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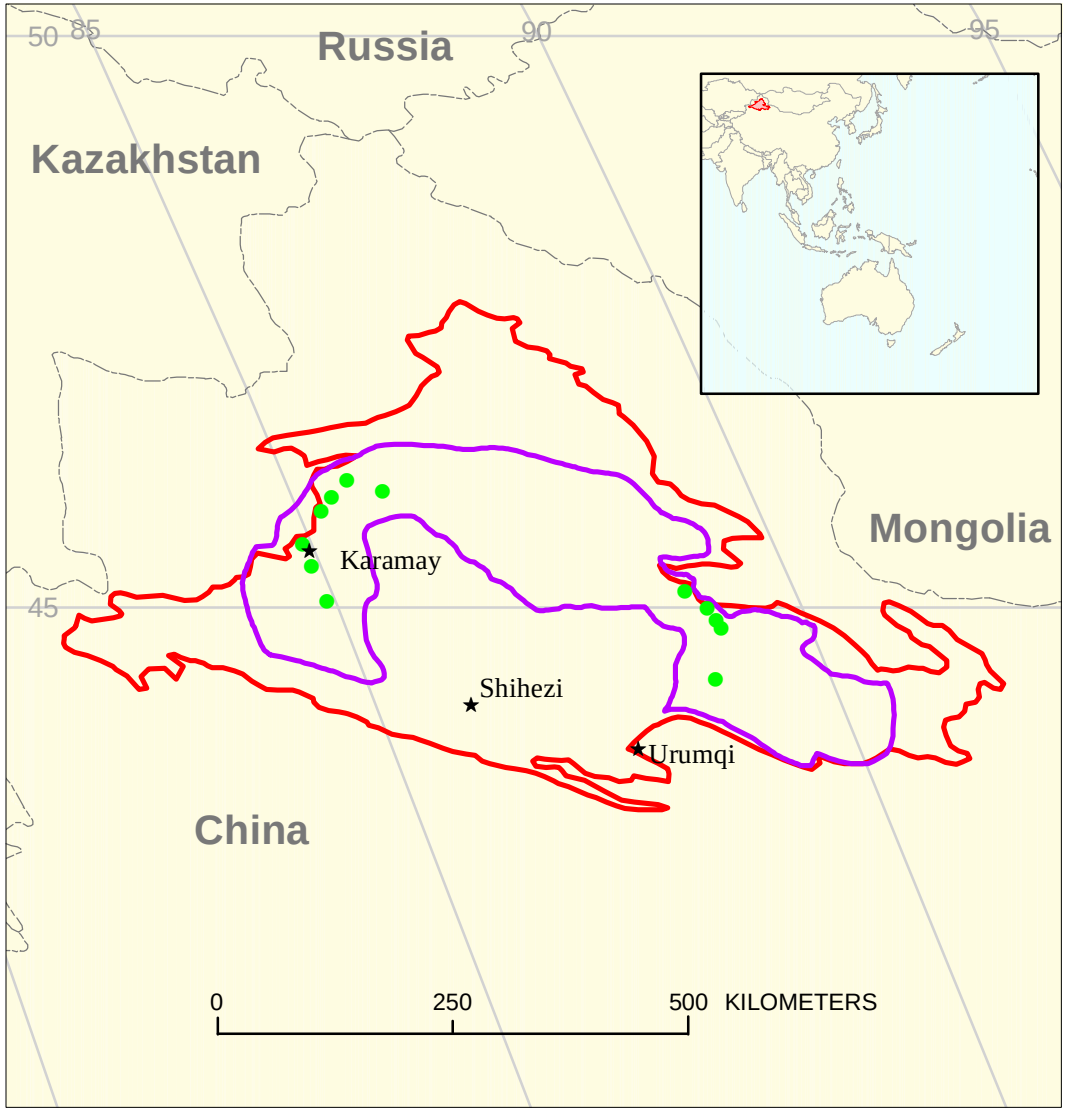
Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics Assessment Unit 31150101



Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics Assessment Unit 31150101
Junggar Basin Geologic Province 3115

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: Junggar Basin (3115) **GEOLOGIST:** R.T. Ryder

TOTAL PETROLEUM SYSTEM: Lucaogou-Karamay/Ulho/Pindequan (311501)

ASSESSMENT UNIT: Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics (31150101)

DESCRIPTION: The assessment unit is characterized by oil fields trapped primarily in anticlines and thrust-faulted blocks on the western, northern, and eastern margins of a large Cenozoic foreland basin. The giant Karamay oil field on the northwest margin of the basin contains greater than 90 percent of the known reserves in the assessment unit. Also, oil is trapped in basement-involved horst(?) blocks formed on the south-dipping homoclinal flank of the basin. A deeply buried pod of mature Permian source rocks that occurs in the southern and central parts of the foreland basin is the source of the oil. Carboniferous, Permian, and Triassic nonmarine conglomerate and sandstone are the dominant reservoirs.

SOURCE ROCKS: The source rocks are deep-water lacustrine shale and mudstone of Permian age. The dominant source rocks are located in the Upper Permian Lucaogou Formation and the Lower Permian Fengchengcheng Formation. The thickness of the source rock sequence ranges from about 700 to 1000 m in the Lucaogou Formation to about 500 m in the Fengchengcheng Formation.

MATURATION: The Lucaogou and Fengchengcheng Formations have been mature with respect to oil generation since about Early Cretaceous time in the deeply buried southern and central parts of the basin. Although they have been mature with respect to gas generation since about Late Cretaceous time very little gas seems to have been generated or expelled. A geothermal gradient of about 22°C/km probably accompanied oil and gas generation.

