Go to Table of Contents

Go to index map

Continuous Gas
in Central Uplift/Northwestern Depression
Assessment Unit 31420103

Continuous gas in Central Uplift/Northwestern Depression Assessment Unit 31420103
Sichuan Basin Geologic Province 3142

Geologic Summary

Detailed map of this assessment unit

Assessment Input Data

Assessment Results

This assessment unit was not assessed quantitatively.

USGS PROVINCE: Sichuan Basin (3142) **GEOLOGIST:** R.T. Ryder

TOTAL PETROLEUM SYSTEM: Maokou/Longtang-Jialingjiang/Maokou/Huanglong (314201)

ASSESSMENT UNIT: Continuous Gas in Central Uplift/Northwestern Depression (31420103)

DESCRIPTION: The assessment unit is characterized by a continuous-type gas accumulation trapped in and above a deeply buried, overpressured pod of mature Permian source rocks in the central uplift and parts of the adjoining northwestern depression. Permian and Triassic carbonate units are the dominant reservoirs. Drilling depths to the accumulation range from about 2 to 5 km.

SOURCE ROCKS: The dominant source rocks are oil-prone marine argillaceous limestone with black shale of the Lower Permian Maokou Formation and gas-prone coal beds of the Upper Permian Longtang Formation. The source rock sequence of the Maokou Formation is located in the lower one-third of the formation and is about 50 to 75 m thick. Total organic carbon (TOC) values for the Maokou Formation source rocks range from 0.3 to 1.8 percent and average about 1 percent. The net thickness of coal beds in the Longtang Formation ranges from about 2 to 5 m.

MATURATION: The source rocks have been mature with respect to gas generation since about Early Cretaceous time. Although originally generated, oil is absent in the assessment unit probably because it has been thermally converted to gas. An absence of oil is consistent with the 2 to 3.5 vitrinite reflectance values for Permian coal beds in the central uplift and adjoining parts of the northwestern depression. Approximately 1 to 3 km of uplift and erosion has occurred in the Sichuan basin since the early Paleogene. A geothermal gradient of about 20 to 25°C/km probably accompanied oil and gas generation.

MIGRATION: Natural gas has remained essentially in the pod of mature Permian source rocks. Local to modest tectonic fracturing of the carbonate reservoirs has limited the vertical migration of gas to several hundreds of meters.

RESERVOIR ROCK: Primary reservoir rocks consist of limestone and dolomite of Early Permian (Maokou and Qixia Formations), Late Permian (Changxian Formation), Early Triassic (Jialingjiang Formation), and Middle Triassic (Leikoupo Formation) age. Reservoir quality is generally poor (porosity of 4 to 8 percent and permeability of ~0.1 mD) and, thus, usually tectonic fractures are required to improve gas deliverability.

TRAPS AND SEALS: The accumulation is trapped in a regionally extensive overpressured pod that encompasses the central uplift and the adjoining northern part of the northwestern depression. Lower and Middle Triassic evaporite, Lower Triassic marine mudstone, and Upper Triassic nonmarine mudstone and siltstone provide the regional seals.

REFERENCES:

Liu X.Z., Schneider, W., and Tan W.B., 1988, Lower Permian limestones as source rocks for thermal gas in south Sichuan, China: Erdöl Erdgas Kohle, v. 104, no. 2, p. 60-65.

Peng D.J. and Liu Y.H., 1994, Genetic mechanism of abnormal pressure, pressure seals and natural gas accumulation in carbonate reservoirs, Sichuan basin, *in* Law, B., Ulmishik, G., and Slavin, V., co-conveners, Abnormal pressures in hydrocarbon environments: American Association of Petroleum Geologists Hedberg Research Conference Proceedings [June 8-10, 1994, Golden, CO]: 12 p.

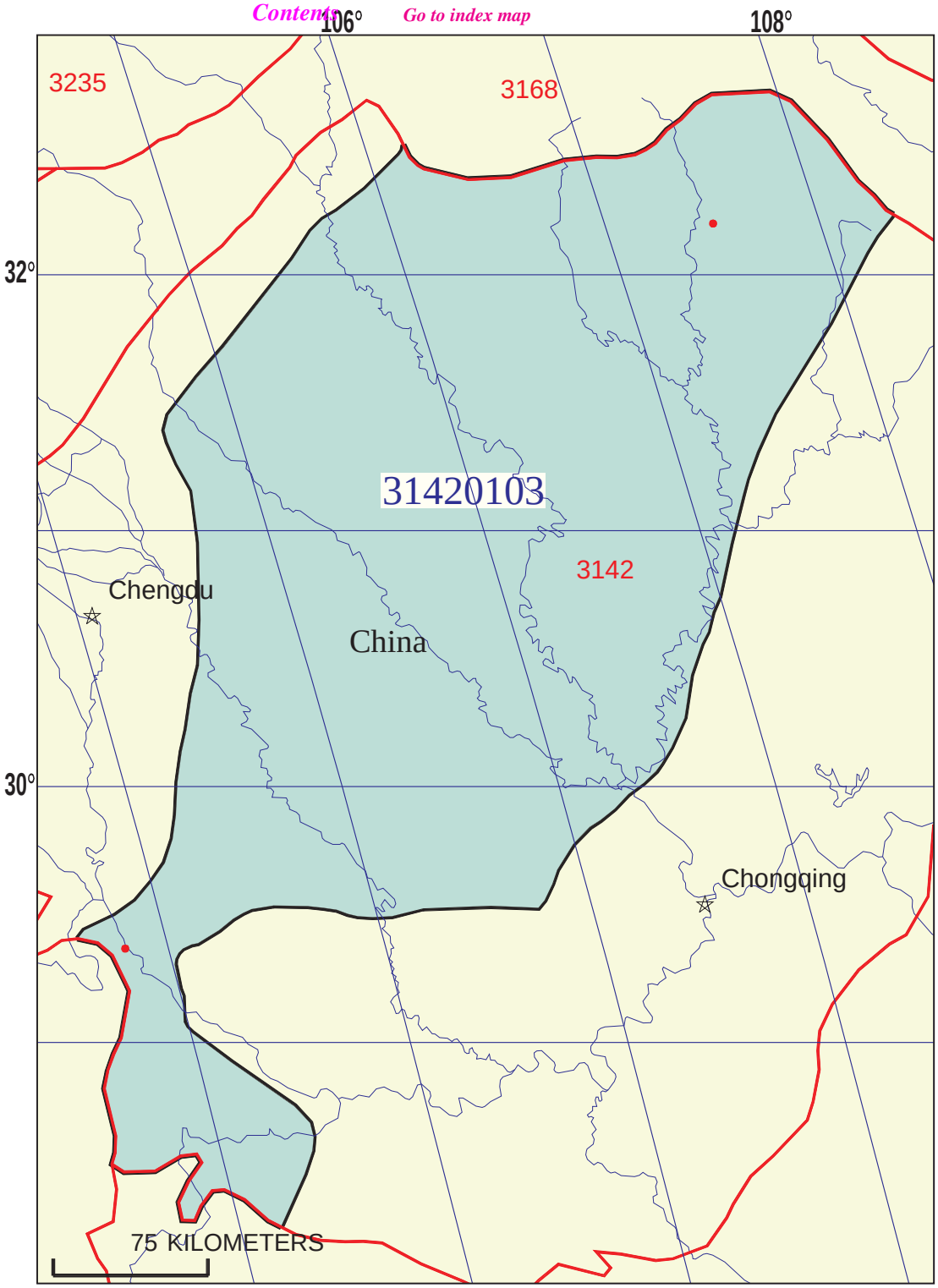
Ryder, R.T., Rice, D.D., Sun Z.C., Zhang Y.G., Qiu Y.Y., and Guo Z.W., 1994, Petroleum geology of the Sichuan basin, China–Report on U.S. Geological Survey and Chinese Ministry of Geology and Mineral Resources field investigations and meetings, October 1991: U.S. Geological Survey Open-File Report 94-426, 67 p.

Tang Z., 1989, Chapter 6–Carbonate reservoirs, *in* Zhang J.M., ed., Sichuan oil and gas field: Beijing, Petroleum Industry Press, p. 151-205.

Wang J. Q., Bao C., Lou Z.L. and Guo Z.W., 1989, Formation and development of the Sichuan basin, *in* Zhu X., ed., Chinese sedimentary basins: Amsterdam, Elsevier, p. 147-163.

Wang T.B. and Liu B., 1997, Characteristics and formation conditions of oil/gas fields (pools) in abnormal formation pressure environments in China, *in* Sun Z.C. and others, eds., Geology of fossil fuels–oil and gas: Proceedings of the 30th International Geological Congress, v. 18A, p. 17-32.

Zhang J.M., 1989, Chapter 5–Generation and evolution of oil and gas, *in* Zhang J.M., ed., Sichuan oil and gas field: Beijing, Petroleum Industry Press, p. 111-150.



Continuous Gas in Central Uplift/Northwestern Depression Assessment Unit - 31420103

EXPLANATION

- Hydrography
- Shoreline
- 3142 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 31420103 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

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

Date:…….. 12/16/99
Assessment Geologist:…….. R.T. Ryder
Region:…….. Asia Pacific Number: 3
Province:…….. Sichuan Basin Number: 3142
Priority or Boutique…… Boutique
Total Petroleum System:…… Maokou/Longtang-Jialingjiang/Maokou/Huanglong Number: 314201
Assessment Unit:…… Continuous Gas in Central Uplift/Northwestern Depression Number: 31420103
* Notes from Assessor Depths in excess of 4 km.

CHARACTERISTICS OF ASSESSMENT UNIT

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

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

Median size (grown) of discovered oil fields (mmboe):
1st 3rd _____ 2nd 3rd _____ 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……	
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size……	
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered field ≥ minimum size	
Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):……..	
4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field ≥ minimum size……	

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) _____ median no. _____ max no. _____
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 _____ median size _____ max. size _____
Gas in gas fields (bcfg):……min. size _____ median size _____ max. size _____

Assessment Unit (name, no.)

_____

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……			
NGL/gas ratio (bngl/mmcfg)……			

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)……			
Sulfur content of oil (%)……			
Drilling Depth (m) ……			
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.)

_____

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

1. _____ represents _____ areal % of the total assessment unit

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

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%)……			