USGS
science for a changing world

To Accompany Map CP-49

Explanatory Notes for the Geologic Map of the Circum-Pacific Region, Pacific Basin Sheet

By KENNETH J. DRUMMOND, JOSE CORVALAN D., H. FREDERICK DOUTCH, R.H. NEEDHAM, TAMOTSU NOZAWA, YOJI TERAOKA, TAKASHI YOSHIDA, TADASHI SATO, CAMPBELL CRADDOCK, FLOYD W. MCCOY, GEORGE W. MOORE, ANNE L. GARTNER, THERESA R. SWINT-IKI, *and* GEORGE GRYC

CIRCUM-PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES

2000
U.S. Department of the Interior
U.S. Geological Survey

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

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

EXPLANATORY NOTES FOR THE GEOLOGIC MAP OF THE CIRCUM-PACIFIC REGION PACIFIC BASIN SHEET

Scale: 1:17,000,000

By

Kenneth J. Drummond, National Energy Board, Calgary, Alberta T2P 3H2, Canada

José Corvalán D., Servicio Nacional de Geología y Minería, Santiago, Chile

H. Frederick Doutch and **R.H. Needham,** Australian Geological Survey Organisation, Canberra, A.C.T. 2601, Australia

Tamotsu Nozawa, Yoji Teraoka and **Takashi Yoshida,** Geological Survey of Japan, Ibaraki 305, Japan

Tadashi Sato, Tsukuba University, Ibaraki 305, Japan

Campbell Craddock, University of Wisconsin, Madison, Wisconsin 53706, U.S.A.

Floyd W. McCoy, University of Hawaii, Kaneohe, Hawaii 96744, U.S.A.

George W. Moore, Department of Geosciences, Oregon State University, Corvallis, Oregon 97331-5506, U.S.A.

Anne L. Gartner, Theresa R. Swint-Iki, and **George Gryc,** U.S. Geological Survey, Menlo Park, California 94025, U.S.A.

2000

Explanatory Notes to Supplement the

GEOLOGIC MAP OF THE CIRCUM-PACIFIC REGION PACIFIC BASIN SHEET

Kenneth J. Drummond, Chair, Northeast Quadrant Panel
José Corvalán D., Chair, Southeast Quadrant Panel
R. W. Johnson, Chair, Southwest Quadrant Panel
Tomoyuki Moritani, Chair, Northwest Quadrant Panel
Ian W. D. Dalziel, Chair, Antarctic Region Panel
George W. Moore, Chair, Arctic Region Panel

LAND GEOLOGY

Kenneth J. Drummond, National Energy Board, Calgary, Alberta T2P 3H2, Canada
José Corvalán D., Servicio Nacional de Geología y Minería, Santiago, Chile
H. Frederick Doutch, W. David Palfreyman, Australian Geological Survey Organisation, Canberra, A.C.T. 2601, Australia
Eiji Inoue, Geological Survey of Japan, Ibaraki 305, Japan
Tadashi Sato, Tsukuba University, Ibaraki 305, Japan
Campbell Craddock, University of Wisconsin, Madison, Wisconsin 53706, U.S.A.

SEAFLOOR SEDIMENT

Floyd W. McCoy, University of Hawaii, Kaneohe, Hawaii 96744, U.S.A.

OFFSHORE GEOLOGY

George W. Moore, Department of Geosciences, Oregon State University, Corvallis, Oregon 97331-5506, U.S.A.

DEEP SEA DRILLING PROJECT AND OCEAN DRILLING PROGRAM COLUMNAR SECTIONS

Anne L. Gartner, Theresa R. Swint-Iki, U.S. Geological Survey, Menlo Park, California 94025, U.S.A.
Paul W. Richards, U.S. Geological Survey, Reston, Virginia 22092, U.S.A.

Map compilation coordinated by
George Gryc, Circum-Pacific Map Project General Chairman,
U.S. Geological Survey, Menlo Park, California 94025, U.S.A

CONTENTS

INTRODUCTION

By
George Gryc

CIRCUM-PACIFIC MAP PROJECT

The Circum-Pacific Map Project is a cooperative international effort designed to show the relationship of known energy and mineral resources to the major geologic features of the Pacific Basin and surrounding continental areas. Available geologic, mineral-resource, and energy-resource data are being integrated with new project-developed data sets such as magnetic lineations, seafloor mineral deposits, and seafloor sediment. Earth scientists representing some 180 organizations from more than 40 Pacific-region countries are involved in this work.

Six overlapping equal-area regional maps at a scale of 1:10,000,000 form the cartographic base for the project: the four Circum-Pacific Quadrants (Northwest, Southwest, Southeast, and Northeast), and the Antarctic and Arctic Sheets. There is also a Pacific Basin Sheet at a scale of 1:17,000,000. Published map series include the Base (published from 1977 to 1989), the Geographic (published from 1977 to 1990), the Geodynamic (published from 1984 to 1990), and the Plate-Tectonic (published from 1981 to 1992); all of them include seven map sheets. Thematic map series in the process of completing publication include Geologic (publication initiated in 1983), Tectonic (publication initiated in 1991), Energy-Resources (publication initiated in 1986), and Mineral-Resources (publication initiated in 1984). Altogether, 57 map sheets are planned. The maps are prepared cooperatively by the Circum-Pacific Council for Energy and Mineral Resources and the U.S. Geological Survey. Maps published prior to mid-1990 are available from Dr. H. Gary Greene, Circum-Pacific Council for Energy and Mineral Resources, Moss Landing Marine Laboratory, MLML, Box 450, Moss Landing, California 95036-0450, U.S.A.; maps published from mid-1990 to present are available from the U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225, U.S.A.

The Circum-Pacific Map Project is organized under six panels of geoscientists representing national earth-science organizations, universities, and natural-resource companies. The regional panels correspond to the basic map areas. Current panel chairs are Tomoyuki Moritani (Northwest Quadrant), formerly by R.W. Johnson (Southwest Quadrant), Ian W.D. Dalziel (Antarctic Region), vacant. (Southeast Quadrant), Kenneth J. Drummond (Northeast Quadrant), and George W. Moore (Arctic Region). José Corvalán D, chaired the Southeast Quadrant from its inception in 1974 to his death in 1996; the Panel completed compilations of all eight topical maps of that quadrant.

Project coordination and final cartography are being carried out through the cooperation of the U.S. Geological Survey under the direction of Map Project General Chair George Gryc of Menlo Park, California. Project headquarters are located at 345 Middlefield Road, MS 951, Menlo Park, California 94025, U.S.A. The project has been overseen from its inception by John A. Reinemund, Director of the Map Project since 1982.

The framework for the Circum-Pacific Map Project was developed in 1973 by a specially convened group of 12 North American geoscientists meeting in California. The project was officially launched at the First Circum-Pacific Conference on Energy and Mineral Resources, held in Honolulu, Hawaii, in August 1974. Sponsors of the conference were the American Association of Petroleum Geologists (AAPG), Pacific Science Association (PSA), and the Committee for Coordination of Joint Prospecting for Mineral Resources in East Asian Offshore Areas (CCOP). The Circum-Pacific Map Project operates as an activity of the Circum-Pacific Council for Energy and Mineral Resources, a nonprofit organization that promotes cooperation among Circum-Pacific countries in the study of energy and mineral resources of the Pacific basin. Founded by Michel T. Halbouty in 1972, the Council also sponsors quadrennial conferences, topical symposia, scientific training seminars, and the Earth Science Series of publications.

GEOLOGIC MAP OF THE PACIFIC BASIN SHEET

The Geologic Map of the Circum-Pacific Region, Pacific Basin Sheet, is a compilation at a scale of 1:17,000,000 of a series of five overlapping 1:10,000,000-scale map sheets. The maps in the 1:10,000,000 series include the Northeast Quadrant, Southeast Quadrant, Northwest Quadrant, Southwest Quadrant, and the Antarctic Region sheets.

Information depicted on the Pacific Basin Geologic Map includes geologic units on land, and in marine areas seafloor sediment, Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP) sites.

A correlation diagram of representative columns from each map region was prepared by a special working group on map explanations at the outset of project work (Reinemund, 1975). The purpose of the diagram was to integrate geologic compilation between the five map sheets and to aid in the merging of compilations in the overlap areas, which in the case of the southern and northern quadrants is appreciable–26° of latitude. The initial subdivisions, which ranged from 9 to 14 units for each map sheet, evolved into considerably more detailed schemes during the ensuing years. A minimum of generalization was necessary for the compilation of the Pacific Basin Sheet from the individual quadrants for the correlation diagram shown in Figure 1.

The purpose of this report is to supplement the Geologic Map of the Circum-Pacific Region, Pacific Basin Sheet, with additional data, explanations, and references that could not be depicted on the face of the map because of space considerations. Most of the information in this report is taken from the explanatory notes for the 1:10,000,000-scale map series.

The Northeast Quadrant Geologic Map was prepared under the direction of Panel Chair Kenneth J. Drummond, Mobil Oil Canada, Ltd., Calgary, Alberta, Canada, with the assistance of Northeast Quadrant panel members and with contributions for the overlap areas with the Northwest Quadrant (Asian continent) and Southeast Quadrant (South American continent) Geologic Maps. These contributors include Tamotsu Nozawa, Geological Survey of Japan, Tsukuba, Japan, former Northwest Quadrant Panel Vice-Chair, and José Corvalán D., University of Chile, Santiago, Chile, Southeast Quadrant Panel Chair. Other principal investigators and sources of data are indicated in the references section on the map sheet and in the references cited.

The Northeast Quadrant panel (1983) was composed of the following members: R.L. Chase, Kenneth M. Dawson, Hubert Gabrielse, and Geoffrey B. Leech, Canada; Samuel Bonis, Gabriel Dengo, and Oscar D. Salazar, Guatemala; G.P. Salas, Mexico; James E. Case, George Gryc, Philip W. Guild, L.D. Kulm, Allen Lowrie, Ray G. Martin, Ralph Moberly, George W. Moore, David W. Scholl, and Peter R. Vail, U.S.A.

The Geologic Map of the Southeast Quadrant was prepared under the direction of Panel Chairman José Corvalán D., Department of Geology and Geophysics, University of Chile, Santiago, Chile, with the assistance of Southeast Quadrant panel members and with contributions for the overlap areas with the Northeast Quadrant (North American continent) and the Antarctica Region. These contributors include Kenneth J. Drummond, Mobil Oil Canada, Calgary, Alberta, Canada, Northeast Quadrant Panel Chairman, and Campbell Craddock, University of Wisconsin, Madison, Wisconsin, U.S.A., Antarctica Region Panel Chairman. Other principal investigators and sources of data are indicated in the references section on the map sheet and in the references cited.

The Southeast Quadrant panel (1985) was composed of the following members: Marcelo R. Yrigoyen, Argentina; Carlos Salinas E., Bolivia; Eduardo Gonzalez P., Alfredo Lahsen A., and Carlos Mordojovich, Chile; Hermann Duque-Caro, Colombia; Rodrigo Alvarado and Giovanni Rosania, Ecuador; H.G. Barsczis, France; Eleodoro Bellido B. and Victor R. Eyzaguirre P., Peru; George E. Erickson and J. Erick Mack, Jr., United States; and Raúl García, Venezuela. Former panel members include Vicente Padula, Argentina; Jaime Cruz and Michel Hermelin, Colombia; Alirio Bellizia B., José Antonio Galavis, Henrique J. Lavie, and Cecilia Martín, Venezuela; and Alberto Giesecke, José Lizzárraga R., and Fernando Zuñiga, Peru.

The Northwest Quadrant Geologic Map was prepared under the direction of former Panel Chairs Chikao Nishiwaki and Eiji Inoue, with the assistance of Northwest Quadrant panel members and with contributions for the overlap areas with the Northeast Quadrant and the Southwest Quadrant. These contributors include Kenneth J. Drummond, Mobil Oil Canada, Calgary, Alberta, Canada, Northeast Quadrant Panel Chair, and H. Frederick Doutch, Australian Geological Survey Organisation [retired], Canberra, A.C.T. 2601, Australia, former Southwest Quadrant Panel Chair. Other principal investigators and sources of data are indicated in the references section on the map sheet and in the references cited that follow.

The Northwest Quadrant Panel has been composed of the following members: Zhang Wen-you, Li Yin-hua, China; Ismet Akil, H.M.S. Hartono, and Fred Hehuwat, Indonesia; Yutaka Ikebe, Yasufumi Ishiwada, Masaharu Kamitani, Hisao Kuwagata, Tomoyuki Moritani, Tamotsu Nozawa, Tadashi Sato, Yoshihiko Shimizaki, Yoji Teraoka, Seiya Uyeda, and Takahashi Yoshida, Japan; S.K. Chung, Malaysia; Dominador H. Almogela, Guillermo R. Balce, and Juanito C. Fernandez, Philippines; Chong Su Kim, No Young Park, and Sang Ho Um, Republic of Korea; Sangad Bunopas, Phisit Dheeradilok, and Kaset Pitakpaiyan, Thailand; Michael Churkin, Maurice J. Terman, and Frank F.H. Wang, U.S.A.; and Lev I. Krasny, V.B. Kurnosov. V.G. Moiseenko, and Nicolay A. Shilo, Russia.

The Southwest Quadrant Geologic Map was prepared under the direction of former Panel Chair H. Frederick Doutch and former Panel Chair W. David Palfreyman, Australian Geological Survey Organisation, Canberra, Australia, in conjunction with the Organisation's map compilation section, and with the cooperation of Southwest Quadrant Panel members. Contributions for the overlap areas with the Northwest Quadrant and the Antarctic Region were made by Tadashi Sato, Tsukuba University, Japan, chief compiler for the Northwest Quadrant, and Campbell Craddock, University of Wisconsin, Madison, Wisconsin, U.S.A., former Antarctic Region Panel Chair. The role of the late Chikao Nishiwaki, former chair of the Northwest Quadrant Panel, was particularly significant in completing work on the northern overlap area. Other principal contributors were Erwin Scheibner, Geological Survey of New South Wales, Sydney, Australia; H. Rudy Katz and George W. Grindley, Geological Survey of New Zealand, Lower Hutt, New Zealand; Duncan B. Dow and C.M. Brown, Australian Geological Survey Organisation, Canberra, Australia; Alexander Macfarlane, Vanuatu Department of Geology, Mines, and Rural Water Supply; Peter Rodda, Fiji Mineral Resources Department, Frank Coulson and William Hughes, Solomon Islands Geological Survey; David Tappin, Tonga Division of Lands and Survey; and Tony Utonga, Cook Islands Resources Division.

The Southwest Quadrant Panel (1988) was composed of the following members: John N. Casey, David Denham, Neville F. Exon, David Falvey, R.W. Johnson, and Peter Wellman, Australian Geological Survey Organisation; Erwin Scheibner, Geological Survey of New South Wales; Ronald N. Richmond, Australia Petroleum Exploration Association, (former Panel Chair); Larry Machesky, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP); Peter Rodda, Fiji Mineral Resources Department; George W. Grindley and H. Rudy Katz, Geological Survey of New Zealand; Greg Anderson, Papua New Guinea Geological Survey; and S. Danitofea, Solomon Islands Geological Survey.

The Antarctic Region Geologic Map was prepared under the direction of former Panel Chair Campbell Craddock, Department of Geology and Geophysics, University of Wisconsin, Madison, Wisconsin, U.S.A., with the assistance of the Antarctic Region panel members. Contributors for the overlap areas with the Southeast Quadrant and the Southwest Quadrant include José Corvalán D., Servicio Nacional de Geología y Minería, Santiago, Chile, former Southeast Quadrant Panel Chair, W. David Palfreyman, Australian Geological Survey Organisation, former Southwest Quadrant Panel Chair, and H. Frederick Doutch, Australian Geological Survey Organisation, former Southwest Quadrant Panel Chair. Other principal investigators and sources of data are indicated in the references section on the map sheet and in the references cited that follow.

The Antarctica Region Panel has been composed of the following members: R.L. Oliver, Australia; Oscar Gonzalez-Ferran, Chile; G.W. Grindley, New Zealand; G.E. Grikurov and M.G. Ravich, Russia; Raymond G. Adie and Janet Thomson, United Kingdom; and Charles R. Bentley, Ian W.D. Dalziel (current Antarctic Region Panel Chair), David H. Elliot, Arthur B. Ford, Dennis E. Hayes, William R. MacDonald, James M. Schopf, and F. Alton Wade, former Antarctic Region Panel Chair, U.S.A.

Authors and contributors of the seafloor portion of this map include Floyd W. McCoy, University of Hawaii, Kaneohe, Hawaii, U.S.A., George W. Moore, Department of Geology, Oregon State University, Corvallis, Oregon, U.S.A., Theresa R. Swint-Iki, Anne L. Gartner, of the U.S. Geological Survey, Menlo Park, California, U.S.A. and Paul W. Richards, U.S. Geological Survey, Reston.

DESCRIPTION OF MAP UNITS

Quaternary

Quaternary (Q)

NORTHEAST QUADRANT

Alluvial, glacial, lacustrine, and eolian deposits. Continental and marine terrace deposits, locally includes Pliocene units. Carbonate banks of Florida, Bahamas, and Yucatan. Volcanic rocks are mainly alkali basalt of the Trans Mexico volcanic belt, southern Baja California, Central America, the Lesser Antilles Arc, the Aleutian Islands, southern and western Alaska, and the Hawaiian Islands (fig. 2)

SOUTHEAST QUADRANT

Alluvial, fluvioglacial, glacial, lacustrine, and eolian deposits. Continental and marine terrace deposits, locally of Pliocene age. Volcanic rocks, predominantly andesitic-basaltic, in southern Colombia, Ecuador, and central/southern Argentina. Basic extrusive rocks in Central America. Salars and alluvial-plain deposits of the sub-Andean region cap Tertiary sedimentary sequences (figs. 3, 4)

NORTHWEST QUADRANT

Alluvial, lacustrine, terrace, and deltaic deposits. Marine carbonate including raised coral reefs in Banda, Molucca, the Philippines, Taiwan, and Ryukyu. Marine deposits in Japan and coastal areas of Sakhalin, Sikhote-Alin, Kamchatskiy, and north Siberia. Extrusive rocks, felsic to intermediate in Burma; intermediate to mafic in Banda and Sulawesi; mafic in east Thailand, Cambodia, south Vietnam, north China, and North Korea. Alkali basalt in China, North Korea, Kuril Islands, Koryaskiy-Kamchatskiy, and Aleutian Islands. Felsic to mafic extrusive rocks characteristic of arc volcanism in island arcs of Japan, Ogasawara, Mariana, Ryukyu, Kuril, and Aleutian Islands (fig. 5)

Quaternary and Neogene (QTn)

NORTHEAST QUADRANT

Intermediate volcanic rocks of the west coast of Central America, the Galapagos Islands, and the Lesser Antilles. Mafic volcanic rocks of Panama

SOUTHEAST QUADRANT

Flow breccia, agglomerate, and pyroclastic rocks of andesitic-dacitic-rhyolitic composition; continental and lacustrine deposits. Includes Quaternary andesitic to rhyolitic volcanic rocks in the meridional part of the Western Cordillera of Peru, and predominantly rhyolitic-dacitic upper Tertiary ignimbrite in southern Peru and Antiplano area of Chile and Bolivia, capped by Quaternary rhyolitic-andesitic volcanic rocks. Mostly andesitic-basaltic volcanic rocks in central/southern Argentina and Antarctica Peninsula region. Intermediate extrusive volcanic rocks in Central America

NORTHWEST QUADRANT

Marine and paralic deposits in Borneo, Sulawesi, Sumatra, Molucca, China, Taiwan, and Japan, including reef limestone in the Philippines. Loess in north China, and nonmarine deposits in China.

Extrusive rocks, felsic in Sumatra; intermediate in the Philippines; intermediate to mafic in Sulawesi and Sunda; mafic (basalt flows) in south Vietnam, Cambodia, west Malaysia, the Philippines, and China; undifferentiated in Sumatra; and felsic to mafic in many island arcs such as Japan, Ogasawara, and the Kuril Islands. Felsic intrusive rocks in Borneo

SOUTHWEST QUADRANT

New Guinea-Mainly Quaternary and Pliocene

Marine and continental clastic rocks, mostly consequent on uplift. Minor shallow-marine clastic and carbonate rocks (some upper Miocene). Intermediate to mafic intrusive and extrusive rocks. Small area of upper Miocene-Pliocene high-temperature metamorphic rocks in Irian Jaya (fig. 6)

New Zealand

Continental and marine clastic rocks; carbonate rocks. Felsic, intermediate to mafic, and mafic extrusive rocks restricted to North Island. Associated with convergent-margin development

Solomon Islands

Shallow-marine carbonate, minor continental and shallow-marine clastic rocks. Intermediate to mafic extrusive and minor intrusive rocks. Island-arc setting

Vanuatu

Quaternary shallow-marine carbonate and minor volcaniclastic rocks. Upper Miocene to Pliocene deep-marine clastic and minor carbonate rocks. Felsic, intermediate to mafic, and mafic extrusive (and, not shown, minor intrusive) rocks. Island-arc setting

Fiji

Upper Miocene to Quaternary marine clastic, volcaniclastic, and pyroclastic rocks, consequent in part on uplifts, and shallow to deep-marine carbonate rocks. Felsic, intermediate to mafic, and mafic extrusive (and, not shown, minor intrusive) rocks. Convergent-margin setting

Cenozoic (Cz)

SOUTHWEST QUADRANT

Australia

Widespread thin alluvial deposits. Continental sand, silt, clay, and carbonate deposits in downwarps on the craton. Cenozoic intraplate mafic extrusive rocks (plateau basalt and shield volcanoes) and minor intermediate to mafic intrusive rocks of eastern Australia

New Guinea

Upper Cenozoic marine and continental clastic rocks overlying lower to middle Cenozoic shallow-marine clastic and carbonate rocks. Interfingers with QTn, TnTp, and $TnPz_2$ (see below)

New Zealand

Mafic extrusive rocks of northern part of North Island, east coast of South Island, and of Antipodes, Auckland, Bounty, Chatham, Campbell, Lord Howe, and Norfolk Islands. "Post-tectonic" in North Island; elsewhere associated with splitting of Gondwana

ANTARCTIC REGION

Undifferentiated volcanic rocks, mainly basaltic, locally with interbedded volcanigenic sedimentary rocks. Occur in east Antarctica, Balleny Islands, Transarctic Mountains, coastal Antarctica, Antarctic Peninsula, and Scotia Arc. Active volcanoes known in northern Victoria Land, Marie Byrd Land, northern Antarctic Peninsula, and South Sandwich Islands

Neogene (Tn)

NORTHEAST QUADRANT

Plateau basalts of the northwest United States (Columbia Plateau, Modoc area, and Snake River) and the Mexican Plateau. Mafic volcanic rocks of central British Columbia. Continental sedimentary rocks in interior plains, United States. Marine deposits of Pacific continental shelf and Gulf Coastal Plain

SOUTHEAST QUADRANT

Marine and continental sedimentary rocks. In Venezuela, mostly marine strata in the Falcon Basin and terrestrial, deltaic, and shallow-water marine sedimentary rocks of the Oriental, Barinas, and Maracaibo Basins; coal deposits locally. Intermediate volcanic rocks (5 Ma) on the Araya-Paria Peninsula. Marine sedimentary rocks; shale and continental sedimentary rocks in the sub-Andean regions of Peru, Bolivia, and Argentina. Granodioritic to dioritic intrusive igneous rocks in Colombia. Andesitic to basaltic rocks in southern Argentina and on Peter I Island

