



Basin Centered Gas (Continuous) in Ordovician Carbonate and Permian Sandstone Assessment Unit 31280201



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-  Ordos Basin Geologic Province 3128

USGS PROVINCE: Ordos Basin (3128)

GEOLOGIST: R.T. Ryder

TOTAL PETROLEUM SYSTEM: Yanchang-Yanan (312801)

ASSESSMENT UNIT: Jurassic/Triassic Fluvial and Lacustrine Sandstone (31280101)

DESCRIPTION: The assessment unit is characterized by oil fields trapped in stratigraphic traps and compaction anticlines. Upper Triassic and Lower Jurassic sandstone are the dominant reservoirs. The fields are concentrated in a pod of mature Upper Triassic source rocks that occupies the southwestern and south-central parts of the basin. Most of the fields are trapped on the gently westward-dipping homoclinal flank of the basin but several are trapped in anticlines along the thrust-faulted, western margin of the basin.

SOURCE ROCKS: Lacustrine shale and mudstone in the Upper Triassic Yanchang Formation is the dominant source rock. The composite thickness of the Yanchang source rock sequence is as much as several hundred meters. Typically, source rocks in the Yanchang Formation range in total organic carbon (TOC) from 1.2 to 4.4 percent and contain largely Type II kerogen.

MATURATION: The Yanchang Formation has been mature with respect to oil generation in the southern part of the basin since about Early Cretaceous time whereas the Yanchang source rocks are immature with respect to oil in the northern part of the basin. A geothermal gradient of about 25°C/km probably accompanied oil generation but a Middle to Late Jurassic heat pulse caused by a brief period of volcanism may have assisted maturation. The Yanchang Formation is immature with respect to gas generation.

MIGRATION: Most oil in the assessment unit has migrated laterally less than about 10 km from the pod of mature Upper Triassic source rocks before entrapment. Vertical oil migration of several hundred meters probably occurred through thick stacks of composite fluvial sandstone.

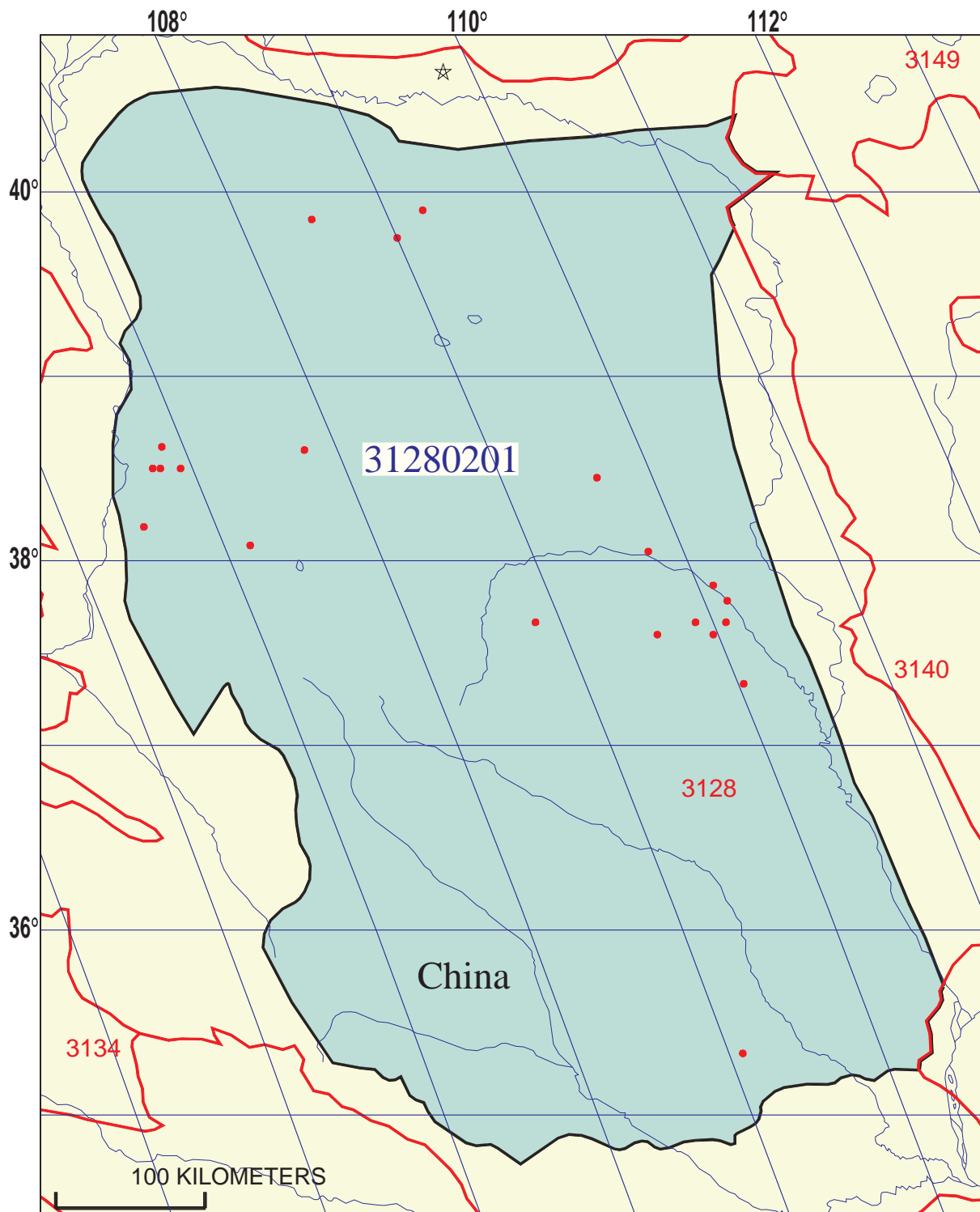
RESERVOIR ROCK: The majority of reservoir rocks consist of sandstone and conglomeratic sandstone of fluvial origin in the Lower Jurassic Yanan and Fuxian Formations. Locally, where the sandstones are coarse grained and conglomeratic, the reservoir quality is good. However, most commonly the reservoir quality of the sandstone is fair to poor. Secondary reservoir rocks consist of fluvial, lacustrine deltaic, and lacustrine turbidite sandstone in the Yanchang Formation. Typically these reservoirs have very low permeability values largely because of their fine to very-fine grain size and high feldspathic content.

TRAPS AND SEALS: Stratigraphic traps (facies-change and valley-fill varieties) and compaction anticlines formed over buried hills account for most of the traps. Thin, moderately continuous lacustrine shale and mudstone of the Upper Triassic and Lower and Middle Jurassic sequences are the best seal rocks.

REFERENCES:

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- Moore, P. S., Hobday, D. K., Mai H., and Sun Z. C., 1986, Comparison of selected non-marine petroleum-bearing basins in Australia and China: Australian Petroleum Exploration Association Journal, v. 26, p. 285-309.
- Sun Z. C., Xie Q. Y., and Yang J. J., 1989, Ordos basin—A typical example of an unstable cratonic interior superimposed basin, *in* Zhu X., ed., Chinese sedimentary basins: Sedimentary basins of the world: Elsevier, p. 63-75.
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Assessment Unit - 31280201

EXPLANATION

- Hydrography
- Shoreline
- 3128 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 31280201 — Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

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

Date:..... 9/29/99
 Assessment Geologist:..... R.T. Ryder
 Region:..... Asia Pacific Number: 3
 Province:..... Ordos Basin Number: 3128
 Priority or Boutique..... Boutique
 Total Petroleum System:..... Taiyuan/Shanxi-Majiagou/Shihezi Number: 312802
 Assessment Unit:..... Basin Centered Gas (Continuous) in Ordovician Carbonat Number: 31280201
 * Notes from Assessor

CHARACTERISTICS OF ASSESSMENT UNIT

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

What is the minimum field size?..... _____ mmmboe 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:

- | <u>Attribute</u> | <u>Probability of occurrence (0-1.0)</u> |
|--|--|
| 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 _____

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

<u>Oil Fields:</u>	minimum	median	maximum
Gas/oil ratio (cfg/bo).....	_____	_____	_____
NGL/gas ratio (bngl/mmcf).....	_____	_____	_____
<u>Gas fields:</u>	minimum	median	maximum
Liquids/gas ratio (bngl/mmcf).....	_____	_____	_____
Oil/gas ratio (bo/mmcf).....	_____	_____	_____

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

<u>Oil Fields:</u>	minimum	median	maximum
API gravity (degrees).....	_____	_____	_____
Sulfur content of oil (%).....	_____	_____	_____
Drilling Depth (m)	_____	_____	_____
Depth (m) of water (if applicable).....	_____	_____	_____
<u>Gas Fields:</u>	minimum	median	maximum
Inert gas content (%).....	_____	_____	_____
CO ₂ content (%).....	_____	_____	_____
Hydrogen-sulfide content (%).....	_____	_____	_____
Drilling Depth (m).....	_____	_____	_____
Depth (m) of water (if applicable).....	_____	_____	_____

**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

<u>Oil in Oil Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	_____	_____
Portion of volume % that is offshore (0-100%):.....	_____	_____	_____
 <u>Gas in Gas Fields:</u>	 minimum	 median	 maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	_____	_____
Portion of volume % that is offshore (0-100%):.....	_____	_____	_____