U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
Charles G. Groat, Director

CIRCUM-PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES

CIRCUM-PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES
Michel T. Halbouty, Founder

CIRCUM-PACIFIC MAP PROJECT
John A. Reinemund, Director
George Gryc, General Chair

ENERGY-RESOURCES MAP OF THE CIRCUM-PACIFIC REGION

PACIFIC BASIN SHEET

KENNETH J. DRUMMOND
Chairman, Northeast Quadrant Panel

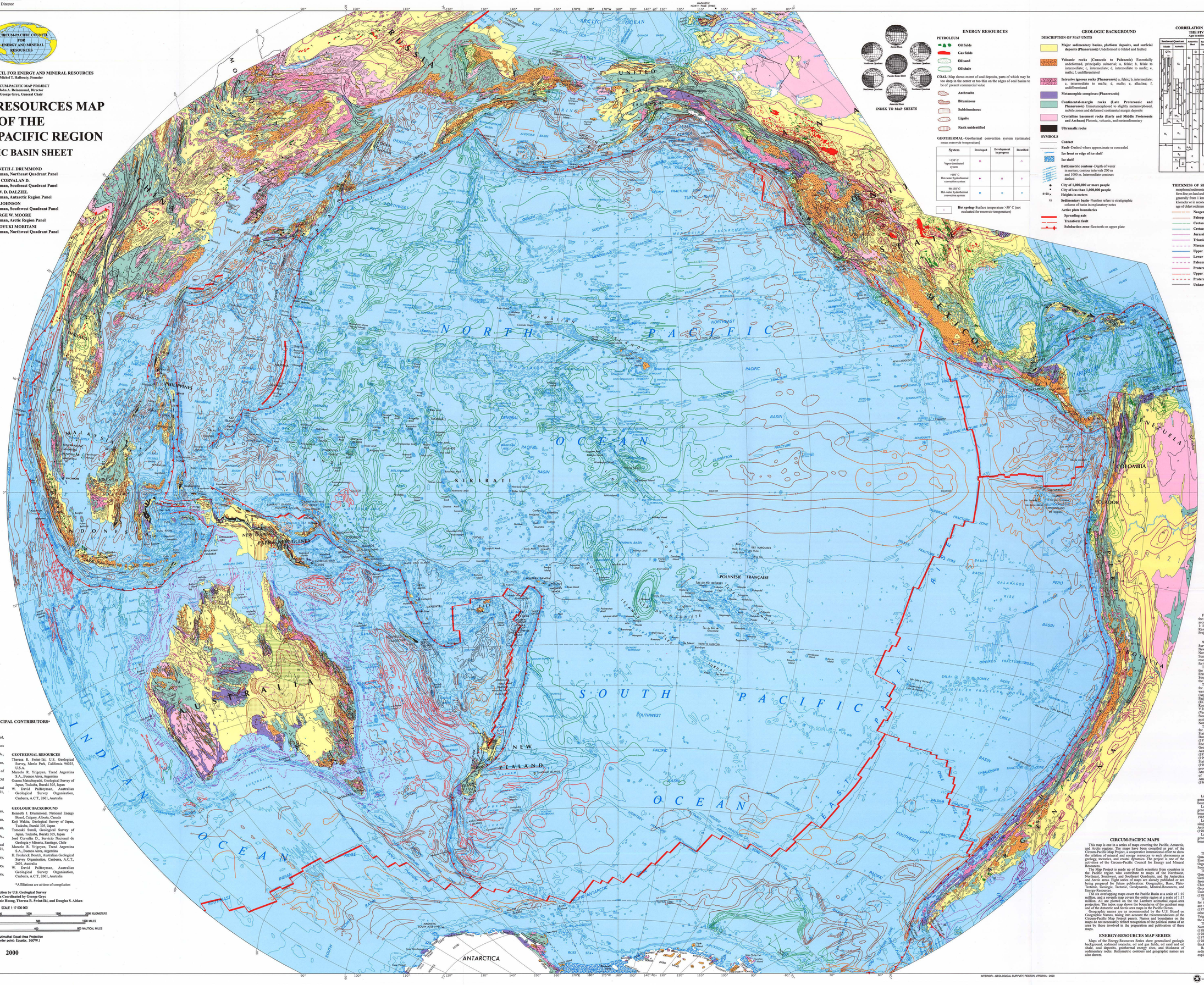
JOSE CORVALAN D.
Chairman, Southeast Quadrant Panel

IAN W. D. DALZIEL
Chariman, Antarctic Region Panel

R. W. JOHNSON
Chairman, Southwest Quadrant Panel

GEORGE W. MOORE
Chairman, Arctic Region Panel

TOMOYUKI MORITANI
Chairman, Northwest Quadrant Panel



INDEX TO MAP SHEETS

ENERGY RESOURCES

PETROLEUM

- Oil fields
- Gas fields
- Oil sand
- Oil shale

COAL–Map shows extent of coal deposits, parts of which may be too deep in the center or too thin on the edges of coal basins to be of present commercial value

- Anthracite
- Bituminous
- Subbituminous
- Lignite
- Rank unidentified

GEOTHERMAL–Geothermal convection system (estimated mean reservoir temperature)

System	Developed	Development in progress	Identified
>150° C Vapor-dominated system	▲	▲	△
>150° C Hot-water hydrothermal convection system	●	○	○
90–150° C Hot-water hydrothermal convection system	●	○	○

Hot spring–Surface temperature >50° C (not evaluated for reservoir temperature)

GEOLOGIC BACKGROUND

DESCRIPTION OF MAP UNITS

Major sedimentary basins, platform deposits, and surficial deposits (Phanerozoic) Undeformed to folded and faulted

Volcanic rocks (Cenozoic to Paleozoic) Essentially undeformed, principally subaerial; *a*, felsic; *b*, felsic to intermediate; *c*, intermediate; *d*, intermediate to mafic; *e*, mafic; *f*, undifferentiated

Intrusive igneous rocks (Phanerozoic) *a*, felsic; *b*, intermediate; *c*, intermediate to mafic; *d*, mafic; *e*, alkaline; *f*, undifferentiated

Metamorphic complexes (Phanerozoic)

Continental-margin rocks (Late Proterozoic and Phanerozoic) Unmetamorphosed to slightly metamorphosed, mobile zones and deformed continental margin deposits

Crystalline basement rocks (Early and Middle Proterozoic and Archean) Plutonic, volcanic, and metasedimentary

Ultramafic rocks

SYMBOLS

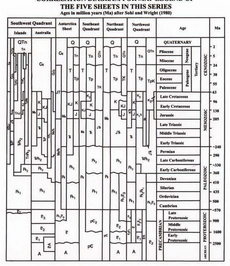
- **Contact**
- **Fault**–Dashed where approximate or concealed
- **Ice front or edge of ice shelf**
- **Ice shelf**
- **Bathymetric contour**–Depth of water in meters; contour intervals 200 m and 1000 m. Intermediate contours dashed
- **City of 1,000,000 or more people**
- **City of less than 1,000,000 people**
- 4190 ▲ **Heights in meters**
- 12 **Sedimentary basin**–Number refers to stratigraphic column of basin in explanatory notes

Active plate boundaries

- **Spreading axis**
- **Transform fault**
- **Subduction zone**–Sawteeth on upper plate

CORRELATION DIAGRAM FOR MAP LEGEND OF THE FIVE SHEETS IN THIS SERIES

Ages in million years (Ma) after Salvi and Wright (1988)



THICKNESS OF SEDIMENTARY ROCKS–The thickness of unmetamorphosed sedimentary strata is indicated by isopachs, or indirectly, by structure form line; on land and in nearshore basins the contours are in kilometers, starting generally from 1 km; in oceanic areas thicknesses are shown in tenths of a kilometer or in seconds of two-way time (contours in seconds). Color indicates age of oldest sediment overlying basement. Dashed where approximate.

- **Neogene**
- **Paleogene**
- **Cretaceous**
- **Cretaceous-Jurassic**
- **Jurassic-Triassic**
- **Triassic**
- **Mesozoic and/or Cenozoic**
- **Upper Paleozoic**
- **Lower Paleozoic**
- **Paleozoic to Mesozoic**
- **Proterozoic**
- **Upper Precambrian**
- **Proterozoic to Paleozoic**
- **Unknown**

COMPILERS AND PRINCIPAL CONTRIBUTORS*

PETROLEUM RESOURCES
Kenneth J. Drummond, National Energy Board, Calgary, Alberta, Canada
Guillermo P. Salas, Consejo de Recursos Minerales, Mexico, D.F.? Mexico
Marcelo R. Yrigoyen, Trend Argentina S.A., Buenos Aires, Argentina
Tomoaki Sumii, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
Hiro'o Natori, Geological Survey of Japan,Tsukuba, Ibaraki 305, Japan
Masakazu Kato, Japan National Oil Corporation, Tokyo 100, Japan
W. David Palfreyman, Australian Geological Survey Organisation, Canberra, A.C.T., 2601, Australia

COAL DEPOSITS
Keizo Fujii, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
Eiji Inoue, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
Masatoshi Sugabe, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
Marcelo R. Yrigoyen, Trend Argentina S.A., Buenos Aires, Argentina
W. David Palfreyman, Australian Geological Survey Organisation, Canberra, A.C.T., 2601, Australia
Gordon H. Wood, U.S. Geological Survey, Reston, Virginia, 20192, U.S.A.
Paul W. Richards, U.S. Geological Survey, Reston, Virginia, 20192, U.S.A.
William V. Bour, III, U.S. Geological Survey, Reston, Virginia, 20192, U.S.A.

GEOTHERMAL RESOURCES
Theresa R. Swint-Iki, U.S. Geological Survey, Menlo Park, California 94025, U.S.A.
Marcelo R. Yrigoyen, Trend Argentina S.A., Buenos Aires, Argentina
Osamu Matsubayashi, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
W. David Palfreyman, Australian Geological Survey Organisation, Canberra, A.C.T., 2601, Australia

GEOLOGIC BACKGROUND
Kenneth J. Drummond, National Energy Board, Calgary, Alberta, Canada
Koji Wakita, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
Tomoaki Sumii, Geological Survey of Japan, Tsukuba, Ibaraki 305, Japan
José Corvalán D., Servicio Nacional de Geología y Minería, Santiago, Chile
Marcelo R. Yrigoyen, Trend Argentina S.A., Buenos Aires, Argentina
H. Frederick Doutch, Australian Geological Survey Organisation, Canberra, A.C.T., 2601, Australia
W. David Palfreyman, Australian Geological Survey Organisation, Canberra, A.C.T., 2601, Australia

*Affiliations are at time of compilation

Map Production by U.S. Geological Survey
Compilation Coordinated by George Gryc
Cartography by Fran R. Mills, Connie Hoong, Theresa R. Swint-Iki, and Douglas S. Aitken

SCALE 1:17 000 000

Lambert Azimuthal Equal-Area Projection
(Map center point: Equator, 160°W.)

2000

SOURCES OF DATA

Full lists of references cited as sources of data for the map elements shown on this sheet are listed in the accompanying explanatory notes booklet and on the 1:10 million scale quadrant maps of the Energy-Resources Map series of the Circum-Pacific Map Project.

ENERGY RESOURCES

W. David Palfreyman, Australian Geological Survey Organisation, compiled data for Australia, New Zealand, and the South Pacific Islands, and the Northwest Quadrant overlap is compiled by Tomoaki Sumii, Geological Survey of Japan. Geothermal resources data are compiled by W. David Palfreyman for the Southeast Quadrant region.

The principal sources of petroleum and coal data for the Northwest Quadrant region for Far East Soviet is Eremenko and others (1978); for China and Southeast Asia, United Nations ESCAP (1985); for the United States, Drummond (1986).

The principal sources of petroleum and coal data for the Southeast Quadrant region for South America were especially prepared by M.R. Yrigoyen (Argentina), R. Solis Ibarra (Bolivia), E. Gonzalez Pacheco (Chile), Empresa Colombiana de Petroleos (ECOPETROL), and Ingeominas (Colombia), G. Calderon (Ecuador), D. del Aguila, V.R. Gyngollen, and V.R. Melgar (Peru), and M. Fonseca y Bellizia (Venezuela). Geothermal resource data are from Stone (1985), and Waring (1965), and updated with assistance of individuals cited in the Explanatory Notes.