NORTHWEST QUADRANT

Marine clastic deposits intercalating pyroclastic rocks and reef limestone in Borneo, Sumatra, Sulawesi, Sunda, Banda, Molucca, the Philippines, Taiwan, Sikhote-Alin, Kamchatskiy, and Sakhalin. Nonmarine deposits widespread in China, Siberia, and Sakhalin. Marine and locally lacustrine deposits in island arcs such as Japan and the Kuril Islands, accompanied by a large amount of felsic and mafic extrusive rocks. Intermediate extrusive rocks in Sumatra, and intermediate to mafic in Molucca and Sulawesi. Felsic intrusive rocks in Sulawesi, the Philippines, and Japan

SOUTHWEST QUADRANT

New Guinea

Upper Oligocene to middle Miocene shallow- to deep-marine volcanilithic clastic and minor carbonate rocks of central Papua New Guinea. Intracratonic trough (Aure Trough)

Neogene and Paleogene (TnTp)

SOUTHWEST QUADRANT

New Guinea

Middle Miocene shallow-marine carbonate and minor clastic rocks in island-arc setting. Middle Miocene intermediate intrusive and extrusive rocks at the craton margin

New Caledonia

Upper Miocene mafic extrusive rocks of Loyalty Islands

New Zealand

Mainly Miocene marine clastic and felsic and intermediate to mafic extrusive rocks of northern North Island. Volcanic-arc deposits

Solomon Islands

Upper Oligocene to Pliocene shallow- and deep-marine carbonate and clastic rocks, including volcaniclastic rocks. Upper Oligocene mafic extrusive and minor intrusive rocks. Island-arc setting

Vanuatu

Lower to middle Miocene shallow- and deep-marine clastic and volcaniclastic, minor carbonate, and intermediate to mafic extrusive rocks. Upper Oligocene to lower Miocene intermediate to mafic extrusive (and, not shown, minor intrusive) rocks. Island-arc setting

Fiji

Uppermost Oligocene and Miocene shallow- and deep-marine clastic and volcaniclastic rocks consequent on uplifts, and minor pyroclastic and shallow-marine carbonate rocks. Miocene mafic extrusives (not shown: felsic and intermediate to mafic extrusive and intrusive rocks). Convergent-margin setting

Mesozoic

Neogene to Late Cretaceous (TnK_2)

SOUTHWEST QUADRANT

New Caledonia—**mainly Eocene**

Minor Miocene shallow-marine carbonate and clastic rocks. Eocene deep-marine clastic and carbonate rocks. Convergent-margin setting, active period

New Zealand—**includes some Lower Cretaceous**

Marine clastic and carbonate rocks of eastern North Island and northeastern South Island. Mafic extrusive rocks on South Island (not shown). Convergent-margin sequences

Fiji—**mainly Paleogene**

Upper Eocene and Oligocene(?) clastic and carbonate (and, not shown, intermediate to mafic intrusive) rocks. Convergent-margin setting

Paleogene to Jurassic (TnJ)

SOUTHWEST QUADRANT

New Guinea

Upper Cretaceous to middle Miocene shallow- and deep-marine carbonate, volcanilithic, minor clastic, and intermediate to mafic intrusive and extrusive rocks. "Mesozoic" mafic intrusive and ultramafic rocks. Allochthonous(?) sequences, in part mantle rocks, in part island-arc setting, in collision zones

New Caledonia

Middle to upper Eocene emplacement of ultramafic rocks possibly as old as Jurassic. Allochthonous unit(?), convergent-margin setting, culminating in active period

New Zealand

Mainly lower Tertiary and Cretaceous mafic extrusive and minor intrusive rocks, northern and eastern North Island

Solomon Islands

Mainly lower Tertiary and Cretaceous. Middle Cretaceous to upper Paleocene deep-marine carbonate rocks. Allochthonous(?) Cretaceous (or Jurassic?) to Paleocene mafic extrusive (and, not shown, intrusive and ultramafic) rocks changed by low-temperature metamorphism in the middle Eocene. Island-arc setting

Tertiary to Late Paleozoic ($TnPz_2$)

SOUTHWEST QUADRANT

New Guinea

Upper Cretaceous to Miocene shallow-marine carbonate and clastic rocks and mafic intrusive rocks; Upper Carboniferous to Upper Cretaceous shallow-marine and continental clastic rocks in Irian Jaya. Triassic continental clastic rocks widespread, and intermediate to mafic extrusive rocks in Papua New Guinea. Generally conformable cover on Australian craton

Tertiary (T)

NORTHEAST QUADRANT

Marine and continental sediment; felsic volcanic rocks of Alaska and Central America. Intrusive, dominantly silicic rocks in Central America and British Columbia

SOUTHEAST QUADRANT

Marine and continental sedimentary rocks and volcanic rocks. Extrusive and intrusive rocks predominantly of silicic to intermediate composition

NORTHWEST QUADRANT

Marine, lacustrine, and terrestrial deposits in Burma, Thailand, west Malaysia, and Sumatra, including oil shale and lignite deposits in Thailand and west Malaysia. Terrestrial deposits in China. Felsic to intermediate extrusive rocks in Burma and intermediate in Borneo. Felsic intrusive rocks in Sumatra, Sunda Arc, Borneo, and Thailand

Paleogene (Tp)

NORTHEAST QUADRANT

Continental and lacustrine deposits in interior plains and plateau areas. Marine sediment of Gulf of Mexico coastal plain and Pacific Coast continental shelf. Marine basalt of the Pacific Coast shelf and the Oregon and Washington Coast Range. Andesite and rhyolite of British Columbia, southern plateau, and the Cascade Range of Washington and Oregon. Felsic volcanic rocks of the interior plateaus, Canada, and the western United States

SOUTHEAST QUADRANT

Marine and continental sedimentary rocks. Deep-water, flysch-type to shallow-water marine (lutite, limestone, conglomerate, and sandstone) deposits in the Oriental and Falcon Basins of Venezuela. Continental and deltaic deposits with abundant coal beds in the Eastern Cordillera and Sierra de Perijá. Intermediate volcanic rocks (66 Ma) in the Venezuelan Caribbean islands. Deep-water marine sedimentary rocks (turbidite) in northwestern Colombia and San Juan Atrato Depression. Clastic fluviatile and deltaic sedimentary rocks, locally containing coal beds, in the Eastern Cordillera and sub-Andean regions of Colombia. Mostly Eocene marine clastic and calcareous sedimentary rocks, in part reef carbonate, turbidite, and olistostrome along the Pacific Coastal Province of Ecuador and northwestern Peru. Predominantly andesitic volcanic rocks and volcaniclastic deposits in the Western Cordillera of Peru and central/southern Argentina, with little marine influx

NORTHWEST QUADRANT

Marine or paralic deposits including reef limestone and pyroclastic rocks in west Malaysia, Sumatra, Sunda, Sulawesi, Banda, Molucca, Borneo, and the Philippines, accompanied by felsic to mafic extrusive rocks in Japan. Marine and continental deposits intercalating felsic, intermediate, and mafic extrusive rocks in Molucca, Sulawesi, and Sikhote-Alin, Koryaskiy-Kamchatskiy, and Verkhoyanskiy-Chukotskiy Fold Belts

Tertiary and Cretaceous (TK)

NORTHEAST QUADRANT

Continental sediment. Felsic volcanic rocks of Alaska and British Columbia interior plateau. Felsic intrusive rocks of Alaska and British Columbia Coast Plutonic Complex, including Paleozoic and Mesozoic metasediment

SOUTHEAST QUADRANT

Clastic continental sedimentary rocks and interbedded andesitic volcanic rocks (red beds in Peru). In the Principal Cordillera, volcanic rocks of rhyolitic-andesitic-basaltic composition and volcaniclastic continental strata. Intrusive rocks of silicic to intermediate composition and of Upper Cretaceous or Lower Tertiary age (not differentiated on map)

Paleogene and Late Cretaceous (TpK_2)

SOUTHWEST QUADRANT

New Caledonia

Upper Cretaceous to Paleocene continental clastic, shallow-marine carbonate and clastic, and intermediate to mafic extrusive rocks. Convergent-margin setting, relatively quiet period

Paleogene and Cretaceous (TpK)

NORTHWEST QUADRANT

Marine sedimentary rocks in Burma, Sulawesi, and the Philippines locally metamorphosed in the Philippines and including flysch in Burma. Intermediate to mafic extrusive rocks in Sulawesi. Predominantly felsic to intermediate extrusive rocks and felsic intrusive rocks in Japan, and in Sikhote-Alin and Verkhoyanskiy-Chukotskiy Fold Belts

Paleogene to Mesozoic (TpMz)

SOUTHWEST QUADRANT

New Guinea

Mesozoic and Eocene deep-marine clastic, volcaniclastic, and mafic extrusive rocks for the most part metamorphosed (low-temperature) in the Oligocene. High-pressure metamorphic rocks in eastern Papua New Guinea. Continental-slope sequences metamorphosed at collision margin

New Caledonia

Undifferentiated Triassic to Paleogene mainly marine clastic rocks, some changed to low-temperature metamorphic rocks in upper Mesozoic and Paleogene. Beginnings of convergent margin, culminating in active period

Late Cretaceous (K_2)

SOUTHEAST QUADRANT

Continental beds and marine platform deposits in southern Argentina

NORTHWEST QUADRANT

Continental and marine sedimentary rocks accompanied by a large amount of felsic, intermediate, mafic, and undifferentiated extrusive rocks on the Siberian Platform and in Sikhote-Alin, Verkhoyanskiy-Chukotskiy, and Koryaskiy-Kamchatskiy Fold Belts

Cretaceous (K)

NORTHEAST QUADRANT

Predominantly marine and volcanic-marine facies throughout the Cordillera from southern Mexico to the Alaska Peninsula. Interior plains and northern Alaska dominantly marine clastic rocks in the Lower Cretaceous becoming nonmarine in the Upper Cretaceous. Dominantly felsic and intermediate intrusions

SOUTHEAST QUADRANT

Predominantly marine and volcanic-marine facies northward from central Peru. Mostly marine sedimentary strata in the Southern Andes. Marine and continental series in the Central Andes. In Venezuela, Lower Cretaceous continental beds and Upper Cretaceous marine sandstone, limestone, and shale. In the Eastern Cordillera of Colombia, mostly black shale with intercalations of limestone and sandstone in the Lower Cretaceous (Berriasian to Aptian); predominantly black shale in the Upper Cretaceous (Albian to Coniacian-Santonian) with some evaporite and phosphatic sedimentary rocks. In the Western Cordillera and western flank of the Central Cordillera of Colombia, volcaniclastic sequences with abundant basic extrusive rocks and pillow lava of Lower Cretaceous (Barremian) to Upper Cretaceous age. In western Ecuador, abundant pyroclastic rocks, basic lava, and dolerite of Lower Cretaceous age overlain by Upper Cretaceous calcareous sedimentary rocks, silicified radiolarian shale, volcanic agglomerate, and basic volcanic rocks (Cenomanian-Maestrichtian); flysch-l}∑e sequences in the Western Corxµllera. In eastern Ecuador, mostly cross-stratified continental sandstone of Lower Cretaceous age overlain by fossiliferous marine marls of Lower and Upper Cretaceous (Albian to Campanian) age. In Peru, mostly nonmarine Lower Cretaceous strata in the Eastern and Western Cordilleras, overlain by transgressive marine beds of Albian to Santonian age, with facies changing from volcanic in the west to calcareous and detrital eastward; volcanic rocks are mostly andesitic. Southward across Peru the Upper Cretaceous series becomes progressively more continental. In Chile and Argentina, Lower Cretaceous and uppermost Jurassic (Tithonian) strata are predominantly marine: limestone, calcareous sandstone, and lutite in the Principal Cordillera, and graywacke, calcareous sandstone, and volcanic rocks of silicic to intermediate composition in the Coastal Range. Upper Cretaceous mostly continental volcaniclastic sedimentary rocks and andesitic volcanic rocks. In eastern and central Argentina, extrusive base volcanic rocks of Neocomian age are present in the subsurface. In the Southern Andes, mostly marine sedimentary rocks; Lower Cretaceous includes abundant volcanic rocks in the west; Upper Cretaceous has prominent flysch sequences. Marine sedimentary rocks in the Antarctic Peninsula region

NORTHWEST QUADRANT

Marine sedimentary rocks locally metamorphosed in Borneo, Sumatra, Sulawesi, Sunda, and the Philippines. Marine and continental sedimentary rocks interbedded with felsic, intermediate, and mafic extrusive rocks; and mafic and felsic intrusive rocks in Japan, the Kolyma Massif, and the Verkhoyanskiy-Chukotskiy Fold Belt

SOUTHWEST QUADRANT

Australia

Thin continental and transgressive marine clastic rocks of northern Australia and Canning and Officer Basins in the west. Post-orogenic, intruding "platform cover" and "craton" in eastern Australia. Felsic intrusive rocks in east intruding Bowen Basin and northern end of New England Fold Belt

ANTARCTIC REGION

Intrusive and extrusive igneous rocks of Marie Byrd Land, and intrusive igneous and sedimentary rocks of the Antarctic Peninsula area. Includes felsic plutons in western Marie Byrd Land; undifferentiated volcanic rocks of the Hobbs Coast; undifferentiated plutons in the Executive Committee Range, on the Bakutis Coast, in eastern Ellsworth Land, and in Palmer Land; and marine sedimentary rocks on islands near the northeastern end of the Antarctic Peninsula

Late Cretaceous to Jurassic (K_2J)

NORTHWEST QUADRANT

Marine sedimentary and mafic extrusive rocks, locally metamorphosed, in Hokkaido and Sakhalin

Cretaceous and Jurassic (KJ)

NORTHEAST QUADRANT

Primarily synorogenic sediments within Cordilleran orogen. Severely deformed marine sedimentary rocks with associated volcanic rocks. Chugach terrane of Alaska and Franciscan assemblage of the western United States. Felsic intrusive rocks of the Peninsular batholith of Baja California and the Sierra Nevada batholith. Intermediate volcanic rocks of Hogatza Arch, Alaska

SOUTHEAST QUADRANT

Marine and nonmarine sedimentary rocks, with associated volcanic rocks, mostly andesitic. Intrusive rocks are silicic to intermediate. Diverse volcanic rocks of the Antarctic Volcanic Group. Marine sedimentary rocks in the Antarctic Peninsula region

SOUTHWEST QUADRANT

Australia

Sequences in downwarps in cratons, eastern Australia. Lower Cretaceous shallow-marine shale and Jurassic, and in places uppermost Triassic, continental sandstone in Carpentaria, Eromanga, and Surat Basins in northeast and east. Jurassic continental sandstone and coal measures in Mulgildie and Clarence-Moreton Basins in east, and mafic extrusive rocks in southern Surat Basin

New Zealand

Felsic and intermediate to mafic intrusive rocks of western South Island. Cratonizing events

Cretaceous to Triassic (K₸)

NORTHWEST QUADRANT

Mostly continental sedimentary rocks, locally of Paleogene age, in Burma, Thailand, west Malaysia, Indochina, China, and Korea. Continental and marine sedimentary rocks, locally of Paleozoic age, in the Yunnan-Malayan Fold Belt, Sumatra, and Banda. Felsic and intermediate intrusive rocks in Burma, west Malaysia, Thailand, Indochina, Sumatra, Borneo (locally accompanied by felsic to mafic extrusive rocks), China, and Korea. Extrusive rocks accompanied by felsic intrusive rocks especially abundant on the eastern margin of the Asian continent, such as southeast and north China

Mesozoic (Mz)

NORTHEAST QUADRANT

Marine sedimentary, metasedimentary, and meta-igneous rocks. Blueschist facies rocks in Cuba and Hispaniola. Low to intermediate metamorphic rocks of the Greater Antilles. Mafic volcanic rocks, including spilite, diabase, pillow basalt, chert, and associated sedimentary rocks, locally metamorphosed to greenschist in Costa Rica, Cuba, and Panama. Felsic intrusive rocks of Baja California and western Mexico

SOUTHEAST QUADRANT

Metamorphic rocks of the Caribbean Mountain System. Nappes of Lara and El Caribe; metamorphic facies include zeolite, prehnite-pumpellyite, greenschist, amphibolite-epidote-almandine, eclogite, and blueschist. Granite, granodiorite, and trondhjemite (70-80 m.y.). Basic intrusive and extrusive rocks (70-130 m.y.); ultramafic and ophiolitic complexes

NORTHWEST QUADRANT

Marine sedimentary rocks and felsic intrusive rocks in Borneo, Sulawesi, and Banda

SOUTHWEST QUADRANT

Australia

Continental deposits of uncertain age on eastern margin of Canning Basin

ANTARCTIC REGION

Intrusive and extrusive igneous rocks in West Antarctica. Felsic plutons in the Whitmore Mountains and small ranges and nunataks to the east; probably Jurassic in age. Undifferentiated plutons of Pine Island Bay and the Eights Coast. Undifferentiated volcanic rocks of the Jones Mountains and Thurston Island

Paleozoic

Mesozoic and Paleozoic (MzPz)

ANTARCTIC REGION

Sedimentary rocks of Transantarctic Mountains and adjacent East Antarctica; volcanic rocks of West Antarctica; sedimentary, metasedimentary, and mafic extrusive rocks of Antarctic Peninsula area; and metasedimentary rocks of Scotia Arc. Includes widespread continental and marine, Devonian-Triassic, subhorizontal, locally fossiliferous, sedimentary rocks (Gondwana sequence) of Transantarctic Mountains and western Queen Maud Land; calcalkaline metavolcanic rocks of Ruppert Coast; diverse sedimentary, metasedimentary, and mafic extrusive rocks, which form a deformed basement complex in much of the Antarctic Peninsula, Alexander Island, and the South Shetland Islands; and metasedimentary rocks of South Orkney Islands

SOUTHWEST QUADRANT

Australia

Onshore and extensive offshore passive-margine sequences of rifts that predated Gondwana breakup episodes. Early Cretaceous marine shale and Jurassic continental sandstone of Laura basin in northeast, Cretaceous felsic extrusives farther south on coast, and Cretaceous coal measures of east-coast Styx basin (all possibly preceding opening of Coral Sea); Cretaceous and Jurassic marine and continental clastics of Maryborough basin on east coast, Gippsland, (offshore) Bass, Otway, and (not shown) Denman basins in the southeast and east; Jurassic intermediate extrusives in the Maryborough basin, marine clastic deposits in the east-coast Nambour basin and lignitic claystone in the south coast Polda basin (preceding openings of the Tasman Sea and the Indian Ocean south of Australia); Cretaceous through Permian—and possibly older—clastic sequences in west and northwest of Perth, Carnarvon, Canning, and Bonaparte basins, and, not shown, offshore Browse and Money Shoal basins (preceding opening of Indian Ocean west of Australia).

Cretaceous to Late Paleozoic (KPz_2)

SOUTHWEST QUADRANT

Australia

Orogenic and postkinematic(?) intrusive rocks, northern New England Fold Belt, eastern Australia. Undifferentiated Carboniferous to Lower Cretaceous felsic and intermediate to mafic intrusive rocks

New Zealand

Carboniferous(?) to Cretaceous marine clastic and volcaniclastic and mafic extrusive rocks, North and South Islands. Permian ultramafic rocks, South Island. Convergent-margin setting

Early Cretaceous to Triassic (K_1TR)

NORTHWEST QUADRANT

Continental and marine sedimentary rocks accompanied by felsic, intermediate, and mafic extrusive rocks; and felsic and alkali intrusive rocks in north China and the Siberian Platform and in Siberia-Mongolia, Koryaskiy-Kamchatskiy, and Verkhoyanskiy-Chukotskiy Fold Belts

Jurassic (J)

NORTHEAST QUADRANT

Felsic intrusive rocks in Idaho, United States

SOUTHEAST QUADRANT

Continental clastic and volcanic rocks and marine deposits. Complete marine sequence (Sinemurian; locally Hettangian to Oxfordian) includes limestone, calcareous sandstone, lutite, and evaporite (anhydrite and gypsum) of regressive facies in the Principal Cordillera of Chile and Argentina (mioliminar facies) overlain by continental red beds (conglomerate, sandstone, and lutite). In the Coastal Range of Chile, Hettangian and (or) Sinemurian to Bajocian, locally to Oxfordian, marine volcanic-sedimentary sequences; volcanics are silicic to intermediate, partly sub-aqueous (pillow lava), partly subaerial. Mostly Middle to Upper Jurassic in the Eastern Cordillera of Peru; mainly of continental facies in the sub-Andean regions of Peru and Ecuador. Marine volcanic-sedimentary sequences in the Coastal Range and Western Cordillera of Peru. In the Southern Andes, a western facies includes graywacke, radiolarite, and siltstone associated with intermediate to basic volcanic rocks

NORTHWEST QUADRANT

Marine sedimentary rocks in Indochina, Thailand, Sumatra, Sulawesi, the Philippines, Tibet, and in Verkhoyanskiy-Chukotskiy and Siberia-Mongolia Fold Belts. Marine and continental sedimentary rocks and felsic intrusive rocks in Japan and Korea

SOUTHWEST QUADRANT

Australia

Restricted to one intraplate igneous stratigraphic unit of uncertain tectonic affinity in Tasmania. Jurassic mafic sills

ANTARCTIC REGION

Mafic extrusive and intrusive igneous rocks of Transantarctic Mountains and adjacent East Antarctica; sedimentary and extrusive igneous rocks of the southern Antarctic Peninsula area. Includes basaltic volcanic rocks, with dikes and sills, at many localities between Thiel Mountains and northern Victoria Land, and on George V Coast; Dufek Massif (layered gabbro complex) in Pensacola Mountains; basaltic volcanic rocks and mafic dikes in western Queen Maud Land; undifferentiated volcanic rocks and marine and continental sedimentary rocks of eastern Ellsworth Land and Palmer Land

Jurassic and Triassic (JTR)

NORTHEAST QUADRANT

Predominantly marine and volcanic-marine facies throughout the Cordillera from Mexico to the Alaska Peninsula and in the Andes. Interior composed of both marine and nonmarine sedimentary deposits. Felsic intrusive rocks of Alaska Peninsula, Yukon, central British Columbia, eastern Sierra Nevada, and central Andes. Mafic volcanic rocks (in part, Permian) of Alaska, including pillow basalt, diabase, peridotite, dunite, radiolarian chert, and slate. Alkalic (island arc) volcanic rocks, interior plateau of British Columbia, Vancouver, and Queen Charlotte Islands of the Insular belt

SOUTHEAST QUADRANT

Marine sedimentary rocks and continental volcanic-sedimentary deposits. Marine conglomerate, sandstone, and lutite of Upper Triassic to Pliensbachian and Toarcian age in the Coastal Range of central Chile. Upper Triassic (Norian) to Lower Jurassic (Liassic) limestone, dolomite, lutite, and chert in central and northern Peru and volcanic (andesitic)-sedimentary sequence in the west. In Colombia and Venezuela, continental red beds: conglomerate, sandstone, and lutite in the Sierra de Perijá and along the eastern flank of the Santander Massif; pyroclastic rocks and volcanic flows of silicic to intermediate composition (195 Ma at El Baúl Massif) and locally intercalations of shallow-water marine limestone of Upper Triassic and Lower Jurassic age. Intrusive rocks are quartz monzonitic to granodioritic batholiths

NORTHWEST QUADRANT

Continental and marine sedimentary rocks in Malaysia, Indochina, Thailand, and Burma. Felsic intrusive rocks in Indochina. Continental and marine sedimentary rocks, felsic to mafic extrusive rocks, felsic and alkali intrusive rocks in Verkhoyanskiy-Chukotskiy Fold Belt

SOUTHWEST QUADRANT

New Caledonia

Upper Triassic and Jurassic marine clastic and volcaniclastic rocks. Convergent-margin development

Triassic and Late Paleozoic ($\text{Ꞧ}Pz_2$)

NORTHWEST QUADRANT

Continental and marine sedimentary rocks, locally metamorphosed, in Borneo, Sulawesi, west Malaysia, Indochina, Thailand, the Philippines, and Banda. Mafic extrusive rocks; and felsic, intermediate, mafic, and alkali intrusive rocks in Borneo, the Siberian Platform, and Siberia-Mongolia and Verkhoyanskiy-Chukotskiy Fold Belts

SOUTHWEST QUADRANT

Australia

Generally convergent-margin settings in eastern Australia. Lower Triassic through Upper Carboniferous of New England Fold Belt: continental and shelf clastic, carbonate, and volcanogenic rocks, flysch sequences, extrusive and intrusive rocks ranging from felsic to ultramafic including emplaced serpentinite, and zones of regional metamorphism mainly low-temperature and pressure, minor high-temperature and low-pressure, and (not shown) rare glaucophane schist. Permian and Upper Carboniferous felsic extrusive and intrusive rocks of Cape York-Oriomo, Coen, Georgetown, and Anakie Inliers, Hodgkinson, Clarke River, and Burdekin Basins, and Lolworth-Ravenswood Block (all in northeastern Australia)

New Guinea

Permian-Triassic felsic intrusive rocks in Irian Jaya. Carboniferous-Permian felsic extrusive, intermediate to mafic intrusive, and low-temperature metamorphic rocks in Papua New Guinea

Triassic (Ꞧ)

NORTHWEST QUADRANT

Marine sedimentary rocks, locally paralic in the upper parts, and felsic intrusive rocks in Thailand, West Malaysia, Borneo, Sumatra, Sulawesi, Banda, China, Japan, and in fold belts of Siberia-Mongolia and Verhoyanskiy-Chukotskiy. Alkali intrusive rocks, mafic extrusive rocks in north China. Felsic to intermediate extrusive rocks in places intercalated within sedimentary rocks throughout the quadrant area, except on the platforms of North China and Yangtze.

