combination traps, where faults produced closure on a lenticular turbidite sandstone. Seals are provided by fault juxtaposition of sandstones and mudstones, as well as mudstones that enclose the turbidite sandstones.

REFERENCES:

Guardado, L.R., Gamboa, L.A.P., and Lucchesi, C.F., 1990, Petroleum geology of the Campos Basin, Brazil–a model for a producing Atlantic-type basin, *in* Edwards, J.D., and Santogrossi, P.A., eds., Divergent-passive margin basins: American Association of Petroleum Geologists Memoir 48, p. 3-80.

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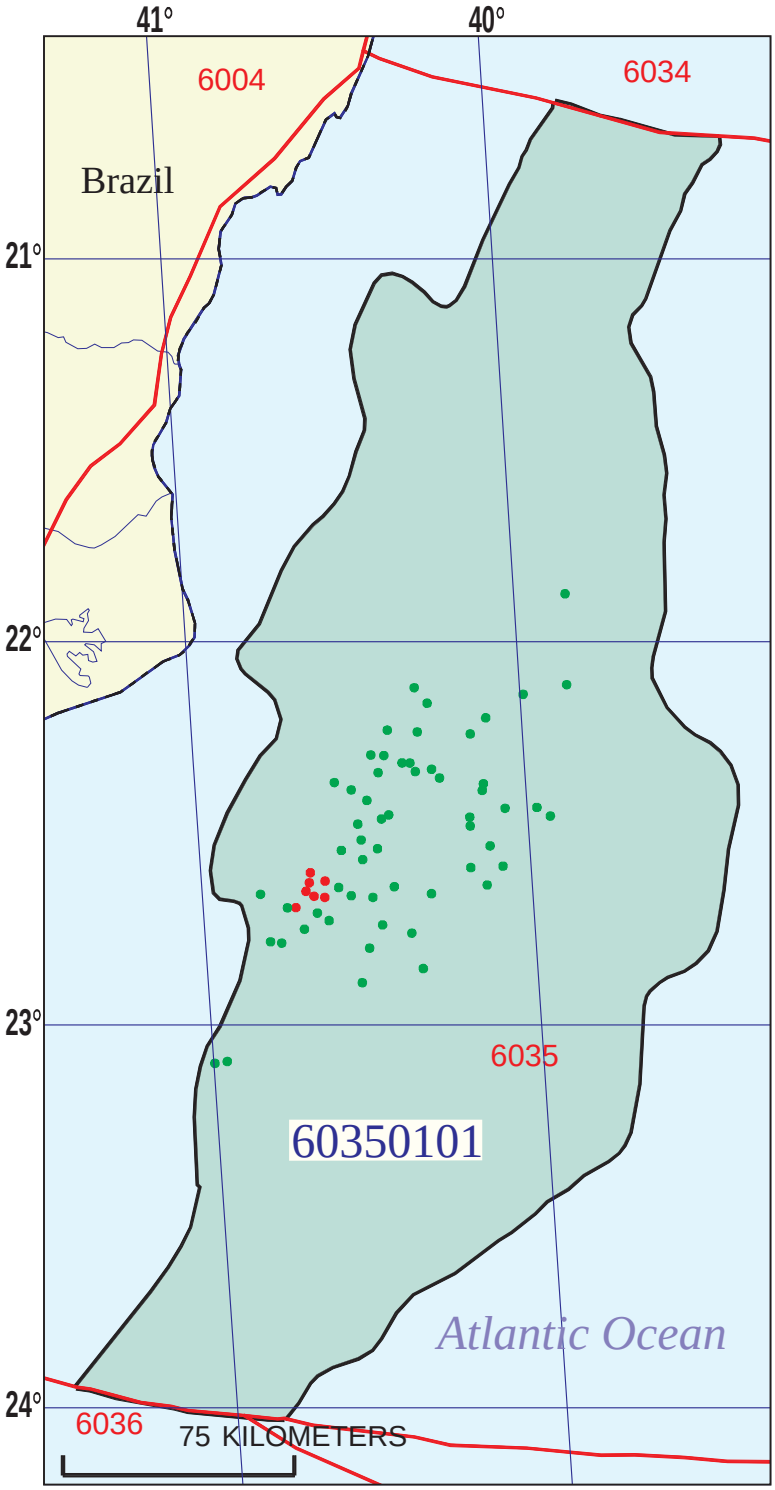
Mohriak, W.U., Mello, M., Dewey, J.F., and Maxwell, J.R., 1990, Petroleum geology of the Campos Basin, offshore Brazil, *in* Brooks, J., ed., Classic petroleum provinces: Geological Society of London Special Publication 50, p. 119-141.



