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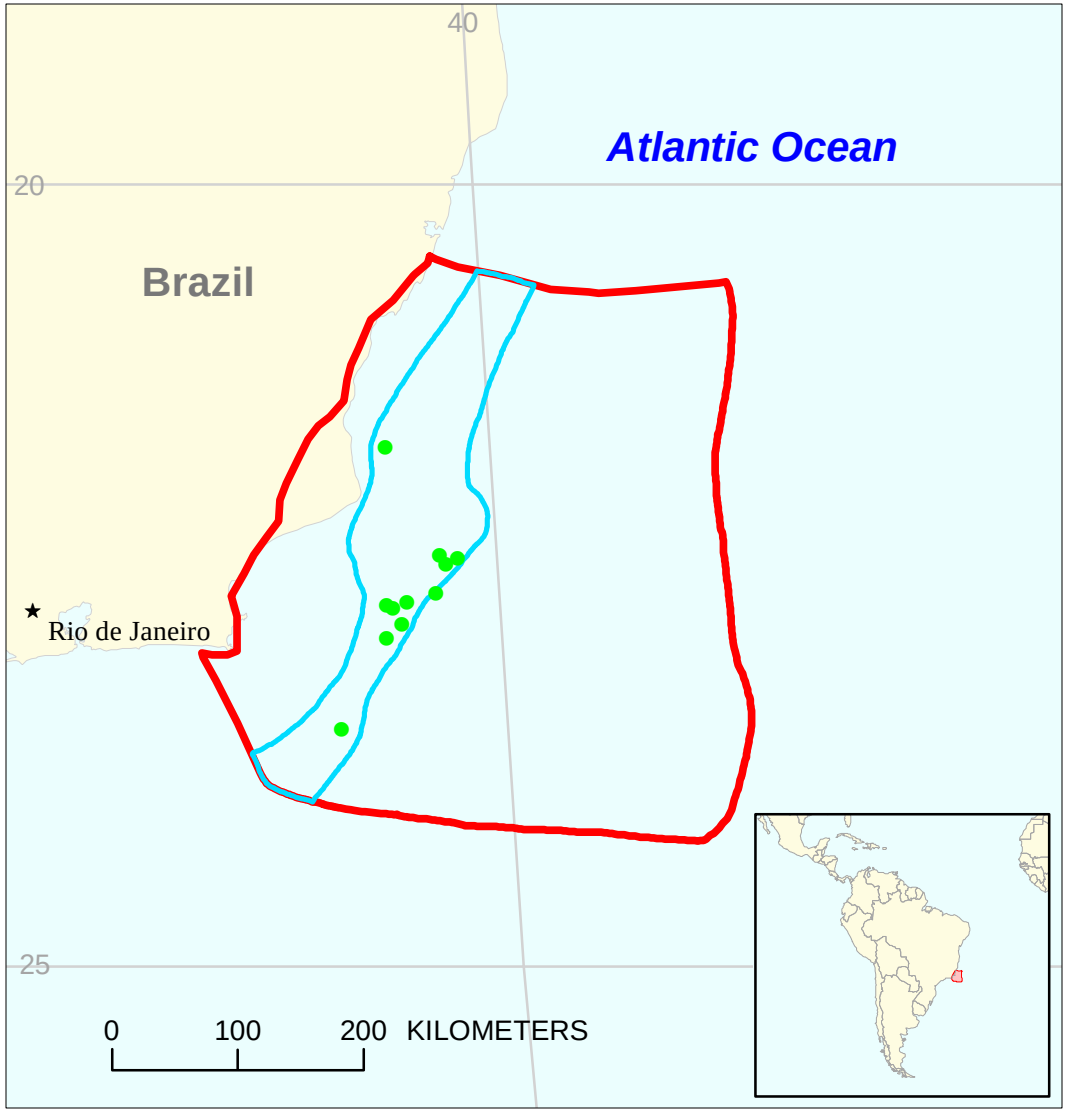
Cretaceous Carbonates
Assessment Unit 60350102



Cretaceous Carbonates Assessment Unit 60350102
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: Cretaceous Carbonates (60350102)

DESCRIPTION: This assessment unit is defined by Cretaceous Macae Formation carbonate reservoirs and several minor rift related reservoirs in the shelf area of the Campos Basin to water depths of about 600 m.

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 Campos Basin in the Miocene, and generation continues to the present.

MIGRATION: Hydrocarbons migrated up listric faults into the carbonate reservoirs; in the rift grabens, hydrocarbons migrated into laterally into proximal clastics and coquinas.

RESERVOIR ROCKS: Major reservoirs are Cretaceous shelf carbonates; minor reservoirs include Lagoa Feia coquinas and conglomerates, and Alagoas conglomerates.