SOUTHEAST QUADRANT

Marine and nonmarine sedimentary sequences and continental volcanic and clastic deposits. Marine unstable platform deposits of conglomerate, sandstone, and lutite with intercalations of continental plant-bearing sedimentary rocks in the upper part. Predominantly silicic volcanic rocks associated with the marine facies. Continental volcaniclastic (molasse-type) sequences; volcanic rocks vary from silicic to intermediate

SOUTHWEST QUADRANT

Australia

"Late orogenic" transitional or successor-basin sedimentary and contemporaneous igneous rocks of central east. Upper Triassic continental clastic rocks with coal and felsic intrusive and extrusive rocks in Ipswich Basin and nearby. Middle Triassic continental and marine clastic, pyroclastic, and felsic and intermediate to mafic extrusive rocks of Gympie Block and Abercorn and Esk Troughs. Middle to Upper Triassic felsic intrusive rocks in same general area

ANTARCTIC REGION

Sedimentary and intrusive and extrusive igneous rocks of East Antarctica, and sedimentary rocks of Antarctic Peninsula area. Includes intrusive igneous and sedimentary rocks of George V Coast; Triassic(?) mafic volcanic rocks of western Queen Maud Land; sedimentary rocks with plant fossils on Livingston Island, South Shetland Islands

Triassic and Permian (ҌP)

SOUTHWEST QUADRANT

Australia

Sequences in widespread downwarps in cratons and, in east, in partly contiguous foreland or foredeep or transform basins. Permian in many places, probably uppermost Carboniferous through Triassic continental and minor marine clastic rocks, with coal and basal tillite, in epicratonic Galilee and Pedirka Basins and wholly concealed Cooper and Arckaringa Basins mainly in central-eastern Australia and in Tasmania Basin; similar sequences, plus (not differentiated) felsic, intermediate to mafic, and mafic extrusive rocks in foreland-foredeep-transform Bowen, Gunnedah, Sydney, and Lorne Basins in east. Permian glacial deposits (some marine) and minor continental epicratonic clastic deposits in Oaklands, Troubridge, Officer, Canning, and Collie Basins and, not shown, below Polda Basin and in Renmark and Menindee Troughs below Murray Basin. Also not shown, Permian marine claystone in Mallabie Depression below Eucla Basin in south. Coal in Oaklands, Canning, and Collie Basins

New Zealand

Upper Permian only; marine clastic rocks, northern South Island. Epicratonic

New Caledonia

Middle Triassic shallow-marine clastic rocks. Middle Permian to Lower Triassic pyroclastic, marine volcaniclastic, and intermediate to mafic extrusive rocks. Island arc

Late Paleozoic (Pz_2)

NORTHEAST QUADRANT

Oceanic volcanic rocks and blueschist with associated sedimentary rocks of north central British Columbia and the Goodnews Arch in Alaska. Miogeoclinal rocks of northern Alaska and the Yukon. Platform and miogeoclinal rocks of the southern and western United States

SOUTHEAST QUADRANT

Mostly marine, partly metamorphosed sedimentary rocks; continental, glacial, and marine-glacial deposits. Intrusive and extrusive rocks predominantly silicic. In Sierra de Perijá, Andean Cordillera and El Baúl Massif of Venezuela, fossiliferous marine limestone and lutite, restricted continental facies, and marine flysch-type metasedimentary rocks (phyllite, slate, schist, quartzite, and recrystallized limestone) (zeolite to amphibolite-almandine facies). In the Eastern Cordillera of Peru and Bolivia, continental clastic sedimentary rocks of Mississippian age and fossiliferous limestone and shale of Pennsylvanian-Lower Permian age are overlain unconformably by continental clastic sedimentary rocks, andesitic volcanic rocks, and ignimbrite of possible Upper Permian or Permian-Triassic age. In Chile, mostly quartzite, slaty shale, and limestone of Mississippian to Lower Permian age; fusulinid limestone, shale, and radiolarian chert in the Patagonian Archipelagos. Marine, glacial-marine, glacial, and plant-bearing continental deposits in Argentina; extensive, predominantly silicic, volcanic rocks of possible Upper Permian or Permian-Triassic age

NORTHWEST QUADRANT

Predominantly marine sedimentary rocks and carbonates, locally metamorphosed, in Sumatra, Borneo, west Malaysia, east Burma, Thailand, Indochina, China, Korea, Japan, the Siberian Platform, and Sikhote-Alin, Siberia-Mongolia, and Verkhoyanskiy-Chukotskiy Fold Belts. Felsic intrusive rocks in Indochina, northwest Thailand, west Malaysia, and in Kunlun-Qinling, Qilian, Siberia-Mongolia, and Verkhoyanskiy-Chukotskiy Fold Belts. Local Permian continental sedimentary rocks in the Siberia-Mongolia Fold Belt, Siberia and North China Platforms, South China Fold Belt, and Indochina. Felsic to mafic extrusive rocks commonly intercalated the upper Paleozoic strata in Siberia-Mongolia, Qilian, and Kunlun-Qinling Fold Belts. The North China Platform lacks strata of Upper Ordovician to Lower Carboniferous age

SOUTHWEST QUADRANT

Australia

North of the Clarence-Moreton Basin, from west to east, Carboniferous to Devonian subaerial felsic and, not shown, intermediate to mafic extrusive rocks; shelf clastic, carbonate, and volcaniclastic rocks; flysch and abyssal-plain sedimentary and spilitic extrusive rocks.

South of the Clarence-Moreton Basin, Carboniferous to Devonian greywacke and shallow-marine clastic, volcaniclastic, pyroclastic, carbonate, and fluvioglacial rocks; Devonian shallow and deeper marine greywacke, other clastic, carbonate, and spilitic extrusive rocks and dolerite

"Late orogenic" transitional to successor basins of eastern half of Australia

Carboniferous and Devonian continental, and in places shallow-marine, clastic, and carbonate rocks of Bundock, Burdekin, Clarke River, and Drummond Basins in northeast, and Bancannia Trough and rifts in the Lachlan Fold Belt in southeast. Lachlan and Drummond also contain felsic and minor bimodal extrusive and intrusive rocks.

Lower Carboniferous(?) and Devonian continental and shallow-marine elastic rocks of part of younger Darling Basin; similar sequence, plus evaporites, deeper water carbonates, and intermediate extrusive rocks in completely concealed Adavale Basin and Warrabin Trough

Sequences in downwarps in cratons in central and western Australia

Lower Carboniferous and Devonian molasse-like continental clastic rocks of Officer, Amadeus, Ngalia, and Georgina Basins and of concealed Warburton Basin, all in central Australia. A few deposits may be as old as Silurian. Carboniferous and Devonian mainly shallow-marine clastic and carbonate rocks of Fitzroy Trough and Carnarvon and Bonaparte Basins in northwest Australia (may be rift sequences preceding continental breakup and opening of Indian Ocean). Devonian evaporite rocks in Fitzroy Trough

New Zealand

Middle Devonian to Carboniferous felsic intrusive rocks, northern South Island

ANTARCTIC REGION

Sedimentary rocks in East Antarctica; intrusive igneous rocks in Transantarctic Mountains; sedimentary rocks in interior and coastal West Antarctica; and intrusive igneous rocks in coastal West Antarctica. Includes clastic sedimentary rocks near Amery Ice Shelf and in western Queen Maud Land; generally felsic Admiralty intrusive igneous rocks (Devonian) of northern Victoria Land; marine sedimentary rocks of Ellsworth Mountains and one outcrop of plant-bearing sedimentary rocks in eastern Ellsworth Land; and felsic igneous plutons of western Marie Byrd Land, and undifferentiated igneous plutons of the Hobbs Coast

Paleozoic (Pz)

NORTHEAST QUADRANT

Marine and continental sedimentary rocks, Basin and Range and Rocky Mountains of United States and Canada. Felsic intrusive rocks of northern Alaska and the Yukon, southern Mexico, and Central America. Volcanic rocks of Belize and Honduras. Metamorphic rocks of southern Mexico, western Coast mountains of British Columbia, and Central America

SOUTHEAST QUADRANT

Silicic batholithic intrusions with various radiometric age values: 220-240 m.y. (Chile) to 270 Ma (Venezuela)

ANTARCTIC REGION

Intrusive igneous rocks of East Antarctica; metamorphic rocks of coastal West Antarctica, and sedimentary and intrusive igneous rocks of interior West Antarctica. Includes many igneous plutons, mainly felsic, along Ingrid Christensen Coast, in Prince Charles Mountains, and in Queen Maud Land; metamorphic rocks in the Amundsen Sea area, and metamorphic and undifferentiated intrusive igneous rocks of Thurston Island; sedimentary rocks, mainly clastic and locally slightly metamorphosed, in the Whitmore Mountains and ranges and nunataks to the north and east (in the Hart Hills, sedimentary rocks are intruded by a body of metagabbro)

Early Paleozoic (Pz_1)

NORTHEAST QUADRANT

Miogeoclinal marine rocks bordering the shield, platform, and eastern Cordillera of Alaska, Canada, and the conterminous United States. Deep-water marine sedimentary rocks with associated volcanic rocks in the central and western Rocky Mountain Cordillera

SOUTHEAST QUADRANT

Marine limestone, graptolite-bearing lutite, conglomerate, and sandstone of Ordovician-Silurian age in the Venezuelan Andes, metamorphosed in the western and central parts. In Sierra de Perijá, Devonian sandstone and lutite. Cambrian-Ordovician phyllite in the El Baúl Massif. Metamorphic rocks of the Caribbean Mountain System (400 Ma). Metasedimentary rocks of Cambrian-Ordovician and Devonian age in central and eastern Colombia. Complete marine series of limestone, shale and quartzite, locally conglomerate and ferruginous sandstone (Cambrian-Devonian) in the Eastern Cordillera and sub-Andean ranges of Bolivia. Similar facies in the Eastern Cordillera of Peru, but Silurian not well documented. Metasedimentary sequences of the Coastal Range of Chile, in part Devonian (quartzites and slates) and probably older Paleozoic slate, phyllite, schist (intermediate- to low-pressure and intermediate- to high-pressure/low-temperature metamorphism); radiometric ages reported to be 340 Ma; sequence also has been interpreted as Precambrian. Predominantly marine, unmetamorphosed, Cambrian to Devonian strata in northwestern Argentina: oriental (eastern) carbonate facies and occidental (western) marine facies with basic volcanic rocks (ophiolite) in the Precordillera and Frontal Cordillera

NORTHWEST QUADRANT

Marine sedimentary rocks, locally metamorphosed, in west Malaysia, east Burma, northwest Thailand, Indochina, China, Korea, Japan, the Siberian Platform, and the Siberia-Mongolia Fold Belt

Felsic intrusive rocks in South China, Qinling, and Siberia-Mongolia Fold Belts, and in the Siberian Platform. Felsic to mafic extrusive rocks commonly intercalated with sedimentary rocks in Siberia-Mongolia and Qinling Fold Belts, and in the Siberian Platform

SOUTHWEST QUADRANT

Australia

Convergent-margin settings, eastern Australia

Middle to Lower Devonian: Marine and minor continental clastic and carbonate rocks of Burdekin Basin and Anakie Inlier, plus intermediate extrusive rocks in the inlier; felsic and intermediate intrusive rocks in Coen, Yambo, Ankle, and Georgetown Inliers. Devonian to Ordovician felsic intrusive rocks in Lolworth-Ravenswood Block. All these areas in far northeast

Devonian to Silurian: Greywacke and other shallow- to deep-marine clastic rocks, carbonate rocks, chert, and spilitic mafic extrusive rocks in Broken River Embayment, where some rocks may be Ordovician, and Hodgkinson Basin, in which also occur felsic extrusive and low- and high-grade metamorphic rocks. Both areas in far northeast. Similar sequence in eastern New England Fold Belt; in northern part Middle Devonian to Upper Silurian felsic and intermediate extrusive and pyroclastic rocks only

Middle Devonian to Silurian: Greywacke and other marine and continental clastic rocks, carbonate rocks, chert, major felsic extrusive and intrusive rocks, minor spilitic mafic intrusive and extrusive rocks (neither shown), serpentinite, and minor low-grade metamorphic rocks, in Lachlan Fold Belt of east and southeast Australia, including Tasmania. Also shelf facies in Tasmania

Sequences in downwarps in cratons, Western Australia

Silurian continental and shallow-marine clastic, carbonate, and evaporite rocks in Carnarvon and Perth Basins

Convergent-margin settings, eastern and southeastern Australia, including Tasmania

Ordovician: Greywacke and other marine clastic rocks, carbonate rocks, chert, intermediate to mafic and spilitic mafic extrusive rocks, and serpentinite in Broken River Embayment in far northeast. Similar sequence plus (in places metamorphosed) volcaniclastic, felsic intrusive, intermediate to mafic intrusive (not shown), and ultramafic rocks, low-grade and high-grade metasedimentary rocks, and minor gneiss in Lachlan Fold Belt in southeast, including Tasmania. Felsic and minor mafic intrusive rocks only, in Kanmantoo Fold Belt in south. Felsic intrusive rocks in Peake-Denison Inlier, central Australia

Ordovician-Cambrian: Marine clastic rocks, greywacke, felsic to intermediate extrusive and pyroclastic rocks, volcaniclastic rocks, serpentinite, and low-grade metamorphic, including mafic metavolcanic rocks, in Lolworth-Ravenswood Block; marine clastic, carbonate, and low-grade metamorphic and mafic metavolcanic rocks in Anakie Inlier, both in northeast

Cambrian: Chiefly intermediate to mafic extrusive and intrusive rocks (neither shown) and pyroclastic rocks, ultramafic rocks, and serpentinite, with minor shallow and deep-marine clastic rocks, chert, and carbonate rocks in southern Lachlan Fold Belt. Similar sequences, but with clastic rocks and greywacke dominating in Dundas Trough in Tasmania, and in less mafic Kanmantoo Fold Belt in south, in which felsic intrusive rocks also occur and clastic rocks grade into low-grade metamorphic rocks with some gneiss

"Late orogenic" transitional successor basin, southeastern Australia

Ordovician-Cambrian: Marine and continental clastic, carbonate, and felsic extrusive rocks associated with Kanmantoo Fold Belt adjacent to and below Bancannia Trough

Sequences in downwarps in cratons in southern, central, and western Australia

Ordovician: Carbonate and shallow-marine clastic rocks wholly concealed in Canning Basin, western Australia

Ordovician-Cambrian: Ordovician shallow-marine clastic, Cambrian carbonate and, some not shown, mafic extrusive rocks in Daly River, Wiso, Georgina, and Officer Basins in northern and central Australia and Bonaparte Basin in northwest. Similar sequences, (1) with felsic intrusive and intermediate rather than mafic extrusive rocks (as far as known) in wholly concealed Warburton Basin and (2) without mafic extrusive rocks, in Amadeus and Ngalia Basins, all three in central Australia

Cambrian: Shallow-marine clastic, carbonate, and mafic extrusive rocks in Ord Basin in northwest and Arrowie Basin in south. Shallow-marine clastic rocks only in Arafura Basin in north

New Guinea

Shallow-marine clastic and carbonate rocks. Minor Carboniferous felsic intrusive rocks. Low- and high-temperature metamorphic rocks. All in Irian Jaya. Unit includes some upper Paleozoic

New Zealand

Devonian to Ordovician marine clastic and carbonate rocks and (not shown) felsic, intermediate to mafic, and mafic intrusive rocks; mostly changed to low- to high-grade metamorphic rocks. Middle Ordovician to Cambrian marine clastic, volcaniclastic, minor carbonate, and (not shown) mafic and ultramafic intrusive and intermediate to mafic and mafic extrusive rocks; mostly changed to low- to high-grade metamorphic rocks. All Pz_1 in western South Island. Convergent-margin setting

ANTARCTIC REGION

Intrusive and extrusive igneous rocks, sedimentary rocks, and metamorphic rocks of Transantarctic Mountains; sedimentary and volcanic rocks of Ellsworth Mountains; and meta-igneous rocks of coastal West Antarctica. Includes many plutons, mostly felsic, undifferentiated volcanic rocks, and diverse sedimentary rocks, locally metamorphosed, widely distributed in the Transantarctic Mountains between northern Victoria Land and the Shackleton Range; undifferentiated volcanic rocks and continental (?) and marine sedimentary rocks, slightly metamorphosed, in the southern Ellsworth Mountains; and metamorphosed gabbroic rocks of the Hobbs Coast

Early Paleozoic and Proterozoic (Pz_1P_3)

NORTHEAST QUADRANT

Metamorphic complexes (Yukon-Tanana and Neroukpuk) of the Yukon Basin and northeast Alaska. Undifferentiated metasedimentary and metavolcanic units of the Cordilleran Orogen, from greenschist to upper amphibolite faces

NORTHWEST QUADRANT

Marine sedimentary rocks, shallow-water clastic rocks, and metamorphic rocks, accompanied by undifferentiated extrusive rocks and felsic intrusive rocks in the Siberian Platform and in Kolyma and Bureya Massifs

Upper Proterozoic sedimentary rocks and non-fossiliferous or poorly fossiliferous lower Paleozoic sedimentary rocks predominantly in the Yangtze Platform. Undifferentiated extrusive rocks, felsic intrusive rocks, and metamorphic rocks in south China

ANTARCTIC REGION

Metasedimentary rocks of East Antarctica; sedimentary rocks, intrusive and extrusive igneous rocks, and metamorphic rocks of Transantarctic Mountains; and sedimentary and metamorphic rocks of West Antarctica. Includes low-grade metasedimentary rocks of western and eastern Wilkes Land, locally with possible microfossils; felsic plutons and diverse sedimentary and volcanic rocks, locally metamorphosed, from northern Victoria Land to Ohio Range; clastic sedimentary rocks and metamorphic complex of western Marie Byrd Land; and sedimentary rocks cut by small Cretaceous pluton in eastern Marie Byrd Land

Precambrian

Late Proterozoic (P_3)

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks of the Sinian System in the North China Platform and other parts of

China

Marine sedimentary rocks and metamorphic rocks of the Baykalian Stage and locally felsic extrusive rocks accompanied by shallow-water sedimentary rocks and felsic intrusive rocks in the Siberian Platform

SOUTHWEST QUADRANT

Australia

Sequences in downwarps in cratons or old mobile belts

Adelaide "Geosyncline" and Stuart Shelf, southern Australia: Cambrian to >1200 Ma continental and shallow-marine clastic, carbonate, and evaporite rocks, mafic and minor felsic extrusive rocks, minor iron formation; low-grade metamorphism 490±10 Ma ("geosyncline" possibly epimobile belt, possibly part passive-margin sequence, "shelf" epicratonic on Gawler Craton)

Peake-Denison Inlier, Birrindudu, Ngalia, Amadeus, and Officer (mostly concealed) Basins, and below Georgina Basin, all in central Australia: Cambrian to 900 Ma or older sequences similar to that of Adelaide "Geosyncline"; deformed, and in Peake-Denison Inlier and Officer Basin metamorphosed to low grade, 575-800 m.y.

