CIRCUM-PACIFIC MAP SERIES
MAP CP-41
Explanatory pamphlet accompanies map

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

CIRCUM - PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES

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

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

PLATE-TECTONIC MAP OF THE CIRCUM-PACIFIC REGION

ARCTIC SHEET

GEORGE W. MOORE, CHAIR, ARCTIC PANEL

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GEOMAGNETIC POLARITY TIME SCALE
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EARTHQUAKE EPICENTERS
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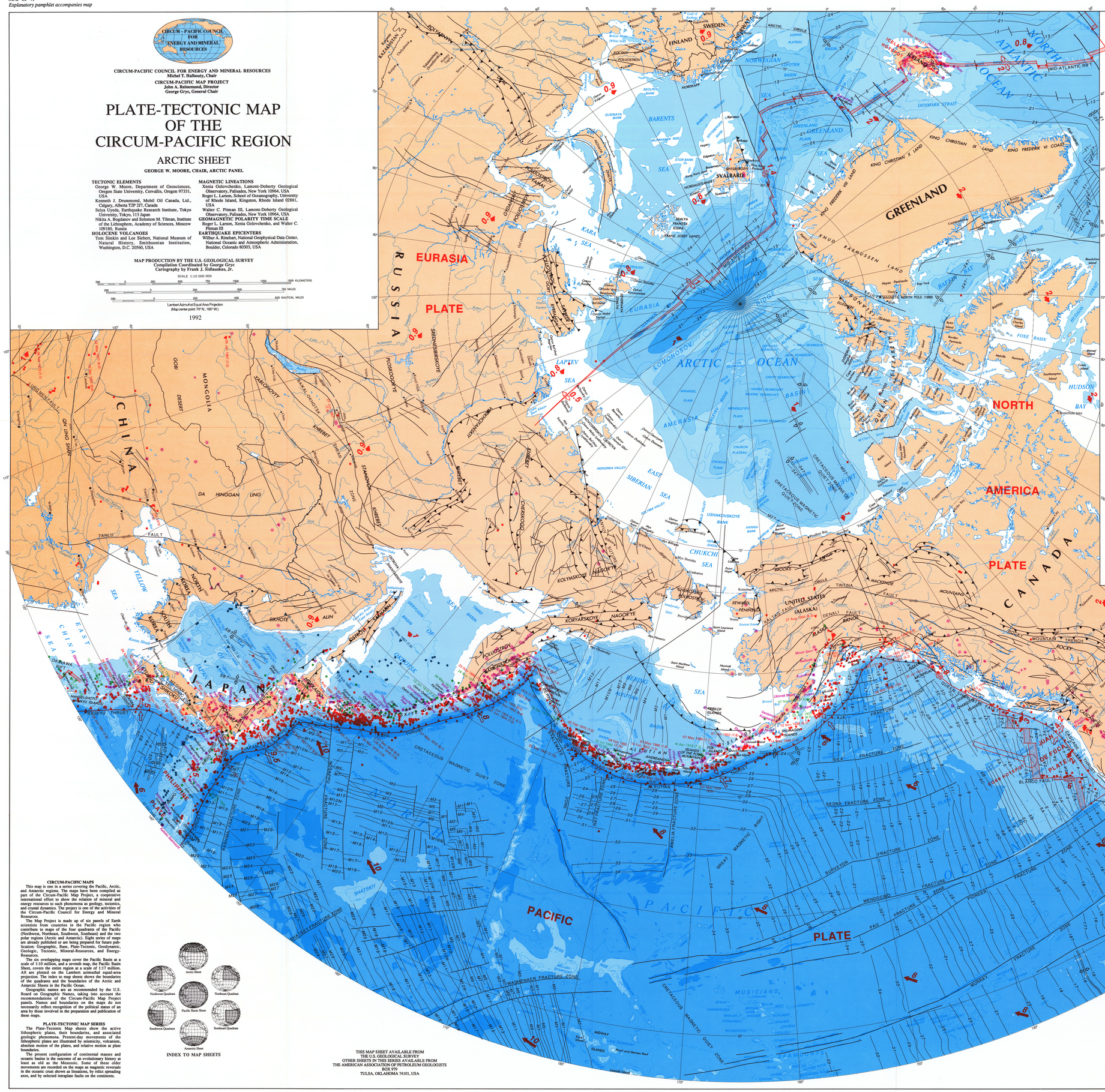
MAP PRODUCTION BY THE U.S. GEOLOGICAL SURVEY
Compilation Coordinated by George Gryc
Cartography by Frank J. Sullivan, Jr.

SCALE 1:10 000 000

Lambert Azimuthal Equal Area Projection
(Map center point: 70° N., 165° W.)

1992



EXPLANATION

ACTIVE TECTONIC PLATES

Subduction zone—Surface trace of a principal fault in a Benioff seismic zone, a dipping layer of earthquake foci at the top of a descending lithospheric plate; barbs on upper plate

Active transform fault—The principal fault at a broad strike-slip plate boundary

Active spreading ridge—Pattern shows oceanic crust formed during the past 1 million years

INTRAPLATE STRUCTURES

Inactive spreading ridge—Also includes minor active spreading ridges

Major intraplate fault—Arrows show relative displacement of strike-slip fault; barbs on upper plate of thrust fault; ticks on downdropped side of normal fault; dashed where approximately located

MOTION VECTORS

Relative plate movement—In cm/yr. After the model of DeMets and others (1990), a computer generated best fit of 1,122 worldwide measurements of rate from seafloor spreading rate, slip vector from transform faults and earthquake mechanisms; entire rate assigned to principal plate boundary where movement is distributed over several faults

6 — Strike-slip plate boundary

5 — Converging plate boundary

2 — Diverging plate boundary

10 — Absolute motion—Derived from relative motion calculated by a best fit of the age and trend of lines of volcanoes formed as the plates move over hotspots; after Gripp and Gordon (1990)

ACTIVE HOTSPOT

Trace of plate movement—Circle shows approximate hotspot position; bar shows movement of associated plate across it during the past 10 m.y.; based on the absolute-motion model of Gripp and Gordon (1990)

MAGNETIC LINEATION

27 — Magnetic anomaly—Label shows correlation with geomagnetic polarity time scale

EARTHQUAKE EPICENTERS

Focal depth—Colored dots indicate 1964 through 1987 magnitude 5.7 through 7.4 events; triangles of matching colors labeled by date and magnitude indicate 1899 through 1990 events of magnitude 7.5 or greater (generally surface-wave magnitude)

Depth (km): 0–70, 70–300, 300–700

06 Mar 1988 (7.6)
15 Jun 1911 (8.7)
25 May 1907 (7.9)

VOLCANIC CENTERS

Active in historic time—Generally during past 1,000 yr and documented during or soon after eruption; volcano named in color if active from 1964 to 1992

Active in Holocene time—During past 10,000 yr; not documented historically

Holocene thermal activity—Includes solfataras and volcano-related thermal springs; no direct evidence for Holocene volcanic eruption

BASE MAP

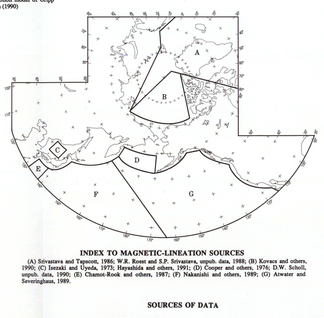
Bathymetric contours—Depth of water in meters

0–200
200–2000
2000–4000
4000–6000
6000–8000
8000—

City—1,000,000 or more people

City—less than 1,000,000 people

International boundary

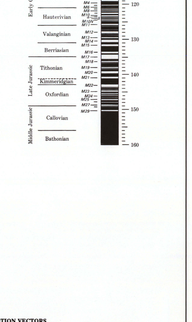


INDEX TO MAGNETIC-LINEATION SOURCES

(A) Srivastava and Tapscott, 1986; W.R. Roest and S.P. Srivastava, unpub. data, 1988; (B) Kovacs and others, 1990; (C) Inoizaki and Uyeda, 1975; Hayashida and others, 1991; (D) Cooper and others, 1976; D.W. Scholl, unpub. data, 1990; (E) Chamot-Rook and others, 1987; (F) Nakanishi and others, 1989; (G) Alvarez and Sevrastjanian, 1989.

GEOMAGNETIC POLARITY TIME SCALE

During periods shown in black, the Earth's north and south magnetic poles conformed to those at present, and during periods shown in white, the poles were reversed; numbers and letters identify magnetic intervals and reversals recorded by systematically oriented magnetization of mineral grains in seafloor lava and mapped as magnetic lineations (after Lallemonde and others, 1977; Larson and Hilde, 1975; and Van Hinte, 1976).