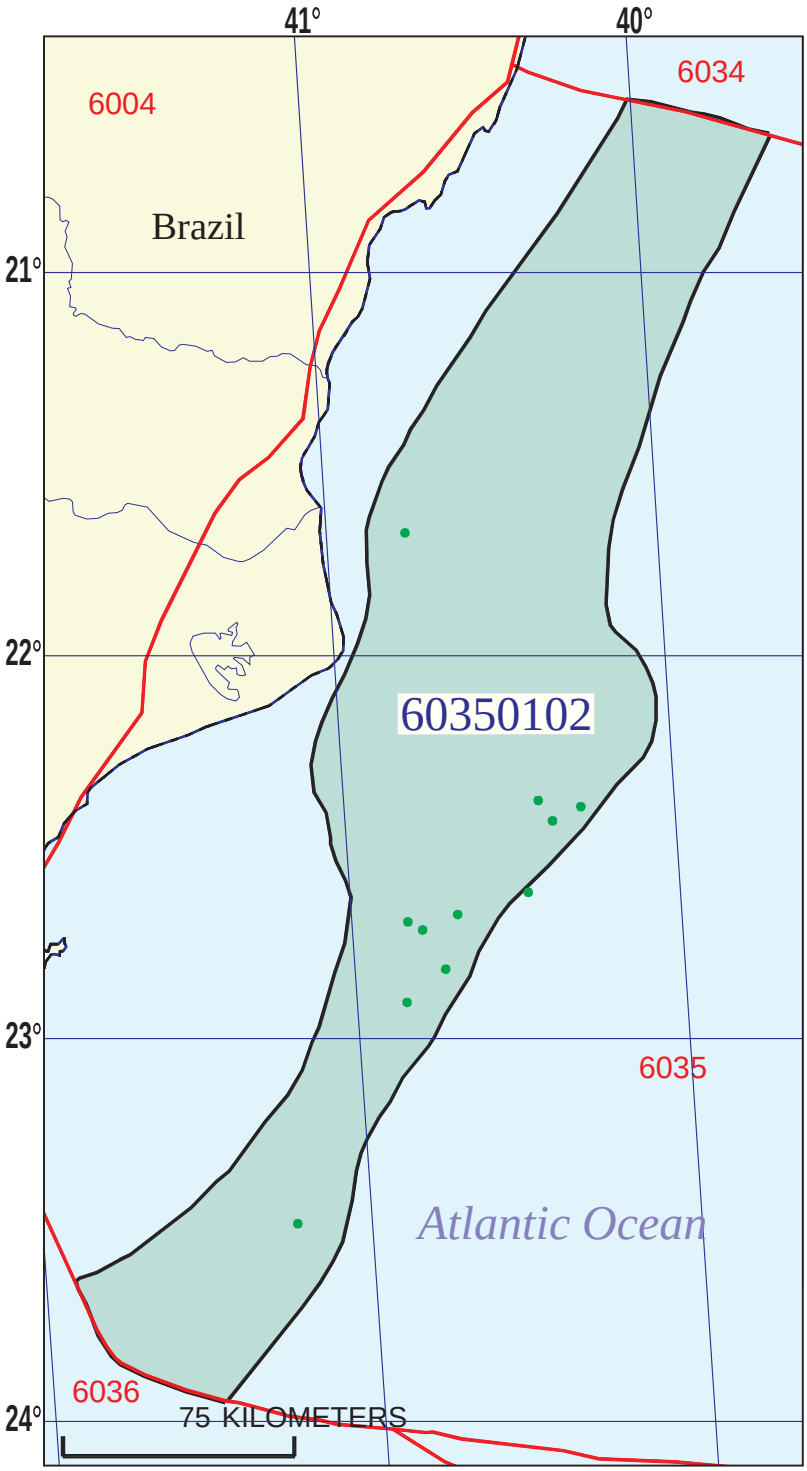
TRAPS AND SEALS: Traps in the Macae carbonates range from diagenetic to fault-related, and traps from the other reservoirs range from fault related to stratigraphic.

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.

Mello, M., Koutsoukos, E.A.M., Mohriak, W.U., and Bacoccoli, G., 1994, Selected petroleum systems of Brazil, *in* Magoon, L.B., and Dow, W.G., eds., The petroleum system–from source to trap: American Association of Petroleum Geologists Memoir 60, p. 499-512.

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.



Cretaceous Carbonates Assessment Unit - 60350102

EXPLANATION

- Hydrography
- Shoreline
- 6035 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 60350102 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

USGS science for a changing world

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:……	Cretaceous Carbonates	Number:	60350102
* Notes from Assessor	MMS growth function.		