Tillite approximately 700 Ma in all these areas and over Kimberley Basin and Halls Creek Province sequences in northwestern Australia. Mafic extrusive rocks on Stuart Shelf (>1200 Ma) and Adelaide "Geosyncline" low in sequences, and (minor, near base) in Amadeus Basin

Orogenic or geosynclinal, possibly taphrogenic

Leeuwin Block, western Australia: Medium- to high-grade felsic gneiss, felsic to mafic granulite, metamorphic age of 655±25 Ma (possibly mobile-belt province)

Rocky Cape and Tyenna Blocks, Tasmania: Protoliths continental clastic rocks, tillite, minor carbonate rocks, depositional age about 1100 Ma; low- to medium-grade metamorphism 580±40 and about 800 Ma, mafic intrusive rocks >700 Ma, felsic intrusive rocks about 715, 750 Ma

Possible mobile belt sequence

Wonominta Block, southern Australia: Protoliths clastic rocks, turbidite, minor extrusive rocks, and iron formation. Low-grade metamorphism. Possible older ($Ᵽ_2$) segments. Felsic intrusive rocks about 410 Ma

New Zealand

High-grade metamorphic rocks, 675 Ma northwest of South Island. Orogenic setting, basement to Pz_1

Late and Middle Proterozoic ($Ᵽ_3Ᵽ_2$)

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks accompanied by felsic and alkali intrusive rocks in north Vietnam

Continental and marine sedimentary rocks of the Riphean System, accompanied by felsic to intermediate volcano-plutonic complexes and alkali intrusive rocks in the Siberian Platform and Bureya Massif

Late Precambrian ($p€_2$)

SOUTHEAST QUADRANT

Schist, gneiss, and amphibolite in Sierra de Perijá; migmatite and anatectic granite in eastern Colombia. Gneiss, migmatite, anatectic granite, and schist in the Eastern Cordillera of Ecuador and northern Peru

Proterozoic (Ᵽ)

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks in the North China Platform, accompanied by undifferentiated extrusive and intrusive rocks

ANTARCTIC REGION

Sedimentary rocks, intrusive and extrusive igneous rocks, and metamorphic rocks of East Antarctica; sedimentary, extrusive igneous, and metamorphic rocks of the Transantarctic Mountains; metasedimentary and metamorphic rocks of interior West Antarctica; and metamorphic rocks of coastal west Antarctica. Includes sedimentary and mafic volcanic rocks of western Queen Maud Land, felsic plutons of Ingrid Christensen Coast and Queen Maud Land, mafic plutons of Queen Maud Land, and widely distributed metamorphic rocks of coastal East Antarctica; undifferentiated extrusive igneous rocks, diverse sedimentary rocks, and metamorphic rocks from Churchill Mountains to Horlick Mountains; sedimentary and metasedimentary rocks from Thiel Mountains to Shackleton Range; felsic extrusive igneous rocks of Luitpold Coast; metasedimentary rocks of interior West Antarctica; metamorphic rocks of southern Ellsworth

Land; and gneiss of central Marie Byrd Land

Middle Proterozoic (P_2)

NORTHEAST QUADRANT

Marine sedimentary rocks, local low-grade metamorphism. Platform deposits on Canadian Shield, miogeoclinal deposits along eastern Cordillera of Canada and the United States

SOUTHWEST QUADRANT

Australia

Sequences in downwarps in cratons and old mobile belts- "platform cover" of north and northwestern Australia

McArthur and South Nicholson Basins: Shelf and continental clastic rocks, shallow to intertidal carbonate and evaporite rocks 1400-1800 m.y., minor tuff 1690±30 Ma, basal felsic and mafic extrusive rocks 1650-1800 m.y.; late mafic intrusive rocks. Shallow subsiding shelf, local rifts (aulacogens?). Epicratonic, in part over Pine Creek Inlier

Victoria River and Birrindudu Basins: Littoral-shelf clastic rocks, chert, carbonate rocks; late continental clastic and glacial deposits in Victoria River. 1100-1300 m.y. in Victoria River (epimobile belt on Halls Creek Province in thicker western part); 1565 Ma in Birrindudu (epicratonic on The Granites-Tanami Block)

Bangemall Basin: Lagoonal-shelf clastic rocks, minor carbonate rocks, chert, evaporite, fluvial rocks about 1100 Ma; late mafic intrusive rocks. Epimobile belt over Capricorn Orogen or marginal epicratonic over Nabberu Basin and Yilgarn Block

Small isolated unmetamorphosed to low-grade sequences peripheral to Yilgarn Block in west: clastic, intermediate to mafic extrusive rocks, minor carbonate rocks, chert, and in places tuff; depositional ages 560-750 m.y. to 1620±100 Ma. Epicratonic shelf now marginal to Northampton Block and Albany-Fraser Province mobile belts

Transitional basin

Georgetown, Yambo, and Coen Inliers, northeast Australia: Felsic intrusive rocks about 1060 and about 1300 Ma; felsic extrusive rocks about 1400 Ma; epicratonic with respect to older than 1400 Ma low- to medium-grade metamorphic rocks. Low-grade metamorphism 876±28 Ma

Gawler Craton, Broken Hill Block, southern Australia: Felsic extrusive rocks in Gawler 1450-1580 m.y. and younger, late to postorogenic felsic intrusive rocks (Gawler 1450-1580 m.y., Broken Hill ~1500, ~1625, ~1665 Ma). Subsequent mild deformations to 490 Ma. Epicratonic with respect to medium- to high-grade metamorphic rocks

Musgrave Block, central Australia: Felsic extrusive (1064±23 Ma), intrusive (1110±27 Ma), and mafic-ultramafic (1100-1200 m.y.) intrusive rocks. Epimobile belt with respect to high-grade granulite

Orogenic or geosynclinal, grading to epicratonic downwarp

Mt. Isa Inlier, Lawn Hill Platform, northern Australia: Continental, shelf, and shallow-marine clastic rocks, minor tuff (1670±20 Ma), iron formation; mafic extrusive rocks, not metamorphosed to low-grade (~1500, ~1680 Ma). Lawn Hill sequence transitional into complexly deformed, multiply metamorphosed, medium- to high-grade (1480-1500 m.y., ~1545, ~1610, ~1670 Ma) Mt. Isa sequence. Postorogenic mafic (~1100 Ma) and felsic (~1500 Ma) intrusive rocks in Mt. Isa. Mt. Isa taphrogenic orogen, possible mobile belt. Lawn Hill geosyncline, epicratonic

Davenport "Geosyncline" and northern part of Tennant Creek Inlier, central and northern Australia: Continental and shallow-marine clastic and minor carbonate, and felsic and mafic extrusive rocks; low-grade metamorphism followed by about 1640 Ma felsic intrusive rocks. Epicratonic

Georgetown Inlier, northeastern Australia: Marginal-marine clastic rocks, mafic intrusive rocks, metamorphosed to low-grade 976±28 Ma and low-medium-grade 1470±20, 1570±20 Ma; "orogenic" complexly deformed eastern sequence grades into low-grade "geosynclinal" sequence in west. Youngest low-grade metamorphisms ~300, ~400 Ma. Apparently similar history in Coen and Yambo Inliers farther north with more pervasive ~400 Ma metamorphism

Mt. Painter and Peake-Denison Inliers, southern Australia: Felsic intrusive rocks 1400-1500 m.y. in Mt. Painter; low-grade metamorphism 1550-1800 m.y., and in Peake-Denison 1000-1150 m.y. (postorogenic); Gawler Craton and Broken Hill Block, medium to high-grade metamorphism 1550-1700 m.y. (orogenic). Possible mobile belts

Nabberu Basin and Paterson Province, western Australia: Shelf clastic rocks; carbonate rocks in upper sequences. Minor chert, iron formation in Nabberu, evaporite in Paterson. Felsic intrusive rocks in Paterson 600, 1080 Ma, late mafic intrusive rocks in Nabberu 1050 Ma. Low-grade metamorphism 1600-1700 m.y. Mildly to moderately deformed "geosynclinal" sequences, epicratonic shelves to Capricorn Orogen

Mobile belts

Arunta Block, central Australia: Metamorphism to mainly high-grade of, and felsic intrusive rocks into, medium to high-grade (granulite) metamorphic rocks with local mafic intrusive rocks 1000-1100, 1400-1500, 1550-1700 m.y.; local carbonatite intrusive 732±5 Ma, postorogenic mafic intrusive rocks 987±9 Ma, ultramafic intrusive rocks 1180±90 Ma

Musgrave block, central Australia: High-grade multiple metamorphism 1200, 1360, 1615±170 Ma of clastic, volcanic, and minor carbonate sequences deposited to 1550 and >1800 Ma

Paterson Province, western Australia: Capricorn Orogen high-grade metamorphism 1334±44 Ma of less than 1700 Ma clastic rocks, iron formation, carbonate, ultramafic, and felsic intrusive rocks; postorogenic felsic intrusive rocks about 1080 and 1132±21 Ma

Albany-Fraser Province, southwestern Australia: High-grade (1300-900, 1328±12 Ma) and medium-grade (1560±36, 1625±40 Ma) metamorphism of Proterozoic continental (?) clastic rocks and Archean greenstone to felsic-mafic gneiss and migmatite; postorogenic (1080±50, 1100±50, 1190±25, 1210-1280 m.y.) and synorogenic (1690±145 Ma) felsic intrusive rocks

Northampton Block, western Australia: Felsic synorogenic intrusive rocks in sediment (turbidite?), gabbro metamorphosed to granulite 1020±50 Ma; late dolerite dykes (?600-1000 Ma)

Precambrian (p€)

NORTHEAST QUADRANT

Metamorphic rocks of the Guayana and Brazilian shields and southern Mexico: gneisses, schists, and slates, intruded by granitic rocks. Metamorphic complexes of east-central British Columbia

SOUTHEAST QUADRANT

Metamorphic rocks of the Guayana and Brazilian Shields and of the Pampean Ranges and Patagonian Massif. Gneiss, schist, and slate, intruded by granitic rocks. Metamorphic rocks associated with granitic intrusions (624-679 m.y.) in the Coastal Range of southern Peru

Proterozoic and Archean (ᴘA)

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks in South Korea and Sumatra, accompanied by felsic intrusive rocks

SOUTHWEST QUADRANT

Australia

Pine Creek Geosyncline, northern Australia: Gneiss, schist complex developed by 1800 Ma and older medium-grade metamorphism of 1800-2000 m.y. sedimentary rocks and ~2500 Ma felsic intrusive rocks. Orogenic metamorphism of geosynclinal deposits subsequent to an orogeny

Gawler Craton, southern Australia: Medium- to high-grade gneiss (protolith mafic intrusive rocks, iron formation, carbonate rocks), metamorphism 2412±72, 2590±130 Ma. Postorogenic felsic intrusive rocks 2360±50 Ma. Orogenic

Gascoyne Province, western Australia: Migmatite in south. Tectonic reactivation of northern margin of Archean Yilgarn Block in middle to upper Lower Proterozoic(?). Orogenic

Hamersley Basin, western Australia: Pyroclastic rocks, minor clastic rocks, carbonate, chert, deposition 2500-2770 m.y.; mafic extrusive rocks 2760±30 Ma. Epicratonic on Pilbara Block

Middle and Early Proterozoic ($ᴘ_2ᴘ_1$)

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks in Yangtze and North China Platforms, accompanied by felsic and intermediate extrusive rocks and felsic and alkali intrusive rocks

Marine and paralic sedimentary rocks, mafic extrusive rocks, mafic and felsic intrusive rocks, and anorthosite in the Siberian Platform

Early Proterozoic (P_1)

NORTHEAST QUADRANT

Metamorphic and intrusive igneous rocks. Churchill and Bear Provinces of the Canadian Shield, Rocky Mountain Front Ranges, southern Arizona, and Seward Block of Alaska

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks in Yangtze and North China Platforms, accompanied by undifferentiated extrusive rocks and felsic intrusive rocks

SOUTHWEST QUADRANT

Australia

Sequences in downwarps in cratons-mainly not deformed and not metamorphosed

Kimberley Basin, northwestern Australia: Shelf clastic rocks, minor carbonate and tuff, mafic extrusive rocks, <1815 Ma; late mafic and felsic intrusive rocks 1762±15 Ma, epicratonic. Younger Middle Proterozoic, Upper Proterozoic (~640-670 m.y.) tillite

Hamersley Basin, western Australia: Shelf clastic rocks, iron formation, carbonate rocks, minor chert, mafic and felsic extrusive rocks 2490±20 Ma

Transitional basin, northern Australia

Mt. Isa Inlier: Shelf clastic rocks, carbonate rocks, minor tuff, felsic to intermediate extrusive rocks 1680, 1780, 1860 Ma; mafic extrusive and intrusive rocks ~1740 Ma, felsic intrusive rocks ~1670, 1740, 1860 Ma; low- to medium-grade metamorphism, deformation 1670-1740 m.y.; remnants of earlier crust 2300-2500 m.y. Possible epimobile belt

Granites-Tanami Inlier: Clastic, felsic (1770±15 Ma) and mafic extrusive rocks, tuff, chert, minor iron formation; felsic intrusive rocks 1720±8, 1764±15, 1770±62, 1780±24, 1802±15 Ma

El Sherana Province: Felsic (1803±10 Ma) and minor mafic extrusive rocks, continental to shallow-water clastic rocks, tuff in rift infill. Upper mafic intrusive rocks 1688±13 Ma, felsic intrusive rocks ~1800 Ma

Orogenic or geosynclinal

Murphy Inlier, northern Australia: Clastic rocks, volcanic rocks deformed and metamorphosed to low-grade 1850-1870 Ma; synorogenic and postorogenic felsic intrusive rocks. Orogenic to transitional basin

Arnhem, Litchfield, and Pine Creek Inliers, northern Australia: 1870-1900 m.y. shelf clastic rocks, carbonate, tuff (1884±3 Ma), minor felsic and mafic extrusive rocks, low- to high-grade metamorphism 1800-1870 m.y., postorogenic and synorogenic (~1870 Ma) felsic intrusive rocks, preorogenic mafic intrusive rocks, in Pine Creek; probable similar events in Arnhem and Litchfield now dominated by synorogenic and postorogenic felsic intrusive and medium- to high-grade metamorphic rocks. Arnhem, Litchfield, northeast of Pine Creek orogenic, remainder of Pine Creek geosynclinal (over Rum Jungle Block)

Southern part of Tennant Creek Inlier, central Australia: Shelf clastic rocks, felsic and mafic extrusive rocks ~1870 Ma on 1920±60 Ma medium-grade metamorphic basement; low-grade metamorphism, mild deformation 1810 Ma. Felsic intrusive rocks ~1650, 1846±8, 1869±20 Ma; subsequent mild deformation ~1450 Ma. Geosynclinal

Peake-Denison and Mt. Painter Inliers, southern Australia: Clastic and mafic extrusive rocks metamorphosed to low grade and intruded by felsic rocks 1580-1820 m.y.

Orogenic, possibly mobile belts

Gawler Craton, Broken Hill Block in south: Deposition of sequences 2050-2200 m.y. (in Broken Hill clastic rocks, iron formation, felsic-mafic extrusive rocks), to medium- to high-grade metamorphism; synorogenic felsic intrusive rocks 1600-1860 m.y., preorogenic felsic intrusive rocks in northern Gawler 2270±43, 2300±33 Ma. Orogenic

Ashburton Trough, Nabberu Basin, and Paterson Province, western Australia: Shelf to littoral clastic rocks, iron formation, carbonate, mafic (and felsic in Paterson) extrusive rocks, and in Nabberu, pyroclastic rocks; metamorphosed low-grade in Ashburton, low-to-high grade in Nabberu, high-grade in Paterson. Synorogenic felsic intrusive rocks 1700 Ma. Subsequent mild deformation in Paterson 1123, ~1333 Ma. Geosynclinal; epicratonic shelf to Capricorn Orogen in Ashburton and Nabberu, orogenic or possibly mobile belt in Paterson

Archean (A)

NORTHEAST QUADRANT

Metamorphosed mafic volcanic rocks and associated sedimentary rocks with intrusive igneous rocks. Slave and Superior Provinces of the Canadian Shield. Wyoming Province of the Rocky Mountain Front Ranges of the United States

NORTHWEST QUADRANT

Marine sedimentary and metamorphic rocks in the North China Platform, accompanied by undifferentiated extrusive rocks and felsic intrusive rocks

Basement of mafic metamorphic rocks, ultramafic to mafic intrusive rocks, and anorthosite, with volcano-sedimentary cover, accompanied by granite-gneiss and felsic intrusive rocks in the Siberian Platform and in the Kolyma and Bureya Massifs

SOUTHWEST QUADRANT

Australia

Late orogenic block

Rum Jungle Block, northern Australia: Felsic intrusive rocks 2500 Ma, older minor metamorphosed (medium-grade) mafic intrusive rocks, metaclastic rocks, iron formation. Orogenic

Primitive crustal blocks of Western Australia

Yilgarn Block: In southwest, mainly felsic gneiss, felsic intrusive (2670±20 Ma) with enclaves of metaclastic, metacarbonate, mafic and ultramafic intrusive rocks, and late (2420±30 Ma) undeformed mafic dikes. Metamorphism 2500-2670 m.y. to medium-high grade of deposits 3000-3200 m.y.; age of provenance formation 3500-3750 m.y. and possibly as old as 4200 Ma. In east and northwest mainly 2600-2700 and 2800-3000 m.y. felsic intrusive rocks with greenstone and metasedimentary belts, metamorphosed to low-medium grade including felsic gneiss 2400-2710 m.y.; mafic intrusive 2470-2650 Ma, mafic extrusive rocks 2750-3000 Ma. Protolith includes pyroclastic rocks, clastic rocks, iron formation, and minor chert. Similar rocks less well dated in Marymia Dome north of Yilgarn Block. Orogenic; may represent formation of primitive crust

Pilbara Block: Volcanic-sedimentary belts around complex felsic gneiss migmatite granitoid batholiths; postorogenic felsic intrusive rocks, low-grade metamorphism 2500-2600 m.y., medium-grade (orogenesis) 2800-3000 m.y.; syntectonic 3270±22 Ma and pretectonic 3300-3500 m.y. felsic intrusive rocks. Older volcanic-sedimentary sequences of mafic extrusive rocks 3450-3700 m.y. and mafic to ultramafic intrusive, with felsic extrusive rocks, chert, iron formation, clastic rocks, minor carbonate in upper part. Orogenic; may represent formation of primitive crust

Sylvania Dome: Clastic, mafic and ultramafic intrusive and extrusive rocks, felsic intrusive rocks, metamorphosed mainly to medium grade. May be continuous with Pilbara Block

SEAFLOOR SEDIMENT

by
Floyd W. McCoy

This map depicts unconsolidated sediment exposed on the ocean floor at the sediment-water interface, as sampled primarily by coring equipment. The sediment is not necessarily of Holocene age, nor are the deposits necessarily the result of Holocene sedimentary processes. Information from two data bases was used to produce a 13- category seafloor-sediment map used in the 1:10-million scale maps of the Geologic Map Series.

The seven types of seafloor lithologies depicted in color on this map are defined in the classification format on the map, which is generalized from the thirteen-category scheme used in the Geologic Map Series 1:10-million scale maps. It is a two-component scheme comparing composition of sedimentary particles to particle size. Particle composition is identified by proportional amounts of biogenic material, in terms of carbonate or biosiliceous constitutents, or of nonbiogenic material. Grain-size criteria follow the accepted gravel-sand-silt-clay grade scale. For simplification on this map, the following lithologies are mapped as single units: clastic terrigenous sediment; pelagic "red" clay and hemipelagic clay; calcareous gravel/sand/silt and calcareous marl/ooze; diatomaceous silt and biosiliceous mud/ooze. The primary data base was derived from a new study of samples from the Lamont-Doherty Earth Observatory archive of deep-sea cores, with additional samples from cores in repositories of other marine institutions. A secondary data base was developed from published and unpublished sources.

The primary data base was developed using sediment descriptions derived from smear-slide analyses supplemented by calcium carbonate ($CaCO_3$) measurements. A smear slide is a thin film of sediment held under a cover slip on a glass slide with mounting compound, such as Canada balsam, and is an excellent method for describing fine-grained sediment such as silt and clay. This technique provided a systematic uniform framework for assimilating disparate sources of information on sediment throughout the Pacific Basin.

Smear-slide analyses were made on the uppermost sediment in over 4,500 Lamont-Doherty Earth Observatory cores throughout the project area, using petrographic-microscope techniques to determine the relative abundances of mineral and biogenic skeletal components. Calcium-carbonate analyses on approximately one-third of the core-top samples provided further quantitative control. Additional smear-slide descriptions and carbonate data from the scientific literature were combined into the primary data set only if both were available in published form and consistent; if either or both were not available, this information was placed in the secondary data base.

Approximately two-thirds of the secondary data base represents compilations by the World Data Bank (WDB). The remaining one-third was obtained from the published literature (listed under References Cited); from unpublished information (noted under Acknowledgments); from existing map compilations such as those of Frazer and others (1972) and Rawson and Ryan (1978); as well as from historical records such as those of the research vessels *Challenger*, *Carnegie*, *Snellius*, *Albatross*, and other oceanographic expeditions. In some areas, these data points are so numerous that one point has been plotted to represent many samples.

Individual data points used in published accounts are not shown. Not all such areas or sources are outlined on the index maps, however (figs. 7-10). Much of the data in the secondary data base not derived from smear-slide analyses are contradictory, incomplete, and difficult to combine into one consistent and interpretable data base. Sediment descriptions may be misleading, for example, if based upon quick field observations, insufficient laboratory data such as coarse-fraction analyses, or a poorly defined terminology and classification scheme. Equipment capabilities for sediment sampling also must be considered, such as the effectiveness of tallow at the end of a sounding line (frequently used in the last century), or the efficiency of modern corers, grab samplers, underway samplers, dredges, and so forth. For these reasons, descriptions based upon smear-slide information from cores are the preferred basis for portraying seafloor sediment.

Deep Sea Drilling Project (DSDP) sediment data have not been used on these maps. Rotary drilling techniques used by DSDP do not recover undisturbed sediment from the seafloor. Data from hydraulic piston cores (HPC) were not available when this mapping was done.

The classification scheme for marine sediment established in 1884 by Murray and Renard was retained in modified form. This classic scheme employs a nomenclature defined by a one-third/two-third division for nonbiogenic/biogenic components respectively.

Nonbiogenic components, predominantly allochthonous from land (terrigenous), are classified by median diameter of the dominant particles using the Wentworth grade scale subdivisions of gravel, sand, silt, and clay. For simplification, adjectival modifiers or multiple-noun designations are not used with these terms, thus eliminating terrigenous-sediment categories such as "silty clay," "sand-silt-clay," and "mud." Pelagic clays are classified with "clay" because these pelagic deposits are predominantly allochthonous clay residues, remaining after dissolution of calcareous biogenic debris, with subordinate amounts of authigenic components, and because differentiation between allogenic and authigenic clays is impossible in smear slides.

Biogenic components are calcareous and silicious skeletal debris that are predominantly formed locally (authochthonous), at least on a regional basis. Biosiliceous is used to distinguish biogenic from nonbiogenic siliceous detritus. Calcareous clay and biosiliceous clay categories define seafloor areas of mixing between biogenic and nonbiogenic material; both are probably underestimated because they require smear-slide or $CaCO_3$ data, not always available. Marl is an abridgment of the Murray and Renard term "marl ooze," which consists of calcareous clay and silt.

Biosiliceous mud is equivalent to marl but with siliceous skeletal material, and is designated "mud" to discriminate it from biosiliceous clay and to identify it as a mixture of clays and silt-sized biosiliceous debris. Oozes contain at least 60 percent biogenic constituents, along with 30 percent or more clay-sized material, which may be either biogenic or nonbiogenic.

Calcareous gravel/sand/silt, diatomaceous silt, and volcanic gravel/sand/silt define sediment with less than 30 percent clay-sized material. These sediment types have been mapped only where adequate sedimentological data are available. Volcanic or calcareous gravel/sand/silt occur on seafloor areas around volcanic islands and atolls, for instance, but are not shown unless sufficient information exists for both a textural and compositional definition. Diatom frustules occur predominantly as silt-sized particles; other biosiliceous debris does not form a dominant silt component in Pacific Ocean sediment.

Primary control in establishing trends of, and boundaries between, sediment types were bathymetry and regional depth variations of the carbonate compensation depth

(CCD). Additional control was provided by documented oceanographic and biologic water-column phenomena, and geologic phenomena influencing seafloor sedimentation.

Details of sediment distribution, such as on continental shelves, insular slopes, banks, and reefs, are indistinguishable at this scale. Calcareous ooze is presumed present and is mapped on seamounts, guyots, and other isolated underwater peaks wherever these physiographic features rise at least 2,000 m (two closed-contour intervals) above the regional CCD level in areas of carbonate productivity. Sediment types that appear anomalous in their position, such as a calcareous ooze at 6 km water depth, could represent displaced sediment or generalized bathymetry.

References cited were used in defining sediment types and distributions. Additional sources consulted are not listed if already noted by other maps or compilations used for this synthesis.

Data were provided by: James V. Gardner, U.S. Geological Survey; Jane Frazer, World Data Bank of Scripps Institution of Oceanography; Herbert W. Meyers, Michael Loughridge, Carla Potter, and Peter W. Sloss, National Geophysical Data Center, National Oceanographic and Atmospheric Administration; James E. Andrews, Naval Oceanographic Research and Development Activity; Margaret Leinen, University of Rhode Island; Ross Heath, University of Washington; and Neville F. Exon, Australia Bureau of Mineral Resources, Geology, and Geophysics.

Assistance in data compilation and map preparation was provided by: Adriano Bartolin, Susan Coughlin, Ginny Gulick, Frank Hall, Eric Halter, David Keil, Stuart Lewis, Sandra Meyn-Thomas, Martine Rawson, James Sonn, and Susan-Marie Stedman, all of the Lamont-Doherty Earth Observatory, and Frances R. Mills of the U.S. Geological Survey.

Clerical help was provided by Ramona Lotti, Rhonda Martinson, and Kathleen Thompson, all of Lamont-Doherty Earth Observatory.