Late Cretaceous-Tertiary Turbidites Assessment Unit - 60350101

EXPLANATION

- Hydrography
- Shoreline
- 6035 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 60350101 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

SEVENTH APPROXIMATION
NEW MILLENNIUM WORLD PETROLEUM ASSESSMENT
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS

Date:……..	11/5/99		
Assessment Geologist:……..	C.J. Schenk		
Region:……..	Central and South America	Number:	6
Province:……..	Campos Basin	Number:	6035
Priority or Boutique……	Priority		
Total Petroleum System:……	Lagoa Feia-Carapebus	Number:	603501
Assessment Unit:……	Late Cretaceous-Tertiary Turbidites	Number:	60350101
* Notes from Assessor	MMS growth function. Gas fields are mainly single-well fields.		

CHARACTERISTICS OF ASSESSMENT UNIT

Oil (<20,000 cfg/bo overall) **or** Gas (≥20,000 cfg/bo overall):… Oil

What is the minimum field size?……. 6 mmboe grown (≥1mmboe)
(the smallest field that has potential to be added to reserves in the next 30 years)

Number of discovered fields exceeding minimum size:…… Oil: 45 Gas: 5
Established (>13 fields) X Frontier (1-13 fields) _____ Hypothetical (no fields) _____

Median size (grown) of discovered oil fields (mmboe):
1st 3rd 60 2nd 3rd 201 3rd 3rd 271
Median size (grown) of discovered gas fields (bcfg):
1st 3rd 43 2nd 3rd 77 3rd 3rd _____

Assessment-Unit Probabilities:

Attribute	Probability of occurrence (0-1.0)
1. **CHARGE:** Adequate petroleum charge for an undiscovered field ≥ minimum size……	1.0
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size……	1.0
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered field ≥ minimum size	1.0

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):…….. 1.0

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field ≥ minimum size…… 1.0

UNDISCOVERED FIELDS

Number of Undiscovered Fields: How many undiscovered fields exist that are ≥ minimum size?:
(uncertainty of fixed but unknown values)

Oil fields:……min. no. (>0)	5	median no.	72	max no.	160
Gas fields:……min. no. (>0)	1	median no.	12	max no.	36

Size of Undiscovered Fields: What are the anticipated sizes (**grown**) of the above fields?:
(variations in the sizes of undiscovered fields)

Oil in oil fields (mmbo)…… min. size	6	median size	60	max. size	4200
Gas in gas fields (bcfg):…… min. size	36	median size	120	max. size	4800

Assessment Unit (name, no.)
Late Cretaceous-Tertiary Turbidites, 60350101

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	500	1000	1500
NGL/gas ratio (bngl/mmcfg)……	15	30	45

Gas fields:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……	11	22	33
Oil/gas ratio (bo/mmcfg)……			

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

Oil Fields:	minimum	median	maximum
API gravity (degrees)……	10	24	32
Sulfur content of oil (%)……	0.2	0.5	1.8
Drilling Depth (m) ……	4500	7000	10000
Depth (m) of water (if applicable)……	300	2500	7500

Gas Fields:	minimum	median	maximum
Inert gas content (%)……			
CO_2 content (%)……			
Hydrogen-sulfide content(%)……			
Drilling Depth (m)……	5000	7500	13000
Depth (m) of water (if applicable)……	300	1250	7500