CHARACTERISTICS OF ASSESSMENT UNIT

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

What is the minimum field size?……. 3 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: 8 Gas: 0
Established (>13 fields) _____ Frontier (1-13 fields) X Hypothetical (no fields) _____

Median size (grown) of discovered oil fields (mmboe):
1st 3rd 93 2nd 3rd 59 3rd 3rd _____
Median size (grown) of discovered gas fields (bcfg):
1st 3rd _____ 2nd 3rd _____ 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)	1	median no.	40	max no.	100
Gas fields:……min. no. (>0)	1	median no.	9	max no.	26

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	3	median size	12	max. size	420
Gas in gas fields (bcfg):…… min. size	18	median size	48	max. size	1440

Assessment Unit (name, no.)
Cretaceous Carbonates, 60350102

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)……	15	28	35
Sulfur content of oil (%)……	0.2	0.5	1.8
Drilling Depth (m) ……	3800	8000	12500
Depth (m) of water (if applicable)……	160	560	1200

Gas Fields:	minimum	median	maximum
Inert gas content (%)……			
CO_2 content (%)……	1	2	6
Hydrogen-sulfide content(%)……	1	3	6
Drilling Depth (m)……	4600	8700	12500
Depth (m) of water (if applicable)……	160	560	1200

Assessment Unit (name, no.)
Cretaceous Carbonates, 60350102

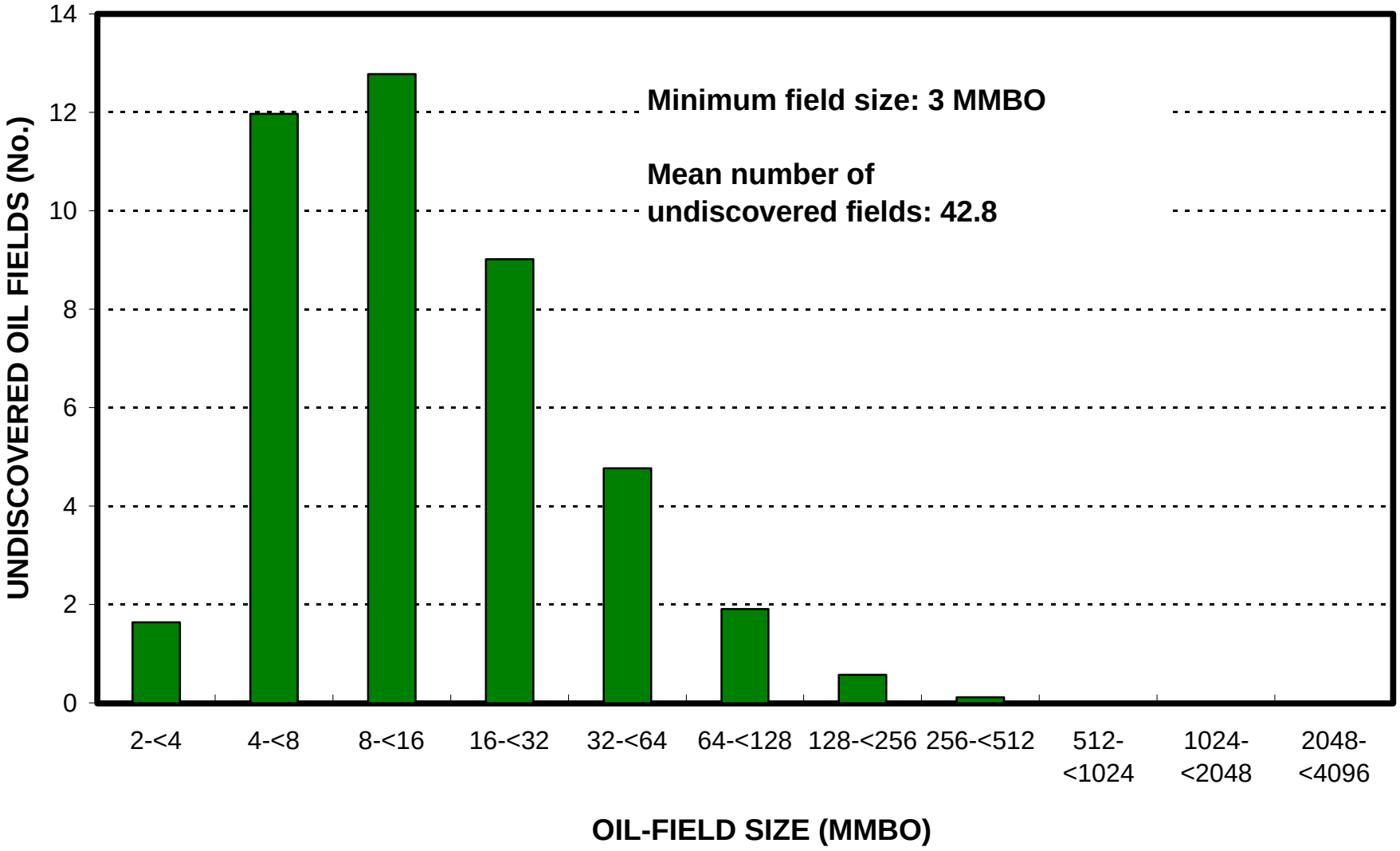
ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT TO COUNTRIES OR OTHER LAND PARCELS (uncertainty of fixed but unknown values)

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	

Cretaceous Carbonates, AU 60350102
Undiscovered Field-Size Distribution



Cretaceous Carbonates, AU 60350102
Undiscovered Field-Size Distribution