This material is based upon work supported by U.S. Geological Survey research grant 14-08-0001-G-609. The sediment maps further reflect decades of support to curatorial facilities at major United States oceanographic institutions by the National Science Foundation and the Office of Naval Research. This is Lamont-Doherty Earth Observatory contribution no. 3288.

OFFSHORE GEOLOGY, CIRCUM-PACIFIC REGION

by

George W. Moore

To accompany the Geologic Map of the Circum-Pacific Region, triangles labeled by geologic age and lithology designate selected seafloor outcrops, including pre-Quaternary sediment samples within 1 m of the seafloor (fig. 11). The samples consist of dredge hauls, sedimentary rocks taken with heavily weighted dart corers, and Cretaceous and Tertiary strata penetrated by gravity and piston cores in areas of very slow deposition and seafloor erosion. Samples on the continental shelves have been selected to extend the outcrop geology of land areas as far seaward as possible. Where samples on the continental shelves are too numerous all to be included, older samples have been selected preferentially, along with those that alter patterns which might be inferred simply from offshore extrapolation of the continental geology.

Deep-sea drilling has shown that the Earth's crust under the ocean basins is much younger than that under the continents. Whereas the oldest continental rocks span a large fraction of the 4.54 billion year age of the Earth, those of the oceans do not exceed 180 million years, or less than 4 percent of the Earth's age. Newly formed oceanic crust, such as that along the East Pacific and Pacific-Antarctic Spreading Axes, is flanked by progressively older oceanic crust. The world's oldest ocean crust, Middle Jurassic in age, occurs in the western Pacific.

Many volcanic seamounts and oceanic plateaus have a geologic age that matches that of the oceanic crust which underlies them. These prominences formed where eruption rates were anomalously great along spreading axes. Adjacent magnetic lineations indicate that many of these thick volcanic bodies formed where a spreading axis was offset by a long and presumably leaky transform fault.

Other seamounts, such as those of the midplate-hotspot type, are believed to have formed above essentially fixed magma sources that were overridden by a lithospheric plate so as to produce a line of islands and seamounts that is progressively older along the line. Most prominences of this type, such as the well-known Hawaiian Ridge, are younger than the underlying oceanic crust.

Water-chilled basalt, fine-grained and glassy, crops out near spreading axes where insufficient time has elapsed since the young oceanic crust was formed to accumulate a cover of sediment. Along fault scarps, dredges commonly recover coarse-grained basalt and gabbro, more slowly cooled at depth below the seafloor. Along major transform faults, the crust is disrupted to sufficient depth to expose such metamorphic rocks as greenschist and, in some places, serpentinite from the Earth's mantle.

Serpentinite, gabbro, and basalt also crop out along some trench slopes. Uplift and disruption of crustal material in the upper plate of a subduction zone is believed to cause these exposures. From other trench slopes, dredges recover Tertiary and older sedimentary rocks, also disrupted by the subduction process.

Accumulation is sufficiently slow in the central Pacific Basin to cause early Tertiary strata to crop out or to lie within

1 m of the seafloor over broad areas (fig. 12). The Pacific Basin has a typical depth of between 5,000 and 6,000 m, well below the ordinary level at which the rate of calcium carbonate deposition is exceeded by that of its dissolution. Thus, carbonate skeletons of foraminifers and nannofossils, the principal sediment materials in areas that are shallow or are highly productive biologically, are eliminated from the sediment of much of the deeper basin.

Opaline skeletons of diatoms and radiolarians are also subject to dissolution. Although some of the more robust fossil radiolarians survive near areas of high surface productivity, over much of the basin windborne dust from the continents and clay and zeolitic reaction products from volcanic material are the main components of a thin and discontinuous late Cenozoic sedimentary section.

Thick Quaternary deposits ring the Pacific Basin and cover the adjacent abyssal plains as a result of sediment plumes from streams, deep-sea fans, and slide-generated turbidity currents. Along the Equator, a belt of Quaternary carbonate ooze, 1,000 km wide and as much as 20 m thick, occurs where nutrient-rich water wells up along the Equatorial Divergence and enhances biologic productivity. In other parts of the deep basin, however, productivity is insufficient to balance seafloor dissolution. Many such places are at a steady state of no net accumulation, and in others, erosion of underlying older deposits occurs by means of both dissolution and bottom currents such as those generated by the sinking and lateral flow of cold dense water from near Antarctica.

Principal sources for the offshore geology of the Circum-Pacific Region are Bryant and others (1969), Campsie and others (1983), Domack and others (1980), Engel and Chase (1965), Fox and Heezen (1975), Gramberg and others (1992), Hanna (1952), Ibrahim and others (1979), Jarrard and Clague (1977), Kudrass and others (1986), Lonsdale and Klitgord (1978), Marlow and Cooper (1980), McDougall (1975, 1982), Perfit and Heezen (1978), Riedel and Funnell (1964), Sheridan and others (1969), Skornyakova and Lipka (1976), Vallier and others (1985), and Vedder and others (1974). Additional data were obtained from the marine data file of the National Geophysical Data Center of the U.S. National Oceanic and Atmospheric Administration, through the courtesy of Carla Potter. Several samples of abyssal clay from within 1 m of the seafloor were dated especially for this map series on the basis of their fossil ichthyoliths by Patrica S. Doyle, Scripps Institution of Oceanography. Samples used on the Pacific-Basin Sheet were collected by ships from the Germany Bundesanstalt für Geowissenshaften und Rohstoffe, Hawaii Institute of Geophysics, Lamont-Doherty Earth Observatory, New Zealand Department of Scientific and Industrial Research, Oregon State University, Scripps Institution of Oceanography, Texas A&M University, University of Texas, University of Washington, U.S. Coast Guard, U.S. Geological Survey, U.S. Navy, U.S.S.R. Academy of Sciences, U.S.S.R.. Ministry of Geology, and Woods Hole Oceanographic Institution.

OCEAN DRILLING PROGRAM/DEEP SEA DRILLING PROJECT COLUMNAR SECTIONS

by
Anne L. Gartner and Theresa R. Swint-Iki

The columnar sections of Deep Sea Drilling Project (DSDP) sites 1 through 326 within the Circum-Pacific region were compiled by Paul W. Richards from a computerized data set provided by Peter B. Woodbury through the cooperation of the Scripps Institution of Oceanography; these sections were later revised to add more detail, using data from the Initial Reports of the DSDP, 1969-1987. Columnar sections for sites 382 through 543 were compiled by Theresa R. Swint-Iki from data in the Initial Core Descriptions of the DSDP, 1978-1982; these sections were later checked and revised following publication of the data in the Initial Reports of the DSDP. Sections for sites 565 through 624 were compiled by Anne L. Gartner from the Initial Reports of the DSDP, and for sites 626 through 908 from the Initial Reports of the Ocean Drilling Program (ODP). Sites 909 to 919 were taken from the Science Operator Reports (JOIDES, 1994). The sediment-classification scheme employed is that used by the ODP/DSDP.

Special permission to use data from the Science Operator Reports was granted by the management of the ODP. Columnar sections from the DSDP sites on the Pacific Basin Geologic Map are inclusive of Leg 96, published March 1987, and ODP sites inclusive of Leg 150, published February, 1994. The information contained on these columns is intended to convey general age and lithologic information.

Columns shown on the 1:10-million scale Geologic Maps of the Circum-Pacific Region, Northeast, Southeast, Southwest, Northwest Quadrants, and Antarctic Sheet, published between 1983 to 1989, were selected on the basis of total depth of penetration, age of the oldest sediment, and whether or not basement was reached, so as to display on those maps the most representative columns (see figures 13-17).

Columns in figure 18 are representative of ODP drill sites in the circum-Pacific region between 1982 and 1994. They have been selected on the basis of total depth of penetration, and age of sediment. Letter symbols on figures 13 through 18 are used to denote geologic age. The amount of detail shown on the columns is controlled by a relatively small scale that limits representation of lithologic units to those thicker than 10 m.

REFERENCES CITED

NORTHEAST QUADRANT

Andersen, N.R., and Malahoff, A., eds., 1977, The fate of fossil fuel CO_2 in the oceans: New York, Plenum Press, p. 429-454.

Andrews, J.E., 1972, Investigation of ferromanganese deposits from the central Pacific: Hawaii Institute of Geophysics Report HIG-72-23, 133 p.

Andrews, J.E., 1973, Sediment core descriptions: R/V *Mahi* 1970 cruise, western Pacific: Hawaii Institute of Geophysics Data Report 24, HIG-73-7, 11 p.

Andrews, J.E., and Foreman, J.A., 1976, Sediment core descriptions: R/V *Kana Keoki* 1972 cruise, eastern and western Pacific Ocean: Hawaii Institute of Geophysics Data Report 32, HIG-76-13, 112 p.

Andrews, J.E., and others, 1974, Ferromanganese deposits of the ocean floor: R/V *Moana Wave* Cruise Report Mn-74-01, : Hawaii Institute of Geophysics Report HIG-74-9, 194 p.

Angino, E.E., Bryant, W.R., and Harding, J.L., 1972, Trace element geochemistry of carbonate sediments, Yucatan shelf, Mexico, *in* Rezak, R., and Henry, V.J., eds., Contributions on geological and geophysical oceanography of the Gulf of Mexico: Houston, Texas A&M University Oceanographic Studies, v. 3, p. 281-290.

Aoki, S., Kohyama, N., and Sudo, T., 1979, Mineralogical and chemical properties of smectites in a sediment core from the southeastern Pacific: Deep Sea Research, v. 26A, p. 893-902.

Arita, M., 1975, Bottom sediments, *in* Mizuno, A., and Chujo, J., eds., Deep-sea mineral resources investigation in the eastern central Pacific basin, August-October 1974 (GH74-5 Cruise): Geological Survey of Japan Cruise Report 4, p. 62-70.

Arita, M., 1977, Bottom sediments, *in* Mizuno, A., and Moritani, T., eds., Deep-sea mineral resources investigation in the central eastern part of the Central Pacific basin, January-March 1976 (GH76-1 Cruise): Geological Survey of Japan Cruise Report 8, p. 94-117.

Arrhenius, G., 1952, Sediment cores from the east Pacific: Reports of the Swedish Deep-Sea Expedition, v. 5, p. 1-227.

Bandy, O.L., and Rodolfo, K.S., 1964, Distribution of foraminifera and sediments, Peru-Chile Trench area: Deep-Sea Research, v. 11, p. 817-837.

Barnes, P.W., 1972, Preliminary results of marine geological studies off the northern coast of Alaska, *in* An ecological survey in the Beaufort Sea, WEBSEC 71-72: U.S. Coast Guard Oceanographic Report CG373-64, p. 183-227.

Barnes, P., and others, 1979, Core descriptions and preliminary observations of vibracores from the Alaska Beaufort Sea shelf: U.S. Geological Survey Open-File Report 79-351, 17 p.

Barnes, P., Reimnitz, E., and Ross, R., 1980, Nearshore surficial sediment textures, Beaufort Sea, Alaska: U.S. Geological Survey Open-File Report 8-196, 41 p.

Belshe, J.C., 1967, Seafloor studies in the Kaulakahi Channel, Hawaii: Hawaii Institute of Geophysics Report HIG-67-8, 39 p.

Belshe, J.C., 1968, Ocean sediments sampled during 1964-1967 in the Hawaiian archipelago: Hawaii Institute of Geophysics Report HIG-68-7, 52 p.

Bennetts, K.R.W., and Pilkey, O.H., 1976, Characteristics of three turbidites, Hispaniola-Caicos Basin: Geological Society of America Bulletin, v. 87, p. 1291-1300.

Berger, W.H., Adelseck, C.G., Jr., and Mayer, L.A., 1976, Distribution of carbonate in surface sediments of the Pacific Ocean: Journal of Geophysical Research, v. 81, p. 2617-2627.

Berritt, G.R., and Rotschi, H., 1956, Chemical analyses of cores from the central and west equatorial Pacific: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 53-56.

Berryhill, J.L., Jr., and Trippet, A.R., 1980, Map showing trace-metal content and texture of surficial bottom sediments in the Port Isabel 1' x 2' Quadrangle, Texas: U.S. Geological Survey Map I-1254-B, scale 1:250,000.

Biscaye, P.E., Kolla, V., and Turekian, K.K., 1976, Distribution of calcium carbonate in surface sediments of the Atlantic Ocean: Journal of Geophysical Research, v. 81, p. 2595-2603.

Bischoff, J.L., Heath, R.G., and Leinen, M., 1979, Geochemistry of deep-sea sediments from the Pacific manganese nodule province: domes sites A, B, and C, *in* Bischoff, J.L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: Marine Science, v. 9, p. 397-436.

Bonatti, E., 1971, Manganese fluctuations in Caribbean sediment cores due to post-depositional remobilization: Bulletin of Marine Science, v. 21, p. 510-518.

Bornhold, B.D., 1976, Marine surficial geology: central and eastern Arctic: Geological Survey of Canada Paper 76-1A, p. 29-31.

Bornhold, B.D., 1980, Surficial sediments on the continental shelf, northwestern Vancouver Island: Geological Survey of Canada Open-File Report 702, scale 1:2,500,000.

Bornhold, B.D., Lewis, C.F.M., and Fenerty, N.E., 1975, Arctic marine surficial geology: Arctic Ice Dynamics Joint Experiment (AIDJEX) 1975: Geological Survey of Canada Paper 75-1C, p. 79-90.

Bouma, A.H., 1972, Distribution of sediments and sedimentary structures in the Gulf of Mexico, *in* Rezak, R., and Henry, V.J., eds., Contributions on geological and geophysical oceanography of the Gulf of Mexico: Texas A&M University Oceanographic Studies, v. 3, p. 35-65.

Bouma, A.H., and others, 1972, Deep sea sedimentation and correlation of strata off Magdalena River and in Beata Strait: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 430-438.

Bouysse, P., Vairon, P., Zeegers, H., 1980, Geochimie des sediments superficiels du plateau continental de la Guyane Française: Bulletin Institute Geologie Basin d'Aquitaine, v. 28, p. 93-114.

Broda, J.E., Franks, C.E., and Keith, D.J., eds., 1981, Descriptions of Woods Hole Oceanographic Institution (WHOI) sediment cores: Woods Hole Oceanographic Institution, Bibliography of Technical Reports, v. 6, WHOI-81-77, 704 p.

Bryant, W.R., Deflache, A.P., and Trabant, P.K., 1974, Consolidation of marine clays and carbonates, *in* Inderbitzen, A.L., Deep-sea sediments: physical and mechanical properties: New York, Plenum Press, p. 209-244.

Bryant, W.R., and others, 1969, Escarpments, reef trends, and diapiric structures, eastern Gulf of Mexico: American Association of Petroleum Geologists Bulletin, v. 53, p. 2506-2542.

Burnett, W.C., 1971, Trace element variations in some central Pacific and Hawaiian sediments: Hawaii Institute of Geophysics Report HIG-71-6, 112 p.

Burnett, W.C., 1975, Trace element geochemistry of biogenic sediments from the western equatorial Pacific: Pacific Science, v. 29, p. 219-225.

Burrell, D.C., and others, 1980, Some geochemical characteristics of Bering Sea sediments, *in* Hood, D.W., and Calder, J.A., eds., The eastern Bering Sea shelf: oceanography and resources–v. 1: Washington, D.C., U.S. Government Printing Office, p. 305-319.

Busch, W.H., and Keller, G.H., 1981, The physical properties of Peru-Chile continental margin sediments–the influence of coastal upwelling on sediment properties: Journal of Sedimentary Petrology, v. 51, p. 705-719.

Campbell, J.S., and Clark, D.L., 1977, Pleistocene turbidites of the Canada abyssal plain of the Arctic Ocean: Journal of Sedimentary Petrology, v. 47, p. 657-670.

Carey, A.G., Jr., 1981, A comparison of benthic infaunal abundance on two abyssal plains in the northeast Pacific Ocean: Deep-Sea Research, v. 28, p. 467-479.

Carlson, P.R., Molnia, B.F., Kittelson, S.C., and Hampson, J.C., Jr., 1977, Map of distribution of bottom sediments on the continental shelf, northern Gulf of Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-876, two sheets, various scales.

Carlson, P.R., Molnia, B.F., and Levy, W.P., 1980, Continuous acoustic profiles and sedimentologic data from R/V *Sea Sounder* cruise (S-1-76), eastern Gulf of Alaska: U.S. Geological Survey Open-File Report 80-65, 20 p.

Carr-Brown, B., 1972, Plioceno-Cuaternario, geología Marina-Pliocene-Quaternary, *in* Marine geology; the Holocene/ Pleistocene contact in the offshore area east of Galeota Point, Trinidad, West Indies: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 381-397.

Case, J.E., and Holcombe, T.L., 1980, Geologic-tectonic map of the Caribbean region: U.S. Geological Survey Miscellaneous Investigations Series, Map I-1100, scale 1:2,500,000.

Clark, D.L., and others, 1980, Stratigraphy and glacial-marine sediments of the Amerasian basin, central Arctic Ocean: Geological Society of America Special Paper 181, 57 p.

Coleman, J.M., 1976, Deltas: processes of deposition and models for exploration: Champaign, Ill., Continuing Education Publishing Company, Inc., 102 p.

Coleman, J.M., Prior, D.B., and Adams, C.E, Jr., 1981, Erosional furrows on continental shelf edge, Mississippi delta region: Geo-Marine Letters, v. 1, p. 11-15.

Conolly, J.R., and Ewing, M., 1967, Sedimentation in the Puerto Rico Trench: Journal of Sedimentary Petrology, v. 37, p. 44-59.

Corliss, B.H., and Hollister, C.D., 1979, Cenozoic sedimentation in the central north Pacific: Nature, v. 282, p. 707-709.

Cox, M.E., and McMurtry, G.M., 1981, Vertical distribution of mercury in sediments from the East Pacific Rise: Nature, v. 289, p. 789-792.

Craig, J.D., 1979, Geological investigation of the equatorial north Pacific sea floor: a discussion of sediment redistribution, *in* Bischoff, L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: Marine Science, v. 9, p. 529-558.

Creager, J.S., 1963, Sedimentation in a high energy, embayed, continental shelf environment: Journal of Sedimentary Petrology, v. 33, p. 815-830.

Curray, J.R., 1960, Sediments and history of Holocene transgression, continental shelf, northwest Gulf of Mexico, *in* Shepard, F.P., and others, Recent sediments, northeast Gulf of Mexico: Tulsa, Okla., American Association of Petroleum Geologists, p. 221-266.

Damuth, J.E., 1977, Late Quaternary sedimentation in the western equatorial Atlantic: Geological Society of America Bulletin, v. 88, p. 695-710.

Davies, D.K., 1968, Carbonate turbidites, Gulf of Mexico: Journal of Sedimentary Petrology, v. 38, p. 1100-1109.

Deep Sea Drilling Project, 1975-1982, Initial core descriptions, legs 44-78: La Jolla, University of California at San Diego, Scripps Institution of Oceanography.

Ditty, P.S., and others, 1977, Mixed terrigenous-carbonate sedimentation in the Hispaniola-Caicos turbidite basin: Marine Geology, v. 24, p. 1-20.

Dowding, L.G., 1976, Sediment dispersal within the Cocos Gap, Panama basin: Journal of Sedimentary Petrology, v. 47, p. 1132- 1156.

Doyle, L.J., and Pilkey, O.H., eds., 1979, Geology of continental slopes: Society of Economic Paleontologists and Mineralogists Special Publication 24, 374 p.

Doyle, L.J., and Sparks, T.N., 1980, Sediments of the Mississippi, Alabama and Florida (MAFLA) continental shelf: Journal of Sedimentary Petrology, v. 50, p. 905-916.

Driscoll, A.H., and Rush, S.M., 1975, Woods Hole Oceanographic Institution (WHOI) geological samples data file, v. 1, 1957-1973: Woods Hole Oceanographic Institution Report WHOI-75-37, 278 p.

Dunn, D.A., and Moore, T.C., Jr., 1981, Late Miocene-Pliocene (Magnetic Epoch 9–Gilbert Magnetic Epoch) calcium-carbonate stratigraphy of the equatorial Pacific Ocean: summary: Geological Society of America Bulletin, pt. I, v. 92, p. 104-107.

Dymond, J., 1981, Geochemistry of Nazca Plate surface sediments: an evaluation of hydrothermal, biogenic, detrital, and hydrogenous sources: Geological Society of America Memoir 154, p. 133-174.

Dymond, J., and Corliss, J.B., 1980, Chemical composition of Nazca Plate surface sediments, pt. II: Geological Society of America Map MC-34, scale 1:1,095,706.

Edwards, G.S., 1969, Distribution of shelf sediments, offshore from Anton Lizardo and the Port of Veracruz, Veracruz, Mexico: College Station, Texas A&M University, master's thesis, p. 3-58.

El Wakeel, S.K., and Riley, J.P., 1961, Chemical and mineralogical studies of deep-sea sediments: Geochimica et Cosmochimica Acta, v. 25, p. 110-146.

Embley, R.W., and Johnson, D.A., 1980, Acoustic stratigraphy and biostratigraphy of Neogene carbonate horizons in the north equatorial Pacific: Journal of Geophysical Research, v. 85, p. 5423-5437.

Emery, K.O., 1980, The sea off southern California: New York, John Wiley and Sons, Inc., 366 p.

Emery, K.O., and Uchupi, E., 1972, Western north Atlantic Ocean: topography, rocks, structure, water, life, and sediments: American Association of Petroleum Geologists Memoir 17, 532 p.

Engel, C.G., and Chase, T.E., 1965, Composition of basalts dredged from seamounts off the west coast of Central America: U.S. Geological Survey Professional Paper 525-C, p. 161-163.

Enos, P., 1974, Map of surface sediment facies of the Florida-Bahamas plateau: Geological Society of America Map and Chart Series MC-5, scale 1:3,937,000.

Ewing, M., Ericson, D.B., and Heezen, B.C., 1958, Sediments and topography of the Gulf of Mexico, *in* Weeks, L.G., ed., Habitat of oil: Tulsa, Okla., American Association of Petroleum Geologists, p. 995-1053.

Ewing, M., and others, 1969, Initial reports of the Deep Sea Drilling Project: National Science Foundation, v. 1, 672 p.

Exon, N.F., 1981, Manganese nodules in the Cook Islands region, southwest Pacific: South Pacific Marine Geological Notes, v. 2, p. 47-65.

Fan, P., 1979, Mineralogy of deep-sea sediments along the Murray fracture zone: Pacific Science, v. 33, p. 213-221.

Fan, P., and Grunwald, R.R., 1971, Sediment distribution in the Hawaiian archipelago: Pacific Science, v. 25, p. 484-488.

Finger, K.L., 1975, Submarine sedimentary facies at Deception Island, South Shetland Islands: Antarctic Journal, v. 11, p. 162-163.

Fisk, H.N., and others, 1954, Sedimentary framework of the modern Mississippi delta: Journal of Sedimentary Petrology, v. 24, p. 76-99.

Flood, R.D., 1981, Longitudinal triangular ripples in Blake-Bahama Basin: Marine Geology, v. 39, p. M13-M20.

Folk, R.L., and Robles, R., 1964, Carbonate sands of Isla Perez, Alacran reef complex, Yucatan: Journal of Geology, v. 72, p. 255- 292.

Fornari, D.J., Malahoff, A., and Heezen, B.C., 1979, Submarine slope micromorphology and volcanic substructure of the island of Hawaii inferred from visual observations made from U.S. Navy deep-submergence vehicle (DSV) *Sea Cliff*: Marine Geology, v. 32, p. 1-20.