Assessment Unit (name, no.)
Late Cretaceous-Tertiary Turbidites, 60350101

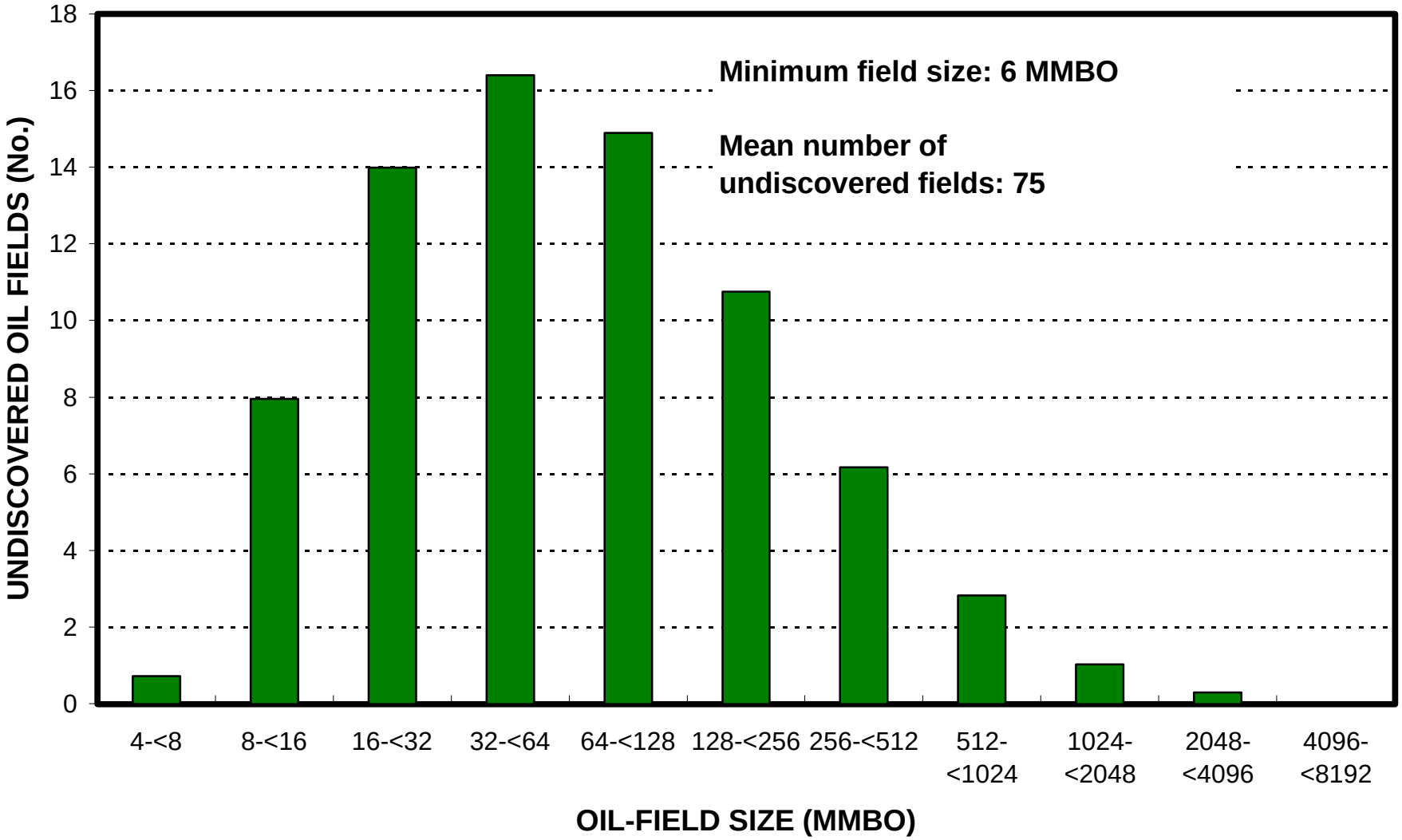
ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT TO COUNTRIES OR OTHER LAND PARCELS (uncertainty of fixed but unknown values)

1. Brazil represents 100 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		100	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		100	

Late Cretaceous-Tertiary Turbidites, AU 60350101
Undiscovered Field-Size Distribution



Late Cretaceous-Tertiary Turbidites, AU 60350101
Undiscovered Field-Size Distribution