SOURCES OF DATA

TECTONIC ELEMENTS
Principal sources were Beikman (1980), Gerstz and others (1990), King (1969), King and Beikman (1974), Ma (1989), Mexico Direccion General de Geografia (1981), Okulitch and others (1989), Stewart and Johnsonn (1979), Tilman and others (1979), Trifonov (1987), Wheeler and others (1988), and Zonenshain and others (1990). Additional contributions were provided by Robert A. Duncan, Oregon State University; Kazuya Fujita, Michigan State University; Hubert Gabrielse, Geological Survey of Canada; Thomas W.C. Hilde, Texas A&M University; Boris A. Natal'in, Russia Institute of Tectonics and Geophysics; Chikao Nishiwaki, Japan Institute for International Mineral Resources Development; Tomatsu Nozawa, Geological Survey of Japan; Leonid M. Parfenov, Russia Institute of Geology; Guillermo P. Salas, Mexico Consejo de Recursos Minerales; and Maurice J. Terman, U.S. Geological Survey.

MAGNETIC LINEATIONS
See index map for principal sources. Additional contributions from colleagues at Lamont-Doherty Geological Observatory.

HOLOCENE VOLCANOES
Plotted with additions from the computerized Smithsonian Institution Volcano Reference file (Simkin and others, 1981) by the U.S. Geological Survey, Reston, Virginia. The contributions to the file by many compilers of the International Association of Volcanology and the Volcanological Society of Japan are especially acknowledged. Submarine-rift volcanism is not included.

EARTHQUAKE EPICENTERS
Compiled from the Earthquake Data File of the U.S. Geological Survey and computer plotted at the National Oceanic and Atmospheric Administration.

PLATE-MOTION VECTORS
Absolute-motion vectors plotted from the plate-rotation poles and angular velocities of Gripp and Gordon (1990). Relative-motion vectors from DeMets and others (1990) and Gripp and Gordon (1990).

BASE MAP
From the Arctic Sheet of the Geographic Map of the Circum-Pacific Region, American Association of Petroleum Geologists (1990), on which the bathymetry was compiled by Frank J. Sullivan, Jr., U.S. Geological Survey, Reston, Virginia, and the topography by Thomas A. Berkman, Department of Geosciences, Oregon State University, Corvallis, Oregon. Latitude and longitude grid lines, shorelines, and drainage are computer plotted.

CIRCUM-PACIFIC MAPS

This map is one in a series covering the Pacific, Arctic, and Antarctic regions. The maps have been compiled as part of the Circum-Pacific Map Project, a cooperative international effort to show the relation of mineral and energy resources to such phenomena as geology, 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 six panels of Earth scientists from countries in the Pacific region who contribute to maps of the four quadrants of the Pacific (Northwest, Northeast, Southwest, Southeast) and the two polar regions (Arctic and Antarctic). Eight series of maps are already published or are being prepared for future publication: Geographic, Base, Plate-Tectonic, Geodynamic, Geologic, Tectonic, Mineral-Resources, and Energy-Resources.

The six overlapping maps cover the Pacific Basin at a scale of 1:10 million, and a seventh map, the Pacific Basin Sheet, covers the entire region at a scale of 1:17 million. All are plotted on the Lambert azimuthal equal-area projection. The index to map sheets shows the boundaries of the quadrants and the boundaries of the Arctic and Antarctic Sheets 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.

PLATE-TECTONIC MAP SERIES

The Plate-Tectonic Map sheets show the active lithospheric plates, their boundaries, and associated geologic phenomena. Present-day movements of the lithospheric plates are illustrated by seismicity, volcanism, absolute motion of the plates, and relative motion at plate boundaries.

The present configuration of continental masses and oceanic basins is the outcome of an evolutionary history at least as old as the Mesozoic. Some of these older movements are recorded on the maps as magnetic reversals in the oceanic crust shown as lineations, by relict spreading axes, and by selected intraplate faults on the continents.

INDEX TO MAP SHEETS

THIS MAP SHEET AVAILABLE FROM
THE U.S. GEOLOGICAL SURVEY
OTHER SHEETS IN THIS SERIES AVAILABLE FROM
THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
BOX 979
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Base by U.S. Geological Survey, 1989

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