Fornari, D.J., Moore, J.G., and Calk, L., 1979, A large submarine sand-rubble flow on Kilauea Volcano, Hawaii: Journal of Volcanology and Geothermal Research, v. 5, p. 239-256.

Forstner, U., and Stoffers, P., 1981, Chemical fractionation of transition elements in Pacific pelagic sediments: Journal of the Geochemical Society and the Meteoritical Society, v. 45, p. 1141-1146.

Fox, P.J., and Heezen, B.C., 1975, Geology of the Caribbean crust, *in* Nairn, A.E.M., and Stehli, F.G., eds., Ocean basins and margins: New York, Plenum Press, v. 3, p. 421-466.

Frank, D.J., Maylan, M.A., Craig, J.D., and Glasby, G.P., 1976, Ferromanganese deposits of the Hawaiian archipelago: Hawaii Institute of Geophysics Report HIG-76-14, 71 p.

Frazer, J.Z., Hawkins, D.L., and Arrhenius, G., 1972, Surface sediments and topography of the north Pacific: Scripps Institution of Oceanography, Geological Data Center, Charts 1-10, scale 1:3,630,000.

Gardner, J.V., Dean, W.E., and Vallier, T.L., 1980, Sedimentology and geochemistry of surface sediments, outer continental shelf, southern Bering Sea: Marine Geology, v. 35, p. 299-329.

Gearing, P., and others, 1976, Hydrocarbons in 60 northeast Gulf of Mexico shelf sediments: a preliminary survey: Journal of the Geochemical Society and the Meteoritical Society, v. 40, p. 1005-1017.

Gershanovich, D.E., 1967, Late Quaternary sediments of Bering Sea and the Gulf of Alaska, *in* Hopkins, D.M., ed., The Bering land bridge: Stanford University Press, p. 32-46.

Gershanovich, D.E., 1968, New data on geomorphology and recent sediments of the Bering Sea and the Gulf of Alaska: Marine Geology, v. 6, p. 281-296.

Glockhoff, C., 1978, Description of cores from the Pacific and Indian Oceans taken on *Antipode* expedition: Scripps Institution of Oceanography Reference Series 78-17.

Glockhoff, C., and Helms, P.B., 1974, Description of cores from the central Pacific taken on *Styx* expedition: Scripps Institution of Oceanography Reference Series 74-16, 29 p.

Glockhoff, C., and Helms, P.B., 1975, Description of cores from the tropical central Pacific taken on *Amphitrite* expedition: Scripps Institution of Oceanography Reference Series 75-29, 43 p.

Goldberg, E.D., and Arrhenius, G.O.S., 1958, Chemistry of the Pacific pelagic sediments: Geochimica et Cosmochimica Acta, v. 13, p. 153-212.

Goodell, H.G., 1967, The sediments and sedimentary geochemistry of the southeastern Atlantic shelf: Journal of Geology, v. 75, p. 665-692.

Gould, H.R., and Stewart, R.H., 1955, Continental terrace sediments in the northeastern Gulf of Mexico, *in* Hough, L., and Menard, H.W., eds., Finding ancient shorelines: a symposium: Society of Economic Paleontologists and Mineralogists Special Publication 3, p. 106-126.

Greenman, N.N., and LeBlanc, R.J., 1956, Recent marine sediments and environments of northwest Gulf of Mexico: American Association of Petroleum Geologists Bulletin, v. 40, p. 813-847.

Griffen, J.J., and Gladberg, E.D., 1969, Recent sediments of Caribbean Sea: American Association of Petroleum Geologists Memoir 11, p. 258-268.

Gross, M.G., McManus, D.A., and Ling, H.-Y., 1967, Continental shelf sediment, northwestern United States: Journal of Sedimentary Petrology, v. 37, p. 790-795.

Gross, M.G., and others, 1969, Marine geology of Kure and Midway Atolls: a preliminary report: Pacific Science, v. 23, p. 17-25.

Hampton, M.A., 1981, Grain size and composition of seafloor sediment, Kodiak Shelf, Alaska: U.S. Geological Survey Open-File Report 81-659, 101 p.

Hampton, M.A., and Bouma, A.H., 1979, Notes on the acquisition of high resolution seismic reflection profiles, side-scanning sonar records, and sediment samples from lower Cook Inlet and Kodiak Shelf, R/V *Sea Sounder* cruise S8-78-WG, August 1978: U.S. Geological Survey Open-File Report 79-1311, 60 p.

Hanna, G.D., 1952, Geology of the continental slope off central California: California Academy of Sciences Proceedings, v. 27, p. 325-358.

Harvey, R.R., Andrews, J.E., and Zaneveld, J.R., 1978, Preliminary Dumand site evaluations: Maui Basin and Keahole Point Basin: Hawaii Institute of Geophysics Report HIG-78-2, 44 p.

Hathaway, J.C., ed., 1966, Continental margin program–Atlantic coast of the United States, sample collection data: Woods Hole Oceanographic Institution Reference Series 66-8, v. 1, 184 p.

Hathaway, J.C., 1967, Continental margin program–Atlantic coast of the United States, sample collection data, supplement 1: Woods Hole Oceanographic Institution Reference Series 67-21, v. 1, 108 p.

Hays, J., Saito, D., Opdyke, N.D., and Burckle, L.H., 1969, Pliocene-Pleistocene sediments of the equatorial Pacific; their paleomagnetic, biostratigraphic, and climatic record: Geological Society of America Bulletin, v. 8, p. 1481-1514.

Heath, G.R., and Dymond, J., 1981, Metalliferous-sediment deposition in time and space: East Pacific Rise and Bauer Basin, northern Nazca Plate: Geological Society of America Memoir 154, p. 175-198.

Hein, J.R., and others, 1979, Mineralogy and diagenesis of surface sediments from Domes Areas A, B, and C, *in* Bischoff, L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: Marine Science, v. 9, p. 365-396.

Henderson, P.J., 1971, Textural study of sediments of Barrow Strait, District of Franklin: Maritime Sediments, v. 7, p. 126-137.

Hirst, D.M., 1962, The geochemistry of modern sediments from the Gulf of Paria–I. The relationship between the mineralogy and the distribution of major elements: Geochimica et Cosmochimica Acta, v. 26, p. 309-334.

Hishida, H., and Uchio, T., 1981, Sedimentological and geochemical studies of manganese micronodules and the associated sediments in some piston cores in the north Pacific Ocean: University of Tokyo Journal of the Faculty of Engineering, v. 36, p. 463- 522.

Horn, D.R., Horn, B.M., and Delach, M.N., 1970, Sedimentary provinces of the north Pacific, *in* Hays, J.D., ed., Geological investigations of the north Pacific: Geological Society of America Memoir 126, p. 1-21.

Horn, D.R., and others, 1970, Turbidites of the Hatteras and Sohm abyssal plains, western north Atlantic: Marine Geology, v. 11, p. 287-323.

Horn, D.R., and others, 1971, Turbidites of the northeast Pacific: Sedimentology, v. 16, p. 55-69.

Huang, T.C., and Goodell, H.G., 1970, Sediments and sedimentary processes of eastern Mississippi Cone, Gulf of Mexico: American Association of Petroleum Geologists Bulletin, v. 54, p. 2070-2100.

Ibrahim, A.K., Latham, G.V., and Ladd, J., 1979, Seismic refraction and reflection measurements in the Middle America Trench offshore Guatemala: Journal of Geophysical Research, v. 84, p. 5643-5649.

Ingle, J.C., Jr., Keller, G., and Kolpack, R.L., 1980, Benthic foraminiferal biofacies sediments and water masses of the southern Peru-Chile Trench area, southeastern Pacific Ocean: Micropaleontology, v. 26, p. 113-150.

Inman, D.L., and Chamberlain, T.K., 1955, Particle-size distribution in nearshore sediments, *in* Hough, J.L., and Menard, H.W., eds., Finding ancient shorelines: a symposium: Society of Economic Paleontologists and Mineralogists Special Publication 3, p. 106-126.

Jarrard, R.D., and Clague, D.A., 1977, Implications of Pacific island and seamount ages for the origin of volcanic chains: Reviews of Geophysics and Space Physics, v. 15, p. 57-76.

Johnson, D.A., 1972, Ocean-floor erosion in the equatorial Pacific: Geological Society of America Bulletin, v. 83, p. 3121-3144.

Johnson, D.A., and Driscoll, A.H., eds., 1975, Descriptions of Woods Hole Oceanographic Institution (WHOI) sediment cores, v. 1-4: Woods Hole Oceanographic Institution Report WHOI-75-8, 2937 p.

Johnson, D.A., and Driscoll, A.H., eds., 1977, Descriptions of Woods Hole Oceanographic Institution (WHOI) sediment cores, v. 5: Woods Hole Oceanographic Institution Report WHOI-77-26, 796 p.

Johnson, T.C., 1976, Biogenic opal preservation in pelagic sediments of a small area in the eastern tropical Pacific: Geological Society of America Bulletin, v. 87, p. 1273-1282.

Johnson, T.C., and Glockhoff, C., 1974, Description of cores from the Pacific Ocean taken on Scan expedition: Scripps Institution of Oceanography Reference Series 74-22, 39 p.

Kanaya, T., 1969, Diatom micropaleontology and deep-sea stratigraphy of the north Pacific: Societe Franco-Japonaise d'Oceanographie Bulletin, v. 7, p. 183-196.

Karig, D.E., Peterson, M.N.A., and Shor, G.G., 1970, Sediment-capped guyots in the Mid-Pacific Mountains: Deep-Sea Research, v. 17, p. 373-378.

Keir, R.S. and Honjo, S., 1981, Calcite dissolution, an *in situ* study in the Panama Basin: Science, v. 212, p. 659-661.

Keller, G.H., and others, 1972, Mass physical properties of Tobago Trough sediments: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 405-408.

Knebel, H.J., Creager, J.S., and Echols, K.J., 1974, Holocene sedimentary framework, east-central Bering Sea continental shelf, *in* Herman, Y., ed., Marine geology and oceanography of the Arctic seas: New York, Springer-Verlag, p. 157-172.

Kobayashi, K., and others, 1971, Magnetic and micropaleontological study of deep-sea sediments from the west-central equatorial Pacific: Deep Sea Research, v. 18, p. 1045-1062.

Kornicker, L.S., and Bryant, W.R., 1969, Sedimentation on the continental shelf of Guatemala and Honduras, *in* Tectonic relations of northern Central America and the western Caribbean; the *Bonacca* expedition: American Association of Petroleum Geologists Memoir 11, p. 244-257.

Kowsmann, R.O., 1973, Coarse components in surface sediments of the Panama Basin, eastern equatorial Pacific: Journal of Geology, v. 81, p. 473-494.

Krause, D.C., Menard, H.W., and Smith, S.M., 1964, Topography and lithology of the Mendocino Ridge: Journal of Marine Research, v. 22, p. 236-249.

Krishnaswami, S., 1976, Authigenic transition elements in Pacific pelagic clays: Journal of the Geochemical Society, v. 40, p. 425- 434.

Kulm, L.D., and Scheidegger, K.F., 1979, Quaternary sedimentation on the tectonically active Oregon continental slope, *in* Doyle, L.J., and Pilkey, O.H., eds., Geology of continental slopes: Society of Economic Paleontologists and Mineralogists Special Publication 27, p. 247-263.

Kuznetsov, Y.V., Alterman, E.I., and Lisitzin, A.P., 1981, Sedimentation rates of metalliferous sediments in the southeastern part of the Pacific Ocean: Okeanologia, v. 21, p. 308-317.

Lair, C., and Sanko, P., 1968, Core, sound velocimeter, hydrographic and bottom photographic stations–cores and bottom photographic stations: Marine Geophysical Survey Program 65-67, western north Atlantic and eastern and central north Pacific Oceans, Area 6: U.S. Naval Oceanographic Office, Alpine Geophysical Association, Inc., v. 8, 82 p.

Landergren, S., 1964, On the geochemistry of deep-sea sediments: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 10: Special Investigations no. 5, p. 60-154.

Landmesser, C.W., and others, 1976, Manganese nodules from the south Penrhyn Basin, southwest Pacific: South Pacific Marine Geological Notes, v. 1, p. 17-39.

Larson, M.C., Nelson, C.H., and Thor, D.R., 1980, Geological and geochemical and geotechnical observations on the Bering Shelf, Alaska: U.S. Geological Survey Open-File Report 80-979, p. 1-37.

Leinen, M., and Heath, G.R., 1981, Sedimentary indicators of atmospheric activity in the northern hemisphere during the Cenozoic: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 36, p. 1-22.

Lewis, K.B., and others, 1980, The origin of channel-fill sands and gravels on an algae-dominated reef terrace, Rarotonga, Cook Islands: South Pacific Marine Geological Notes, v. 2, p. 1-23.

Lineberger, P.H., 1975, Sedimentary processes and pelagic turbidites in the eastern central Pacific basin: Hawaii Institute of Geophysics Report HIG-75-24, 124 p.

Lisitsyn, A.P., 1969, Recent sedimentation in the Bering Sea: Jerusalem, Israel Program for Scientific Translation, 614 p.

Lisitsyn, A.P., 1972, Sedimentation in the world ocean: Society of Economic Paleontologists and Mineralogists Special Publication 7, 218 p.

Lisitsyn, A.P., and Petelin, V.P., 1967, Features of distribution and modification of $CaCO_3$ in bottom sediments of the Pacific Ocean: Lithology and Mineral Resources 5, p. 565-578.

Logan, B.W., 1969, Carbonate sediments and reefs, Yucatan Shelf, Mexico: American Association of Petroleum Geologists Memoir 11, p. 1-198.

Logvinenko, N.V., and Ogorodnikov, V.I, 1980, Recent sediments on the continental shelf of the Chukchi Sea: Oceanology, v. 20, p. 448-452.

Lonsdale, P., and Klitgord, K.D., 1978, Structure and tectonic history of the eastern Panama Basin: Geological Society of America Bulletin, v. 89, p. 981-999.

Lonsdale, P., and Malfait, B. 1974, Abyssal dunes of foraminiferal sand on the Carnegie Ridge: Geological Society of America Bulletin, v. 85, p. 1697-1712.

Lonsdale, P., Normark, W.R., and Newman, W.A., 1972, Sedimentation and erosion on Horizon Guyot: Geological Society of America Bulletin, v. 83, p. 289-316.

Luz, B., and Shackleton, N.J., 1975, $CaCO_3$ solution in the tropical east Pacific during the past 130,000 years, *in* Sliter, W.V., Be, A.W.H., and Berger, W.H., eds., Dissolution of deep-sea carbonates: Cushman Foundation for Foraminiferal Research Special Publication 13, p. 142-150.

Lynch, S.A., 1954, Geology of the Gulf of Mexico: U.S. Fish and Wildlife Service Fishery Bulletin 89, v. 55, p. 67-86.

MacIlvaine, J.C., and Ross D.A., 1973, Surface sediments of the Gulf of Panama: Journal of Sedimentary Petrology, v. 43, p. 215-223.

Marchig, V., 1978, Brown clays form the central Pacific metalliferous sediments or not?: Geologisches Jahrbuch, ser. D, no. 30, p. 3-25.

Marlow, M.S., and Cooper, A.K., 1980, Mesozoic and Cenozoic structural trends under southern Bering Sea shelf: American Association of Petroleum Geologists Bulletin, v. 64, p. 2139-2155.

Marlow, M.S., and others, 1979, Description of dredge samples from the Bering Sea continental margin: U.S. Geological Survey Open-File Report 79-1139, 2 p.

McBirney, A.R., ed., 1969, Tectonic relations of northern Central America and the western Caribbean, the *Bonacca* expedition: American Association of Petroleum Geologists Memoir 11, p. 199-280.

McClellan, P.H., and others, 1980, New biostratigraphic results of dredging and dart coring in the western Gulf of Alaska and their tectonic implications: U.S. Geological Survey Open-File Report 80-1237, 14 p.

McManus, D.A., Kelley, J.C., and Creager, J.S., 1969, Continental shelf sedimentation in an Arctic environment: Geological Society of America Bulletin, v. 80, p. 1961-1984.

McManus, D.A., and others, 1974, Yukon River sedimentation on the northernmost Bering Sea shelf: Journal of Sedimentary Petrology, v. 44, p. 1052-1060.

McManus, D.A., and others, 1977, Distribution of bottom sediments on the continental shelf, northern Bering Sea: U.S. Geological Survey Professional Paper 759-C, p. 1-31.

McMurtry, G.M., and Yeh, H.-W., 1981, Hydrothermal clay mineral formation of East Pacific Rise and Bauer Basin sediments: Chemical Geology, v. 32, p. 189-205.

Milliman, I.D., 1972, Atlantic continental shelf and slope of the United States–petrology of the sand fraction of sediments, northern New Jersey to southern Florida: U.S. Geological Survey Professional Paper 529-J, 40 p.

Mizuno, A., and Chujo, J., eds., 1975, Deep-sea mineral resources investigation in the eastern central Pacific basin, August-October 1974 (GH74-5 Cruise): Geological Survey of Japan Cruise Report 4, 103 p.

Mizuno, A., and Moritani, T., eds., 1977, Deep sea mineral resources investigation in the eastern central Pacific basin, January-March 1976 (GH76-1 Cruise): Geological Survey of Japan Cruise Report 8, 217 p.

Moberly, R., Jr., and McCoy, F.W., Jr., 1966, The seafloor of the eastern Hawaiian Islands: Marine Geology, v. 4, p. 21-48.

Moore, G.W., and Luken, M.D., 1979, Offshore sand and gravel resources of the Pacific Northwest: Oregon Geology, v. 41, p. 143-152.

Moore, J.G., and Fiske, R.S., 1969, Volcanic substructure inferred from dredge samples and ocean-bottom photographs: Geological Society of America Bulletin, v. 80, p. 1191-1202.

Moore, T.C., Heath, G.R., and Kowsmann, R.O., 1973, Biogenic sediments of the Panama Basin: Journal of Geology, v. 81, p. 458-472.

Morelock, J., and Bryant, W.R., 1972, Consolidation of marine sediments, *in* Rezak, R., and Henry, V.J., eds., Contributions on geological and geophysical oceanography of the Gulf of Mexico: Texas A&M University Oceanographic Studies, v. 3, p. 181-202.

Morelock, J., and Koenig, K.J., 1967, Terrigenous sedimentation in a shallow water coral reef environment: Journal of Sedimentary Petrology, v. 37, p. 1001-1005.

Morgenstein, M., 1972, Sedimentary diagenesis and rates of manganese accretion of the Waho Shelf, Kauai Channel, Hawaii, *in* Andrews, J.E., ed., Investigations of ferromanganese deposits from the central Pacific: Hawaii Institute of Geophysics Report HIG-72-23, p. 1-40.

Moritani, T., ed., 1979, Deep-sea mineral resources investigation in the western central Pacific basin, January-March 1977 (GH77-1 Cruise): Geological Survey of Japan Cruise Report 12, 256 p.

Morton, R.W., 1975, Sound velocity in carbonate sediments from the Whiting Basin, Puerto Rico: Marine Geology, v. 19, p. 1-17.

Mullins, H.T., and others, 1980, Carbonate sediment drifts in northern Straits of Florida: American Association of Petroleum Geologists Bulletin, v. 64, p. 1701-1717.

Murray, J., and Renard, A.F., 1891, Report on deep-sea deposits based on the specimens collected during the voyage of H.M.S. *Challenger* in the years 1872 to 1876, *in* Thomson C.W., and Murray, J. eds., Report on the scientific results of the voyage of H.M.S. *Challenger* during the years 1873-1876: New York, Johnson Reprint Corporation, p. 80-147.

Naidu, A.S., and Mowatt, T.C., 1972, Aspects of size distributions, mineralogy and geochemistry of deltaic and adjacent shallow marine sediments, *in* An ecological survey in the Beaufort Sea: WEBSEC 71-72, U.S. Coast Guard Oceanographic Report CG373-64, p. 238-268.

Nakao, S., 1979, Bottom sediments, *in* Moritani, T., ed., Deep-sea mineral resources investigation in the western central Pacific basin, January-March 1977 (GH77-1 Cruise): Geological Survey of Japan Cruise Report 12, p. 131-151.

Naugler, F.P., Silverberg, N., and Creager, J.S., 1974, Recent sediments of the east Siberian Sea, *in* Herman, N., ed., Marine geology and oceanography of the Arctic seas: New York, Springer-Verlag, p. 191-210.

Nemoto, K., and Kroenke, L.W., 1981, Marine geology of the Hess Rise 1, bathymetry, surface sediment distribution, and environment of deposition: Journal of Geophysical Research, v. 86, p. 10734-10752.

Ninkovich, D., and Shackleton, N.J., 1975, Distribution, stratigraphic position and age of ash layer "L", in the Panama Basin region: Earth and Planetary Science Letters, v. 27, p. 20-34.

Northam, M.A., Curry, D.J., Scalan, R.S., and Parker, P.L., 1981, Stable carbon isotope ratio variations of organic matter in Orca Basin sediments: Geochimica et Cosmochimica Acta, v. 45, p. 257-270.

Olausson, E., 1960, Sediment cores from the west Pacific: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 161- 214.

Palmer, H.D., 1964, Marine geology of Rodriguez Seamount: Deep-Sea Research, v. 11, p. 737-756.

Pautot, G., and Melguen, M., 1979, Influence of deep-water circulation and seafloor morphology on the abundance and grade of central south Pacific manganese nodules, *in* Bischoff, J.L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: Marine Science, v. 9, p. 621-650.

Pelletier, B.R., 1974, Sediment dispersal in the southern Beaufort Sea: Interim Report of Beaufort Sea Project Study F4:BIO, Atlantic Geoscience Center, Geological Survey of Canada, 23 p.

Perfit, M.R., and Heezen, B.C., 1978, The geology and evolution of the Cayman Trench: Geological Society of America Bulletin, v. 89, p. 1155-1174.

Pettersson, H., ed., 1948-1952, Sediment cores from the east Pacific: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 5, p. 1-244.

Pettersson, H., ed., 1948-1960, Sediment cores from the west Pacific: Reports of the Swedish Deep Sea Expedition, 1947-1948, v. 6, p. 1-214.

Pilkey, O.H., and others, 1981, The Georgia Embayment continental shelf: stratigraphy of a submergence: Geological Society of America Bulletin, v. 92, p. 52-63.

Prell, W.L., 1978, Upper Quaternary sediments of the Colombia Basin; spatial and stratigraphic variation: Geological Society of America Bulletin, v. 89, p. 1241-1255.

Rawson, M.Q., and Ryan, W.B.F., 1978, Ocean floor sediment and polymetallic nodules: Lamont-Doherty Geological Observatory and U.S. Department of State, scale 1:23,230,300.

Reinemund, J.A., 1975, Circum-Pacific Map Project summary report: Menlo Park, Calif., Circum-Pacific Map Project, unpublished report, 24 p.

Revelle, R.R., 1944, Marine bottom samples collected in the Pacific Ocean by the *Carnegie* on its seventh cruise, *in* Scientific results of Cruise VII of the *Carnegie* during 1928-1929 under command of Captain J.P. Ault: Department of Terrestrial Magnetism, Oceanography-II, Carnegie Institution of Washington Publication 556, 115 p.

Rezak, R., and Edwards, G.S., 1972, Carbonate sediments of the Gulf of Mexico, *in* Rezak, R., and Henry, V.J., eds., Contributions on geological and geophysical oceanography of the Gulf of Mexico: Texas A&M University Oceanographic Studies, v. 3, p. 263-280.

Riedel, W.R., and Funnell, B.M., 1964, Tertiary sediment cores and microfossils from the Pacific Ocean floor: Geological Society of London Quarterly Journal, v. 120, p. 305-368.