The principal sources of petroleum and coal data for the Northeast Quadrant region for the United States, Crowell and Schell (1977), Curtil (1972), Duncan and Swanson (1965), Moen (1978), Van Wert (1972), Vlassiuk and Curtil (1972); for Canada, Geological Survey of Canada (1969), Geological Survey of Canada (1981); for Mexico, Acevedo and Dunn (1980), and Salas and Cortes (1978); and for South America, Yrigoyen and others (1991). Geothermal resource data for the United States is from Muffler (1979) and Berry and others (1980). Computer plots of the geothermal data were provided by Ronald H. Smith, National Oceanic and Atmospheric Administration. The principal sources of geothermal data for South America, Central America, and Canada are Stone (1985), and Waring (1965).

GEOLOGIC BACKGROUND

Land geology for the Southwest Quadrant is generalized from Deutch (1988). Active plate boundaries are generalized from Moore (1981).

Land geology for the Northwest Quadrant region is generalized from Inoue (1988). Active plate boundaries are generalized from Nishiwaki (1981, 1984).

Land geology for the Southeast Quadrant region is simplified and generalized from Corvalan (1985). Active plate boundaries are generalized from Moore (1982), modified in 1991.

Land geology for the Northeast Quadrant region is generalized from Drummond (1983). Active plate boundaries are generalized from Moore (1981).

SEDIMENTARY BASINS

The sediment-thickness data for the Southwest Quadrant was compiled by W. David Palfreyman and Erwin Scheibner, of the Australian Geological Survey Organisation. Principal source of data for Australia is from Bureau of Mineral Resources (1981).

The sediment-thickness data for the Northwest Quadrant region was compiled by Tomoaki Sumii, Geological Survey of Japan. The principal data are from Eremenko and others (1978), Khain (1985), Chinese Academy of Geological Science, Institute of Geomechanics (1984), Ludwig and Houtz (1979), United Nations ESCAP (1985), and Drummond (1986).

The principal sources of sediment-thickness data for the Southeast Quadrant region for marine areas are Case and Holcombe (1980), Ludwig and Houtz (1979), Martin (1980), and Westbrook and others (1984). Land isopachs were compiled by M. R. Yrigoyen with the assistance of individuals cited in the accompanying Explanatory Notes.

The principal sources of isopach data for the Northeast Quadrant region are Case and Holcombe (1980), Conrad and others, (1984), Frezon and others (1983), Grantz and May (1982), Ludwig and Houtz (1979), Martin (1980), and Westbrook and others, (1984). Salmon Bloch assisted in compiling sediment-thickness data.

Representative columnar sections for selected sedimentary basins are shown in the accompanying explanatory notes booklet.

CIRCUM-PACIFIC MAPS

This map is one in a series of maps covering the Pacific, Antarctic, and Arctic regions. The maps have been compiled as part of the Circum-Pacific Map Project, a cooperative international effort to show the distribution and interpretation of various kinds of geological, geophysical, geologic, tectonics, and crustal dynamics. The project is one of the activities of the Circum-Pacific Council for Energy and Mineral Resources.

The Map Project is made up of Earth scientists from countries in the Pacific region who contribute to maps of the Northwest, Northeast, Southwest, and Southeast Quadrants, and the Antarctica and Arctic areas. Eight series of maps are already published or are being prepared for future publication: Geographic, Base, Plate-Tectonic, Geologic, Tectonic, Geodynamics, Mineral-Resources, and Energy-Resources.

The Geographic mapping maps cover the Pacific Basin at a scale of 1:10 million, and a seventh map covers the entire region at a scale of 1:17 million. All are plotted on the the Lambert azimuthal equal-area projection. The index map shows the boundaries of the quadrant map and of the Antarctic and Arctic area maps in the Pacific Ocean.

Geographic names are as recommended by the U.S. Board on Geographic Names, taking into account the recommendations of the Circum-Pacific Map Project panels. Names and boundaries on the maps do not necessarily reflect recognition of the political status of an area by those involved in the preparation and publication of these maps.

ENERGY-RESOURCES MAP SERIES

Maps of the Energy-Resources Series show generalized geologic background, sedimentary isopachs, oil and gas fields, oil sand and oil shale, coal deposits, geothermal energy sites, and thickness of sedimentary rocks. Bathymetric contours and geographic names are also shown.

Base by U.S. Geological Survey, 1989

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