MIGRATION: Most oil migrated laterally about 10 to 50 km from the pod of mature Permian source rocks before entrapment. Although preferential oil migration was northward and westward toward the Karamay field, eastward migration of oil most certainly occurred. Very little oil and (or) gas migrated vertically from the pod of mature source rocks.

RESERVOIR ROCK: Primary reservoir rocks consist of sandstone and conglomerate of fluvial and alluvial fan origin. Reservoire quality is generally very poor because of the volcanic litharenite composition of the sandstone and conglomerate. The best nonmarine clastic reservoirs are the Upper Permian Ulho and Pindequan Formations and the Middle Triassic Karamay Formation. Secondary reservoir rocks consist of volcaniclastic and low-grade metamorphic rocks of the Carboniferous basement.

TRAPS AND SEALS: The major traps are anticlines and fault blocks of compressional origin. However, extensional(?) fault blocks in the Carboniferous basement and overlying drape anticlines may be important traps. Stratigraphic traps (lithologic, diagenetic, onlap, and unconformity varieties) may account for additional entrapment. Shale and mudstone of the Lower Triassic and Lower Cretaceous sequences provide the best regional seals. Other local

shale and mudstone seals exist in Upper Permian and Middle/Upper Triassic alluvial plain and lacustrine deposits.

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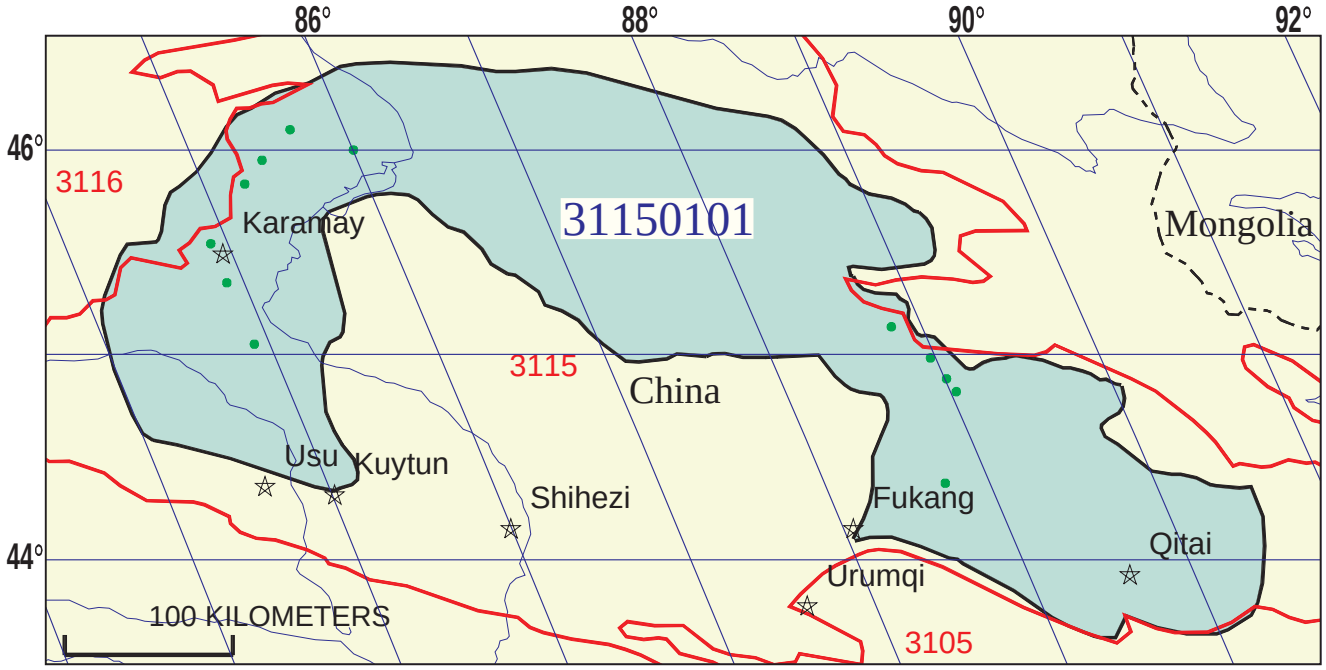

Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics Assessment Unit - 31150101

EXPLANATION

- Hydrography
- Shoreline
- 3115 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 31150101 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

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

Date:……..	5/27/99		
Assessment Geologist:……..	R.T. Ryder		
Region:……..	Asia Pacific	Number:	3
Province:……..	Junggar Basin	Number:	3115
Priority or Boutique……	Priority		
Total Petroleum System:……	Lucaogou-Karamay/Ulho/Pindequan	Number:	311501
Assessment Unit:……..	Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clas	Number:	31150101
* 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?……. 5 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: 12 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 30 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)	2	median no.	15	max no.	40
Gas fields:……min. no. (>0)	_____	median no.	_____	max no.	_____

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	5	median size	20	max. size	300
Gas in gas fields (bcfg):……min. size	_____	median size	_____	max. size	_____

Assessment Unit (name, no.)
Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics, 31150101

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	350	750	1100
NGL/gas ratio (bngl/mmcfg)……	30	60	90

Gas fields:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……			
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)……	20	35	55
Sulfur content of oil (%)……	0	0.1	0.2
Drilling Depth (m) ……	500	2500	5000
Depth (m) of water (if applicable)……			

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

Assessment Unit (name, no.)
Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics, 31150101

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

1. China 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%)……		0	

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

Upper Paleozoic/Lower Mesozoic Nonmarine Coarse Clastics, AU 31150101, Undiscovered Field-Size Distribution