Roberts, R.W., 1976, Bottom sediment granulometric data for the continental margins of the Bering, Chukchi, East Siberian, Laptev, and Beaufort Seas: University of Washington Special Report 70, 228 p.

Rona, P.A., 1980, The central north Atlantic Ocean basin and continental margin: National Oceanic and Atmospheric Adminstration (NOAA) Environmental Research Laboratories, NOAA Atlas 3, 99 p.

Rosato, V.J., Kulm, L.D., and Derks, P.S., 1975, Surface sediment of the Nazca Plate: Pacific Science, v. 29, p. 117-130.

Ross, C., Reynolds, L., and Bowman, J., 1976, A summary of sediment size, chemistry, x-radiography, sound velocity, and mass physical properties of three cores from the Pacific: USNS *Steigver* laboratory, item 495: Washington, D.C., Naval Oceanographic Office, Geological Laboratory Oceanographic Support Division Department, 22 p.

Roy, K.J., and Smith, S.V., 1971, Sedimentation and coral reef development in turbid water: Fanning Lagoon: Pacific Science, v. 25, p. 234-248.

Ryan, J.J., and Goodell, H.G., 1972, Marine geology and estuarine history of Mobile Bay, Alabama, pt. 1, contemporary sediments: Geological Society of America Memoir 133, p. 517-554.

Saito, T., Burckle, L.H., and Hays, J.D., 1975, Late Miocene to Pleistocene biostratigraphy of equatorial Pacific, *in* Saito, T., and Burckle, L., eds., Late Neogene epoch boundaries: Micropaleontology Special Publication 1, p. 226-244.

Sayles, F.L., Ku, T.L., and Bowker, P.C., 1975, Chemistry of ferro-manganoan sediment of the Bauer Deep: Geological Society of America Bulletin, v. 86, p. 1423-1431.

Scherer, W., and Macsotay, O., 1972, Ecologic analysis and facies distribution of the Lecherias-Manare platform area, northeastern Venezuela: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 418-422.

Schneider, E.D., and Heezen, B.C., 1966, Sediments of the Caicos Outer Ridge, the Bahamas: Geological Society of America Bulletin, v. 77, p. 1381-1398.

Schneidermann, N., Pilkey, O.H., and Saunders, C., 1976, Sedimentation on the Puerto Rico insular shelf: Journal of Sedimentary Petrology, v. 46, p. 167-173.

Schreiber, B.C., 1968, Core, sound velocimeter, hydrographic, and bottom photograph stations-cores: Marine Geophysical Survey Program 65-67, western north Atlantic and eastern and central north Pacific Oceans: U.S. Naval Oceanographic Office, Alpine Geophysical Association, Inc., Area V, v. 8, 84 p.

Scruton, P.C., 1955, Sediments of the eastern Mississippi Delta, *in* Hough, J.L., and Menard, H.W., eds., Finding ancient shore-lines: a symposium: Society of Economic Paleontologists and Mineralogists Special Publication 3, p. 21-51.

Scruton, P.C., 1960, Delta building and deltaic sequence, *in* Shepard, F.P., and others, eds., Recent sediments, northwest Gulf of Mexico: Tulsa, Okla., American Association of Petroleum Geologists, p. 82-102.

Sediment Core Laboratory, 1970, Sediment core descriptions: Solomon Islands, 1968-1969, and Murray fracture zone, 1967: Hawaii Institute of Geophysics Data Report 16, HIG-70-25 (various pagings).

Seiglie, G.A., Froelich, P.N., and Pilkey, O.H., 1976, Deep-sea sediments of Navidad Basin: correlation of sand layers: Deep-Sea Research, v. 23, p. 89-101.

Sharma, G.D., 1979, The Alaskan Shelf; hydrographic, sedimentary and geochemical environment: New York, Springer-Verlag, 487 p.

Shepard, F.P., 1960, Mississippi delta, marginal environments, sediments and growth: Tulsa, Okla., American Association of Petroleum Geologists, p. 56-81.

Shepard, F.P., and Moore, D.G. 1955, Sediment zones bordering the barrier islands of central Texas coast, *in* Hough, J.L., and Menard, H.W., eds., Finding ancient shorelines: a symposium: Society of Economic Paleontologists and Mineralogists Special Publication 3, p. 106-126.

Sheridan, R.E., Smith, J.D., and Gardner, J., 1969, Rock dredges from Blake Escarpment near Great Abaco Canyon: American Association of Petroleum Geologists Bulletin, v. 53, p. 2551-2558.

Shideler, G.L., 1980, Maps showing composition of surficial sediments on the insular shelf of southwestern Puerto Rico: U.S. Geological Survey Miscellaneous Field Studies 1258, scale 1:90,000.

Skornyakova, N.S., and Petelin, V.P., 1967, Sediments in the central part of the south Pacific: Oceanology, v. 7, p. 779-793.

Smith, S.V., 1970, Calcium-carbonate budget of the southern California continental borderland: Hawaii Institute of Geophysics Report HIG-70-11, 174 p.

Stackelberg, U.-V., 1979, Sedimentation, hiatuses, and development of manganese nodules: Valdivia site VA-13/2, north central Pacific, *in* Bischoff, J.L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: Marine Science, v. 9, p. 559-586.

Stetson, H.C., 1953, The continental terrace of the western Gulf of Mexico: its surface sediments, origin and development: Physical Oceanography and Meteorology Papers, v. 12, p. 5-44.

Swift, S.A., 1977, Holocene rates of sediment accumulation in the Panama Basin, eastern equatorial Pacific: pelagic sedimentation and lateral transport: Journal of Geology, v. 85, p. 301-309.

Swift, S.A., and Wenkam, C., 1978, Holocene accumulation rates of calcite in the Panama Basin: lateral and vertical variations in calcite dissolution: Marine Geology, v. 27, p. 67-77.

Theyer, F., and others, 1977, Sediment core descriptions: R/V *Kana Keoki* 1973 north central Pacific cruise, 1974 southeastern Pacific cruise, and a 1974 Mid-Atlantic Ridge IPOD site-survey: Hawaii Institute of Geophysics Data Report 33, HIG-77-9, 13 p.

Thomas, C.W., 1969, Paleontological analyses of north Pacific ocean-bottom cores: Pacific Science, v. 23, p. 473-482.

Thomson, C.W., and Murray, J., 1891, Report on the scientific results of the voyage of H.M.S. *Challenger* during the years 1873-1876: London, Johnson Reprint Corporation, 782 p.

Thorp, E.M., 1936, The sediments of Pearl and Hermes Reef: Journal of Sedimentary Petrology, v. 6, p. 109-118.

Thrasher, G.P., 1979, Geologic map of the Kodiak outer continental shelf, western Gulf of Alaska: U.S. Geological Survey Open-File Report 79-1267, scale 1:250,000.

Thunell, R.C., 1975, Calcium carbonate dissolution history in late Quaternary deep-sea sediments, western Gulf of Mexico: Quaternary Research, v. 6, p. 281-297.

Tieh, T.T., and Pyle, T.E., 1972, Distribution of elements in Gulf of Mexico sediments, *in* Rezak, R., and Henry, V.J., eds., Contributions on geological and geophysical oceanography of the Gulf of Mexico: Texas A&M University Oceanographic Studies, v. 3, p. 129-152.

Tiffin, D.L., and others, 1978, Bottom sediments–vicinity of Juan de Fuca and Explorer Ridges, northeast Pacific ocean: current research, part A: Geological Survey of Canada Paper 78-1A, p. 533-537.

Tompkins, R.E., and Shephard, L.E., 1979, Orca Basin: depositional processes, geotechnical properties and clay mineralogy of Holocene sediments within an anoxic hypersaline basin, northwest Gulf of Mexico: Marine Geology, v. 33, p. 221-238.

Turekian, K.K., ed., 1971, The late Cenozoic glacial ages: New Haven, Conn., Yale University Press, 606 p.

Uchupi, E., and Emery, K.O., 1963, The continental slope between San Francisco, California and Cedros Island, Mexico: Deep Sea Research, v. 10, p. 397-447.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), 1971, Bathymetric map: NOS 1308N-175, scale 1:250,000.

U.S. Government Printing Office, 1969-1982, Initial reports of the Deep Sea Drilling Project: Washington, D.C., v. 1-68.

U.S. National Ocean Survey, 1971, Bathymetric map: surficial bottom sediments: Washington, U.S. Department of Commerce, National Administration maps 1308N-12, 1308N-175, 1308N-22, scale 1:250,000.

U.S. Naval Oceanographic Office, 1965, Oceanographic atlas of the north Atlantic Ocean, sec. V: Marine geology: U.S. Government Printing Office Publication 700, various scales, 71 p.

van Andel, T.H., 1964, Recent marine sediments of the Gulf of California, *in* van Andel, T.H., and Shor, G.W., eds., Marine geology of the Gulf of California: American Association of Petroleum Geologists Memoir 3, p. 216-230.

van Andel, T.H., 1967, The Orinoco delta: Journal of Sedimentary Petrology, v. 37, p. 297-310.

van Andel, T.H., Heath, G.R., and Moore, T.C., Jr., 1975, Cenozoic history and paleo-oceanography of the central equatorial Pacific Ocean: Geological Society of America Memoir 143, 134 p.

van Andel, T.H., and Postma, H., 1954, Recent sediments of the Gulf of Paria: Koninklijke Nederlandse Akademie van Wetenschappen Afdeling Natuurkunde Verhandelingen, ser. 1, v. 20, 245 p.

Vedder, J.G., and others, 1974, Preliminary report on the geology of the continental borderland of southern California: U.S. Geological Survey Miscellaneous Field Studies MF-624, 34 p.

Vedder, J.G., and others, 1979, Descriptions of dart core samples, R/V *Samuel P. Lee* Cruise L2-78-SC, May 1978, California continental borderland: U.S. Geological Survey Open-File Report 79-936, 47 p.

Venkatarathnam, K., and Hays, J.D., 1974, Sedimentation in the Indian Ocean, *in* Inderbitzen, A.L., ed., Deep-sea sediments: physical and mechanical properties: Marine Science, v. 2, p. 401-415.

Wantland, K.E., and Pusey, W.C., eds., 1975, Belize shelf; carbonate sediments, clastic sediments, and ecology: American Association of Petroleum Geologists Studies in Geology 2, 599 p.

Welday, E.E., and Williams, J.W. 1975, Offshore surficial geology of California: California Division of Mines and Geology, sheet 26, scale 1:500,000.

Wells, J.T., and Coleman, J.M., 1978, Longshore transport of mud by waves, northeastern coast of South America, *in* MacGillavry, H.J., and Rets, D.J., eds., Caribbean Geological Conference, 8th, Curaçao, 1977: Geologische Mijnbouw, v. 57, p. 353-359.

Yorath, C.J., Bornhold, B.D., and Thomson, R.E., 1979, Oscillation ripples on the northeast Pacific continental shelf: Marine Geology, v. 31, p. 45-58.

Zen, E.-A., 1959, Mineralogy and petrography of marine bottom sediment samples off the coast of Peru and Chile: Journal of Sedimentary Petrology, v. 29, p. 513-539.

NORTHWEST QUADRANT

Andrews, J.E., and Foreman, J.A., 1976, Sediment core descriptions: R/V *Kana Keoki* 1972 cruise, eastern and western Pacific Ocean: Hawaii Institute of Geophysics Data Report 32, HIG-76-13, 112 p.

Aoki, H., Yoshihara, T., and Hoshino, M., 1967, Geology of the Suruga Bay; Submarine distribution of gravels, pt. 1: Journal of the College of Marine Science and Technology, Tokai University, p. 85-92.

Arita, M., 1975, Bottom sediments, *in* Mizuno, A., and Chujo, J., eds., Deep-sea mineral resources investigation in the eastern central Pacific Basin, August-October 1974 (GH 74-5 Cruise): Geological Survey of Japan Cruise Report 4, p. 62-70.

Arita, M., 1977, Bottom sediments, *in* Mizuno, A., and Moritani, T., eds., Deep-sea mineral resources investigation in the central eastern part of the Central Pacific Basin, January-March 1976 (GH 76-1 Cruise): Geological Survey of Japan Cruise Report 8, p. 94-117.

Arita, M., and Kinoshita, Y., 1976, Sedimentological map of Sagami-Nada Sea and its vicinity: Marine Geology Map Series 4, scale 1:200,000.

Arita, M., and Kinoshita, Y., 1978, Sedimentological map of Hachinohe: Marine Geology Map Series 9, scale 1:200,000.

Basov, I.A., 1981, Benthonic foraminifers in the recent sediments of the inland seas of the Malay Archipelago: Okeanologiya, v. 21, p. 97-104.

Berger, W.H., Adelseck, C.G., Jr., and Mayer, L.A., 1976, Distribution of carbonate in surface sediments of the Pacific Ocean: Journal of Geophysical Research, v. 81, p. 2617-2627.

Boggs, S., Wang, W.C., Lewis, F.S., and Chen, J.C., Jr., 1979, Sediment properties and water characteristics of the Taiwan shelf and slope: Acta Oceanographica Taiwanica, Science Reports of the National Taiwan University, no. 10, p. 10.

Bureau of Mines and Geosciences, 1981, Geology and mineral resources of the Philippines: Bureau of Mines, Geology, v. 1, scale 1:2,500,000, 406 p.

Chen, J.C., and Chen, C., 1971, Mineralogy, geochemistry, and paleontology of shelf sediments of the South China Sea and Taiwan Strait: Acta Oceanographica Taiwanica, Science Reports of the National Taiwan University, no. 1, p. 35-54.

Chen, L., 1982, Mineral assemblages and their distribution patterns in the sediments of the East China Sea, *in* Department of Marine Geology of the Institute of Oceanology of Academia Sinica, Geology of the Yellow Sea and East China Sea: Beijing, Science Publishers, p. 39-51.

Chin, Y., 1962, Preliminary investigations of the bottom sediments in the Gulf of Bohai: Oceanologia et Limnologia Sinica, v. 4, p. 199-206.

Chin, Y., 1963, Preliminary study on the morphology and bottom sediment types of the Chinese continental shelf: Oceanologia et Limnologia Sinica, v. 5, p. 71-85.

Chinese Academy of Geological Sciences, 1975, Geological map of Asia: Beijing, Cartographic Publishing House, scale 1:5,000,000.

Chinese Academy of Geological Sciences, 1979, Tectonic map of China: Beijing, Cartographic Publishing House, scale 1:4,000,000.

Chinese Academy of Geological Sciences, ed., 1982, An outline of the stratigraphy of China: Beijing, Geological Publishing House, no. 1, 445 p.

Chinese Petroleum Corporation, 1970, Note on sea-bottom sampling in the offshore area of Taiwan, China: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 3, p. 35-36.

Chou, J.T., 1972, Sediments of Taiwan Strait and the southern part of the Taiwan Basn: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 6, p. 75-97.

Chough, S.K., and Kim, D.C. 1981, Dispersal of fine-grained sediments in the southwestern Yellow Sea: a steady-state model: Journal of Sedimentary Petrology, v. 51, p. 721-728.

Corvalán D., J., 1985, Geologic map of the circum-Pacific region, southeast quadrant: Tulsa, Okla., American Association of Petroleum Geologists, scale 1:10,000,000, 36 p.

Craddock, C.W., 1989, Geologic map of the circum-Pacific region, Antarctica sheet: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 21 p.

Damuth, J.E., 1980, Quaternary sedimentation processes in the South China Basin as revealed by echo-character mapping and piston-core studies, *in* Hayes, D. , ed., The tectonic and geologic evolution of southeast Asia seas and islands: American Geophysical Union, Geophysical Monograph 23, p. 105-125.

Direction Géographique Nationale du Viet-Nam, 1971, Carte geologique, Viet-Nam Kampuchia-Lao: 3rd ed., scale 1:2,000,000.

Drummond, K.J., 1983, Geologic map of the circum-Pacific region, northeast quadrant: Tulsa, Okla., American Association of Petroleum Geologists, scale 1:10,000,000, 72 p.

Earth Sciences Research Division of Burma, 1977, Geological map of Burma: 22 p.

Emery, K.O., 1969, Distribution pattern of sediments of the continental shelves of western Indonesia: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 2, p. 79-82.

Emery, K.O., 1971, Bottom sediment map of Malacca Strait: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 4, p. 149-152.

Emery, K.O., and Niino, H., 1963, Sediments of the Gulf of Thailand and adjacent continental shelf: Geological Society of America Bulletin, v. 74, p. 541-554.

Exon, N.F., 1981, Manganese nodules in the Cook Islands region, southwest Pacific: South Pacific Marine Geological Notes, v. 2, p. 47-65.

Exon, N.F., and others, 1981, Morphology, water characteristics, and sedimentation in the silled Sulu Sea, southeast Asia: Marine Geology, v. 39, p. 165-195.

Faughn, J.L., 1974, NAGA expedition: station index and data: NAGA Report; Scientific results of marine investigation of the South China Sea and the Gulf of Thailand, v. 1.

Furuta, T., 1976, Petrographic and magnetic properties of tephra in a deep-sea core from the northwest Pacific: Marine Geology, v. 20, p. 229-237.

Gao, M., and others, 1982, The basic characteristics of the subaqueous delta of the Changjiang River, *in* Department of Marine Geology of the Institute of Oceanology of Academia Sinica, Geology of the Yellow Sea and East China Sea: Beijing, Science Publishers, p. 208-219.

Gardner, J.V., Dean, W.E., and Vallier, T.L., 1980, Sedimentology and geochemistry of surface sediments, outer continental shelf, southern Bering Sea: Marine Geology, v. 35, p. 299-329.

Geological Survey of Indonesia, 1969, Geological map of southeast Kalimantan: scale 1:500,000.

Geological Survey of Indonesia, 1970, Peta geologi Kalimantan barat dan Barat-Daja: scale 1:500,000.

Geological Survey of Indonesia, 1977, Geological map of Djawa and Madura: scale 1:200,000.

Geological Survey of Japan, 1978, Geological map off Hachinohe: Geological Survey of Japan, Marine Geology Map Series 10, scale 1:200,000.

Geological Survey of Malaysia, 1973, Geological map of west Malaysia: 7th ed., scale 1:500,000.

Gershanovich, D.E., 1967, Late Quaternary sediments of Bering Sea and the Gulf of Alaska, *in* Hopkins, D.M., ed., The Bering land bridge: Stanford University Press, p. 32-46.

Goloudin, R.I., 1980, Composition and dynamics of the near-shore marine sediments off the west coast of southern Sakhalin: Oceanology, v. 20, p. 330-333.

Goossens, P.J., 1978, The metallogenic provinces of Burma; their definitions, geologic relationships and extensions in China, India, and Thailand: Regional Conference on Geology and Mineral Resources of Southeast Asia, 3rd, Bangkok, 1978, Proceeding, p. 431-536.

Harkevich, D.S., and Moskaleva, V.N., 1971, Magmatic formation map of USSR: Moscow, All Union Science-Research Geological Institute, scale 1:2,500,000.

Hishida, H., and Uchio, T., 1981, Sedimentological and geochemical studies of manganese micronodules and the associated sediments in some piston cores in the north Pacific Ocean: Journal of the Faculty of Engineering, University of Tokyo, v. 36, p. 463-522.

Honza, E., 1976, General remarks, *in* Honza, E., ed., Ryukyu Island (Nansei-Shoto) Arc, January-February 1975 (GH75-1 Cruise) and July-August 1975 (GH75-5 Cruise): Geological Survey of Japan Cruise Report 6, p. 1-6 and p. 31-36.

Honza, E., 1977, Outline of the cruise, *in* Honza, E., ed., Geological investigation of Japan and southern Kurile Trench and slope areas, April-June 1976 (GH76-2 Cruise): Geological Survey of Japan Cruise Report 7, p. 1-9.

Honza, E., 1978, Outline of the research cruise, *in* Honza, E., ed., Geological investigations in the northern margin of the Okinawa Trough and the western margin of the Japan Sea, April-May 1977 (GH77-2 Cruise): Geological Survey of Japan Cruise Report 10, p. 1-11.

Honza, E., 1978, Outline of the research cruise, *in* Honza, E., ed., Geological investigation of the Okhotsk and Japan Seas off Hokkaido, June-July 1977 (GH77-3 Cruise): Geological Survey of Japan Cruise Report 11, p. 1-11.

Honza, E., 1979, Outline of research cruise, *in* Honza, E., ed., Geological investigations of the Japan Sea, April-June 1978 (GH78-2 Cruise): Geological Survey of Japan Cruise Report 13, p. 1-13.

Honza, E., Arita, M., Inouchi, Y., and Onodera, K., 1976, Cored material, *in* Honza, E., ed., Ryukyu Island (Nansei-Shoto) Arc, January-February 1975 (GH75-1 Cruise) and July-August 1975 (GH75-5 Cruise): Geological Survey of Japan Cruise Report 6, p. 23-24.

Honza, E., Arita, N., and Onodera, K., 1976, Dredged material, *in* Honza, E., ed., Ryukyu Island (Nansei-Shoto) Arc, January-February 1975 (GH75-1 Cruise) and July-August 1975 (GH75-5 Cruise): Geological Survey of Japan Cruise Report 6, p. 25-26.

Honza, E., and Yuasa, M., 1979, Cored material, *in* Honza, E., ed., Geological investigation of the Japan Sea, April-June 1978 (GH78-2 Cruise): Geological Survey of Japan Cruise Report 13, p. 61-63.

Honza, E., Yuasa, M., and Ishibashi, K., 1978, Cored material, *in* Honza, E., ed., Geological investigations in the northern margin of the Okinawa Trough and the western margin of the Japan Sea, April-May 1977 (GH77-2 Cruise): Geological Survey of Japan Cruise Report 10, p. 50-54.

Honza, E., Yuasa, M., and Onodera, K., 1976, Cored material, *in* Honza, E., ed., Ryukyu Island (Nansei-Shoto) Arc, January-February 1975 (GH75-1 Cruise) and July-August 1975 (GH75-5 Cruise): Geological Survey of Japan Cruise Report 6, p. 62-63.

Honza, E., Yuasa, M., and Onodera, K., 1978, Cored material, *in* Honza, E., ed., Geological investigation of the Okhotsk and Japan Seas off Hokkaido, June-July 1977 (GH77-3 Cruise): Geological Survey of Japan Cruise Report 11, p. 54-55.

Horn, D.R., Horn, B.M., and Delach, M.N., 1970, Sedimentary provinces of the north Pacific, *in* Hays, J.D., ed., Geological investigations of the north Pacific: Geological Society of America Memoir 126, p. 1-21.

Huang, C.C., 1978, An outline of the tectonic characteristics of China: Eclogae Geologicae Helvetiae, v. 71, no. 3, p. 611-635.

Huang, T.-W., and Chen, P.-Y., 1975, The abyssal clay minerals in the west Philippine Sea: Acta Oceanographica Taiwanica 5, Science Reports of the National Taiwan University, p. 37-63.

Ichikawa, K., Hada, S., and Yao, H., 1985, Recent problems of Paleozoic-Mesozoic micro-biostratigraphy and Mesozoic geohistory of southwest Japan: Memoirs of the Geological Society of Japan, no. 25, p. 1-18.

Inouchi, Y., and Kinoshita, Y., 1977, Sedimentological map of the south of Kii Strait: Geological Survey of Japan Marine Geology Map Series 6, scale 1:200,000.

Inouchi, Y., Kinoshita, Y., and Murakimi, F., 1979, Sedimentological map of Nishi-Tsugaru Basin: Geological Survey of Japan Marine Geology Map Series 12, scale 1:200,000.

Inouchi, Y., Yuasa, M., and Onodera, K., 1977, Cored materials, *in* Honza, E., ed., Geological investigations of Japan and southern Kurile Trench and slope areas, April-June 1976 (GH76-2 Cruise): Geological Survey of Japan Cruise Report 7, p. 78-79.

Inoue, E., 1975, Goto-nada Sea and Tsushima Strait, *in* Inoue, E., ed., Investigations of northwestern Kyushu, 1972-1973: Geological Survey of Japan Cruise Report 2, 68 p.

Inoue, E., 1975, Sagami-nada Sea investigations, April-May 1974 (GH74-1 and GH74-2 Cruises): Geological Survey of Japan Cruise Report 3, 58 p.

Inoue, E., 1978, Outline of the research cruise, *in* Inoue, E., ed., Investigations of the continental margin of southwest Japan, June-July 1975 (GH75-4 Cruise): Geological Survey of Japan Cruise Report 9, p. 3-9.

Inoue, E., 1978, Preliminary study on the sediment cores from the continental slope and deep- sea bottom off the outer zone of southwest Japan, *in* Inoue, E., ed., Investigations of the continental margin of southwest Japan, June-July 1975 (GH75-4 Cruise): Geological Survey of Japan Cruise Report 9, p. 30-53.

Inoue, E., 1988, Geologic map of the circum-Pacific region, northwest quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 30 p.

Inoue, E., Suzuki, T., Matsumoto, E., and Yuasa, M., 1972, Deep-sea sediments, *in* Takeda, H., ed., Deep sea mineral resources investigations in northwest Pacific, November-December 1972: Geological Survey of Japan Cruise Report l, p. 20-33.

Institute of Geology, Chinese Academy of Sciences, and Wuhan College of Geology, 1985, Atlas of the paleogeography of China: Beijing, Cartographic Publishing House, 281 p.

Jarrard, R.D., and Clague, D.A., 1977, Implications of Pacific island and seamount ages for the origin of volcanic chains: Reviews of Geophysics and Space Physics, v. 15, p. 57-76.

Javanapet, J.C., 1969, Geological map of Thailand: Thailand Department of Mineral Resources, scale 1:1,000,000.

Johnson, T.C., and others, 1977, Physical properties of calcareous ooze: control by dissolution at depth: Marine Geology, v. 24, p. 259-277.

Kagami, H., 1959, Preliminary report on the shelf sediments off Kamo, Yamagata, Japan: Records of Oceanographic Works in Japan, v. 5, p. 59-67.

Kanaya, T., 1969, Diatom micropaleontology and deep-sea stratigraphy of the North Pacific: Societe Franco-Japonaise d'Oceanographie Bulletin, La Mer, v. 7, p. 183-196.

Kaseno, Y., 1971, Geological features of the Japan sea floor: a review of recent studies: Pacific Geology, v. 4, p. 91-111.

Kaseno, Y., and Omura, A., 1969, On the core samples collected by M.R.V. *Seifu-maru* from the Japan sea floor in 1966 and 1967: Bulletin of the Japan Sea Research Institute, Kanazawa University, v. 1, p. 35-38.

Keller, G.H., and Richards, A.F., 1967, Sediments of the Malacca Strait, southeast Asia: Journal of Sedimentary Petrology, v. 37, p. 102-127.

Khain, V.V., 1985, Geology of the USSR; old cratons and Paleozoic fold belts: Berlin, Gebrueder Borntraeger, pt. 1, 272 p.

Kidd, R.B., and Davies, T.A., 1978, Indian Ocean sediment distribution since the Late Jurassic: Marine Geology, v. 26, p. 49-70.

Kim, B.Y., Kim, S.W., and Kim, J.J., 1970, Foraminifera in the bottom sediments off the southwestern coast of Korea: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas, Technical Bulletin (CCOP), v. 3, p. 147-163.

Kinoshita, Y., Okuda, Y., Grapes, R., and Inoue, E., 1978, Sediments and rocks from the continental slopes and Nankai Trough off southwest Japan, *in* Inoue, E., ed., Investigations of the continental margin of southwest Japan, June-July 1975 (GH75-4 Cruise): Geological Survey of Japan Cruise Report 9, p. 22-29.

Kobayashi, K., ed., 1981, Preliminary report of R/V *Hakuho Maru* cruise KH 80-3: University of Tokyo, Ocean Research Institute, 210 p.

Kobayashi, K., Kitazawa, K., Kanaya, T., and Sakai, T., 1971, Magnetic and micro-paleontological study of deep-sea sediments from the west-central equatorial Pacific: Deep-Sea Research, v. 18, p. 1045-1062.

Kobayashi, K., Tonouchi, S., Furuta, T., and Watanabe, M., 1980, Paleomagnetic results of deep-sea sediment cores collected by R/V *Hakuho Maru* in the period 1968-1977, compiled with associated information: University of Tokyo, Ocean Research Institute, 148 p.

Korea Institute of Energy and Resources, 1981, Geological map of Korea: scale 1:1,000,000.

Krasny, L.I., and others, 1969, Structure-formation map of the northwestern part of the Pacific mobile belt: All Union Science-Research Geological Institute, scale 1:1,500,000.

Krasny, L.I., and others, 1970, Geological map of Pacific mobile belt and Pacific Ocean: USSR Ministry of Geology and Academy of Sciences, scale 1:10,000,000.

Krause, D.C., 1967, Bathymetry and geologic structure of the northwestern Tasman Sea-Coral Sea-South Solomon Sea area of the southwestern Pacific Ocean: New Zealand Oceanographic Institute Bulletin 183, Department of Scientific and Industrial Research, Memoir 41, 46 p.

Kudrass, H.R., Wiedicke, M., Cepek, P., Kreuzer, H., and Muller, P., 1986, Mesozoic and Cainozoic rocks dredged from the South China Sea (Reed Bank area) and Sulu Sea and their significance for plate-tectonic reconstructions: Marine and Petroleum Geology, v. 3, p. 19-30.

Kurnosov, M., 1978, Glenestee minerale e sovremennek ocadkak Okotskogo More: Okeanologe, v. 17, p. 671-680.

Landergren, S., 1964, On the geochemistry of deep-sea sediments: Reports of the Swedish Deep Sea Expedition, 1947-1948, v. 10: Special Investigations no. 5, p. 60-154.

Larsen, B., 1968, Sediments from the central Philippine Trench, *in* Wolff, T., ed., *Galathea* report; scientific results of the Danish deep-sea expedition round the world 1950-1952: Copenhagen, Danish Science Press, Ltd., p. 7-21.

Lee, D.S., ed., 1987, Geology of Korea: Seoul, Geological Society of Korea, Kyohak-Sa Publishing Co., 514 p.

Lipps, J.H., and Warme, J.E., 1966, Planktonic foraminiferal biofacies in the Okhotsk Sea: Contribution of the Cushman Foundation Foraminiferal Research, v. 17, p. 125-135.

Lirong, C., Zuofeng, L., Tiemen, Z., Wenqiang, X., and Tailu, D., 1980, Mineral assemblages and their distribution patterns in sediments of the Gulf of Bohai Sea: Oceanologia et Limnologia Sinica, v. 11, p. 46-64.

Lisitsyn, A.P., 1969, Recent sedimentation in the Bering Sea: Jerusalem, Israel Program for Scientific Translations, 614 p.

Lisitsyn, A.P., and Petelin, V.P., 1967, Features of distribution and modification of $CaCO_3$ in bottom sediments of the Pacific Ocean: Lithology and Mineral Resources 5, p. 565-578.

Logvinenko, N.V., and Ogoradnikov, V.I., 1980, Recent sediments on the continental shelf of the Chukchi Sea: Oceanology, v. 20, p. 448-452.

Markovsky, A.P., and others, 1972, Geological map of Eurasia: USSR Ministry of Geology, scale 1:5,000,000.

Marlow, M.S., and Cooper, A.K., 1980, Mesozoic and Cenozoic structural trends under southern Bering Sea shelf: American Association of Petroleum Geologists Bulletin, v. 64, p. 2139-2155.

Marlow, M.S., and others, 1979, Descriptions of dredge samples from the Bering Sea continental margin: U.S. Geological Survey Open-File Report 79-1139.

McManus, D.A., Kelley, J.C., and Creager, J.S., 1969, Continental shelf sedimentation in an Arctic environment: Geological Society of America Bulletin, v. 80, p. 1961-1984.

McManus, D.A., Venkatarathnam, K., Hopkins, D.M., and Nelson, C.H., 1974, Yukon River sediment on the northernmost Bering Sea shelf: Journal of Sedimentary Petrology, v. 44, p. 1052-1060.

McManus, D.A., Venkatarathnam, K., Hopkins, D.M., and Nelson, C.H., 1977, Studies on the marine geology of the Bering Sea: U.S. Geological Survey Professional Paper 759-C, 31 p.

Mei-o, R., and Chen-kai, T., 1980, Late Quaternary continental shelf of east China: Acta Oceanologia Sinica, v. 2, p. 1-9.

Mogi, A., 1979, An atlas of the sea floor around Japan, aspects of submarine geomorphology: Tokyo, University of Tokyo Press, 96 p.

Murray, J.W., and Grundmanis, V., 1980, Oxygen consumption in pelagic marine sediments: Science, v. 209, p. 1527-1530.

Murray, J., and Renard, A.F., 1891, Report on deep-sea deposits based on the specimens collected during the voyage of H.M.S. *Challenger* in the years 1872 to 1876, in Thomson, C.W., and Murray, J., eds., Report on the scientific results of the voyage of H.M.S. *Challenger* during the years 1873-1876: New York, Johnson Reprint Corporation, p. 80-147.

Murty, M.R., Venkatesh, K.V., and Narasimham, C.V.L., 1979, Organic matter in sediments off northeastern Andamans: Indian Journal of Marine Science, v. 8, p. 176-179.

Nakao, S., 1979, Bottom sediments, *in* Moritani, T., ed., Deep-sea mineral resources investigations in the western central Pacific basin, January-March 1977 (GH77-1 Cruise): Geological Survey of Japan Cruise Report 12, p. 131-151.

Nalivkin, D.V., and others, 1973, Geology of the USSR: Edinburgh, Oliver and Boyd, 855 p.

Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences, 1982, Stratigraphic correlation chart in China with explanatory text: Beijing, Science Press, 318 p.

Nasu, N., and Saito, Y., 1958, Shelf sediments of the Gulf of Kumano, Japan, v. I: Records of Oceanographic Works in Japan, Special Number 2, p. 58-62.

Neeb, G.A., 1943, Bottom samples, sect. II, geological results: the *Snellius* expedition in the eastern part of the Netherlands East Indies, 1929-1930: v. V, part 3, p. 55-268.

Nemoto, K., and Kroenke, L.W., 1981, Marine geology of the Hess Rise l: bathymetry, surface sediment distribution, and environment of deposition: Journal of Geophysical Research, v. 86, p. 10734-10752.

Niino, H., 1948, Sediments of Oki Bank in the Japanese Sea: Journal of Sedimentary Petrology, v. 18, p. 79-85.

Niino, H., 1950, Bottom deposits at the mouth of Wakasa Bay, Japan, and on the adjacent continental shelf: Journal of Sedimentary Petrology, v. 20, p. 37-54.

Niino, H., 1957, Sediments on three submarine banks as promising fishery grounds (sediments on the Umitaka, Yoneyama, and Senjyu-sho): Records of Oceanographic Works in Japan, Special Number, p. 58-62.

Niino, H., 1968, A study on the marine geology around Danjo Islands in the East China Sea and Mishima Island in the east part of the Korea Strait: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 1, p. 87-94.

Niino, H., 1971, A study of the sediments and magnetics across the continental shelf between Borneo and Malaya Peninsula: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 4, p. 143-147.

Niino, H., and Emery, K.O., 1961, Sediments of shallow portions of East China Sea and South China Sea: Geological Society of America Bulletin, v. 72, p. 731-762.

Niino, H., and Emery, K.O., 1966, Continental shelf sediments off northeastern Asia: Journal of Sedimentary Petrology, v. 36, p. 152-161.

Niino, H., Emery, K.O., and Kim, C.M., 1969, Organic carbon in sediments of Japan Sea: Journal of Sedimentary Petrology, v. 39, p. 152-161.

Ollausson, E., 1960, Sediment cores from the west Pacific: Reports of Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 163-214.

Oshima, N., Mitsushio, Y., and Kuroda, K., 1975, Sea bottom sediments, *in* Inoue, E., ed., Investigation of northwestern Kyushu, 1972-1973: Geological Survey of Japan Cruise Report, p. 35-39.

Oshima, K., Yuasa, M., and Mitsushio, H., 1975, Bottom sediments map, Tsushima and Goto Islands area: Marine Geology Map Series 2, scale 1:200,000.

Palfreyman, W.D., 1988, Geologic map of the circum-Pacific region, southwest quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 37 p.

Pautot, G., and Melguen, M., 1979, Influence of deep-water circulation and seafloor morphology on the abundance and grade of central south Pacific manganese nodules, *in* Bischoff, J.L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: Marine Science, v. 9, p. 621-650.

Peive, A.V., and others, 1979, Tectonic map of northern Eurasia: USSR Academy of Sciences, scale 1:5,000,000.

Petelin, V.P., 1957, Mineralogy of the sand-aluerite fractions in the bottom sediments of the Okhotsk Sea: Trudy Institut Okeanologiya, v. 22, p. 77-138.

Qin, Y.S., and Zhen, T., 1982, A study of distribution pattern of sediments on the continental shelf of the East China Sea, *in* Department of Marine Geology of the Institute of Oceanology of Academia Sinica, Geology of the Yellow Sea and East China Sea: Beijing, Science Publishers, p. 39-51.

Reinemund, J.A., 1975, Circum-Pacific Map Project summary report: Menlo Park, Calif., Circum-Pacific Map Project, unpublished report, 24 p.

Repechka, M.A., 1976, Chemical composition of terrigenous and volcanogenic deep-sea bottom sediments in the Sea of Japan: Oceanology, v. 15, p. 690-692.

Revelle, R.R., 1944, Marine bottom samples collected in the Pacific Ocean by the *Carnegie* on its seventh cruise, *in* Scientific results of Cruise VII of the *Carnegie* during 1928-1929 under command of Captain J.P. Ault: Oceanography-II: Washington, D.C., Carnegie Institution of Washington Publication 556, 115 p.

Riedel, W.R., and Funnell, B.M., 1964, Tertiary sediment cores and microfossils from the Pacific Ocean floor: Geological Society of London Quarterly Journal, v. 120, p. 305-368.

Roberts, R.W., 1969, Sediments of the Andaman Basin, northeastern Indian Ocean: Marine Geology, v. 7, p. 371-402.

Roberts, R.W., 1976, Bottom sediment granulometric data for the continental margins of the Bering, Chukchi, East Siberian, Laptev, and Beaufort Seas: University of Washington Special Report 70, 228 p.

Sakanoue, M., Osawa, M., Kitagawa, S., Sugiura, H., and Nakanishi, T., 1970, Studies on sediment core samples from the Japan Sea by x-ray diffraction, x-ray fluorometry, activation analysis, and by radiochemical analysis of alph-ray emitters: Bulletin of the Japan Sea Research Institute, Kanazawa University, v. 2, p. 75-87.

Sediment Group, Marine Geology Department, South China Sea Institute of Oceanology, 1980, Characteristics of the surface sediments on the north shelf of the South China Sea: Nan Hai Studia Marina Sinica, v. 1, p. 50-56.

Shepard, F.P., Emery, K.O., and Gould, H.R., 1949, Distribution of sediments on east Asiatic continental shelf: University of California, Allan Hancock Foundation Occasional Paper 9, 64 p.

Sidorenko, A.V., Beliaerskii, N.A., and Unksov, V.A., 1978, Map of the territory of USSR and its adjacent area: USSR Academy of Sciences, scale 1:2,500,000.

Skornyakova, N.S., and Lipka, M.I., 1976, Basic and ultrabasic rocks of the Mariana Trench: Oceanology, v. 15, p. 688-690.

Skornyakova, N.S., and Petelin, V.P., 1967, Sediments in the central part of the south Pacific: Oceanology, v. 7, p. 779-793.

Suensilpong, S., Burton, C.K., Mantajit, N., and Workman, R.D., 1978, Geological evolution and igneous activity of Thailand and adjacent areas: Episodes, no. 3, p. 12-18.

Suensilpong, S., and others, 1982, Geological map of Thailand: Thailand Department of Mineral Resources, Geological Survey Division, scale 1:1,000,000.

Sugisaki, R., 1978, Chemical composition of argillaceous sediments on the Pacific margin of southwest Japan, *in* Inoue, E., ed., Investigations of the continental margin of southwest Japan, June-July 1975 (GH75-4 Cruise): Geological Survey of Japan Cruise Report 9, p. 65-73.

Sukamto, R., 1975, Geological map of Indonesia, sheet VIII, Ujiung Pandang: Geological Survey of Indonesia, scale 1:1,000,000.

Sukamto, R., 1978, The structure of Sulawesi in the light of plate-tectonics: Regional Conference on Geology and Mineral Resources of Southeast Asia, 3rd, Bangkok, 1978, Proceeding, p. 121-141.

Sukamto, R., Apandi, T., and Supriatna, S., 1981, The geology and tectonics of Halmahera Island and surrounding areas, *in* The geology and tectonics of Eastern Indonesia: Geologic Research and Development Center Special Publication no. 2, p. 349-362.

Sval'nov, V.N., and others, 1979, A lithologic-stratigraphic subdivision of the bottom sediments on the profile from the Sunda Archipelago to the East Indian (Ninety East) Ridge: Oceanology, v. 18, p. 569-574.

Tamaki, K., Miyazaki, T. , and Honza, E., 1976, Continuous seismic reflection profiling survey, *in* Honza, E., ed., Ryukyu Island (Nansei-Shoto) Arc, January-February 1975 (GH75-1 Cruise) and July-August 1975 (GH75-5 Cruise): Geological Survey of Japan Cruise Report 6, p. 55-61.

Tanaka, K., and Nozawa, T., eds., 1977, Geology and mineral resources of Japan–v. 1. geology, 3rd ed.: Geological Survey of Japan.

Taylor, G.R., 1977, Investigation of shallow submerged plateaus in the Manning Straits and southwest of Choiseul Island: result of the February 1976 expedition: South Pacific Marine Geological Notes, v. 1, p. 41-46.

Thansuthipitak, T., 1978, A review of igneous rocks of Thailand: Regional Conference on Geology and Mineral Resources of Southeast Asia, 3rd, Bangkok78, Proceeding, p. 775-782.

Thiede, J., 1979, Wind regimes over the late Quaternary southwest Pacific Ocean: Geology, v. 7, p. 259-262.

Thomas, C.W., 1969, Paleontological analyses of north Pacific ocean-bottom cores: Pacific Science, v. 23, p. 473-482.

Tiba, T., 1974, Chemical composition of the deep-sea core from the Philipppine Sea: Tokyo, Bulletin of the National Science Museum, v. 17, p. 181-185.

Tilman, S.M., and others, 1979, Tectonic map of the eastern USSR and adjacent regions: USSR Ministry of Geology, scale 1:2,500,000.

Tsuchi, R., 1966, Geologic survey by the Umitakamaru International Indian Ocean Expedition in the winter of 1963-1964; general report of the participation of Japan in the International Indian Ocean Expedition: Records of Oceanographic Works in Japan, v. 8, p. 27-32.

Turner, C.C., Eade, J.V., Danitofea, S., and Oldnall, R., 1977, Gold-bearing sediments on the continental shelf, northern Guadalcanal, Solomon Islands: South Pacific Marine Geological Notes, v. 1, p. 55-69.

Udintsev, G.B., and others, eds., 1975, Geological-geophysical atlas of the Indian Ocean: United Nations Educational, Scientific and Cultural Organization (UNESCO)/Moscow, Academy of Sciences of the USSR, p. 131-135.

United Nations Economic Commission for Asia and the Far East (ECAFE), 1971, Geological map of Asia and the Far East, and explanatory brochure, 2nd ed.: ECAFE, scale 1:5,000,000.

U.S. Government Printing Office, 1969-1974, Initial reports of the Deep Sea Drilling Project: Washington, D.C., v. 1-36.

U.S. Navy Hydrographic Office, 1951, Marine geography of Formosan waters: Hydrographic Office Publication 755, 45 p.
U.S. Navy Hydrographic Office, 1951, Marine geography of Indochinese waters: Hydrographic Office Publication 754, 38 p.
U.S. Navy Hydrographic Office, 1951, Marine geography of Korean waters: Hydrographic Office Publication 752, 32 p.
U.S. Navy Hydrographic Office, 1951, Marine geography of the Sea of Japan: Hydrographic Office Publication 757, 53 p.
U.S. Navy Hydrographic Office, 1951, Marine geography of the Sea of Okhotsk: Hydrographic Office Publication 758, 47 p.
van Andel, T.H., and Veevers, J.J., 1967, Morphology and sediments of the Timor Sea: Australia Bureau of Mineral Resources, Geology and Geophysics Bulletin 83, scale, 1:1,000,000, 173 p.
van Baren, F.A., and Kiel, H., 1950, Contribution to the sedimentary petrology of the Sunda Shelf: Journal of Sedimentary Petrology, v. 20, p. 185-213.
Veeraburus, M., Mantajit, N., and Suensilpong, S., 1981, Outline of geology and ore deposits of Thailand: Report of the Geological Survey of Japan, no. 261, p. 81-92.
Venkatarathnam, K., Be, A.W.H., and Biscaye, P.E., 1976, Calcium-carbonate distribution in the surface sediments of the Indian Ocean: Journal of Geophysical Research, v. 81, p. 2605-2616.
Venkatarathnam, K., and Hays, J.D., 1974, Sedimentation in the Indian Ocean, *in* Inderbitzen, A.L., ed., Deep-sea sediments: physical and mechanical properties, Marine Science, v. 2, p. 401-415.
Von der Borch, C.C., 1972, Marine geology of the Huon Gulf region, New Guinea: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 127, 50 p.
Yamada, N., Teraoka, Y., and Hata, M., eds., 1982, Geological map of Japan: Geological Survey of Japan, scale 1:1,000,000.
Yang, Z., Cheng, Y., and Wang, H., 1986, The geology of China: Oxford, Clarendon Press, 303 p.
Yuasa, M., Honza, E., Onodera, K., and Inoue, E., 1976, Sediments and rocks from the Izu-Ogasawara Arc and trench area, *in* Izu-Ogasawara (Bonin) Arc and trench investigations, June 1974 (GH74-3 Cruise) and October-November 1974 (GH75-6 Cruise): Geological Survey of Japan Cruise Report 5, p. 46-52.
Yuasa, M., Inouchi, Y., Onodera, K., and Kimura, M., 1977, Rocks and sediments, *in* Honza, E., ed., Geological investigation of Japan and southern Kurile Trench and slope areas, April-June 1976 (GH76-2 Cruise): Geological Survey of Japan Cruise Report 7, p. 72-77.
Yuasa, M., and Ishibashi, K., 1978, Description of rocks and sediments, *in* Honza, E., ed., Geological investigations in the northern margin of the Okinawa Trough and the western margin of the Japan Sea, April-May 1977 (GH77-2 Cruise): Geological Survey of Japan Cruise Report 5, p. 46-52.
Yuasa, M., Kanaya, H., and Terashima, S., 1979, Rocks and sediments, *in* Honza, E., ed., Geological investigations of the Japan Sea, April-June 1978 (GH78-2 Cruise): Geological Survey of Japan Cruise Report 13, p. 54-60.
Yuasa, M., and Onodera, K., 1978, