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Jurassic Lacustrine Assessment Unit 31420201

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Sichuan Basin Geologic Province 3142

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

TOTAL PETROLEUM SYSTEM: Daanzhai-Daanzhai/Lianggaoshan (314202)

ASSESSMENT UNIT: Jurassic Lacustrine (31420201)

DESCRIPTION: The assessment unit is characterized by structurally and stratigraphically controlled oil fields with Lower Jurassic nonmarine limestone and sandstone reservoirs. The oil was derived from a pod of Lower Jurassic lacustrine source rock that approximately coincides with the central uplift of the basin. Commonly, oil accumulations in the assessment unit are overpressured.

SOURCE ROCKS: Lacustrine shale and mudstone in the Lower Jurassic Daanzhai Formation is the source rock. The net thickness of the source rock sequence is about 50 to 100 m. Total organic carbon (TOC) values range from about 0.6 to 2.2 percent and average about 1 percent. Type II kerogen is the dominant kerogen.

MATURATION: The source rocks have been mature with respect to oil generation since Late Cretaceous time. Higher than average gas to oil ratios in the oils and vitrinite reflectance (% Ro max) values ~1 to 1.35 indicate that some gas was generated. A geothermal gradient of about 20 to 25°C/km probably accompanied oil and gas generation.

MIGRATION: Most oil was trapped in the pod of mature source rocks. Several fields located as much as 100 km from the pod suggest either lateral migration of that magnitude or additional pods of mature lacustrine source rock. Little vertical migration of oil is suggested.

RESERVOIR ROCK: Reservoir rocks consist of 10-to-20 m-thick, pelecypod-bearing bioclastic limestone (Lower Jurassic Daanzhai Formation) of lacustrine origin and 20- to 30-m-thick quartzose sandstone and siltstone (Lower Jurassic Lianggaoshan Formation) of fluvial-lacustrine origin. Both reservoir units are closely associated with lacustrine source rocks. Generally, their quality is poor and they depend on secondary porosity provided by dissolution pores and vugs and open tectonic fractures for commercial production. Porosity in the better reservoirs ranges from 4 to 11 percent and averages about 8 percent and permeability ranges from 0.1 to several hundred millidarcies and averages about 10 mD.

TRAPS AND SEALS: Major traps are broad, basement-involved anticlines, structural terraces, stratigraphic pinchouts, and combination structural-stratigraphic traps. Middle Jurassic, Upper Jurassic, and Lower Cretaceous nonmarine red mudstone units provide regional seals.

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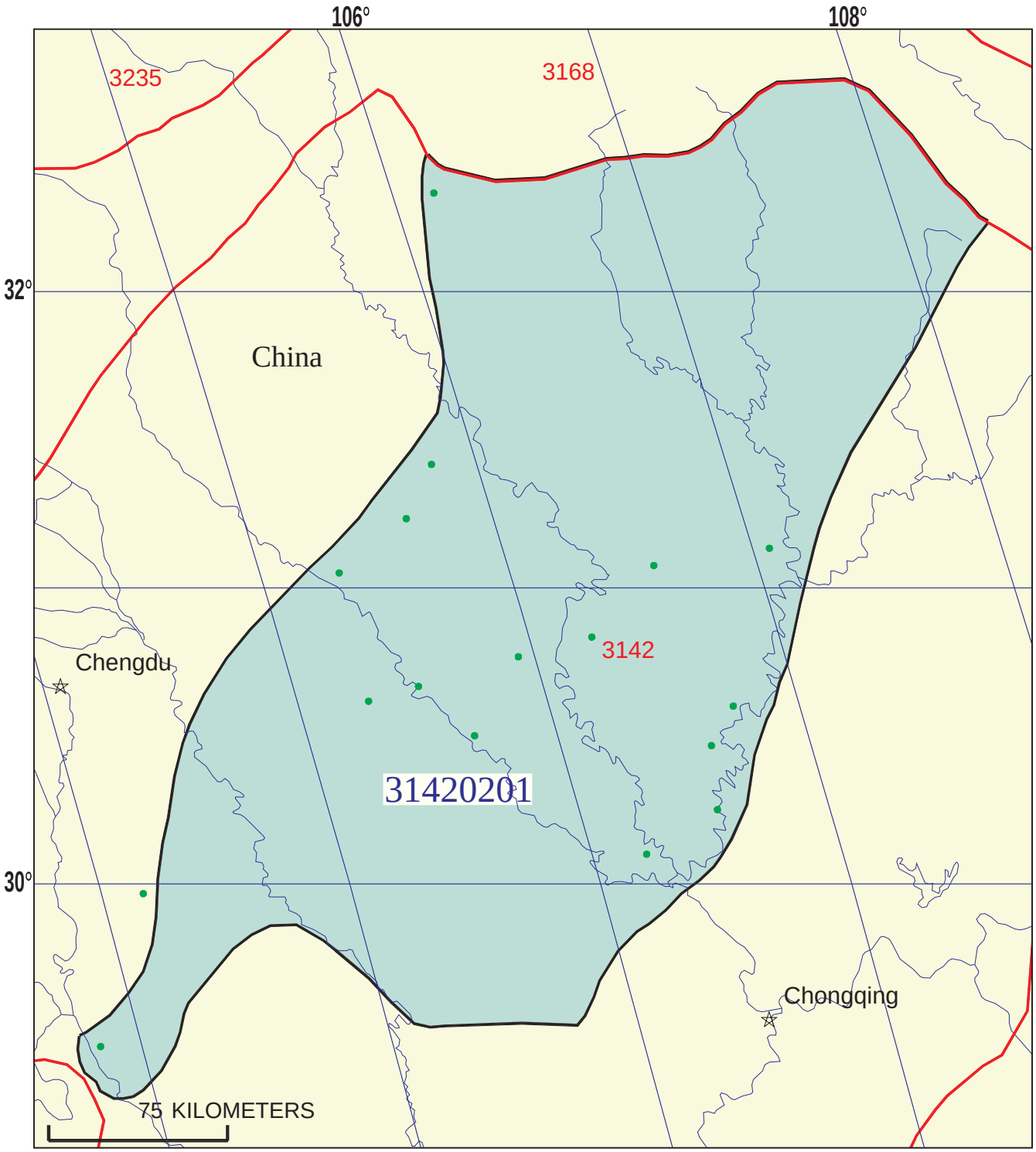

Jurassic Lacustrine Assessment Unit - 31420201

EXPLANATION

- Hydrography
- Shoreline
- 3142 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 31420201 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:……..	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:……	Daanzhai-Daanzhai/Lianggaoshan	Number:	314202
Assessment Unit:……	Jurassic Lacustrine	Number:	31420201
* 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?……. 1 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 6 2nd 3rd 2 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.	10	max no.	25
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	1	median size	2	max. size	20
Gas in gas fields (bcfg):……min. size	_____	median size	_____	max. size	_____

Assessment Unit (name, no.)
Jurassic Lacustrine, 31420201

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	2500	5000	7500
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)……	30	38	50
Sulfur content of oil (%)……	0.04	0.1	0.8
Drilling Depth (m) ……	1500	2000	3000
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.)
Jurassic Lacustrine, 31420201

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%)……			

Jurassic Lacustrine, AU 31420201
Undiscovered Field-Size Distribution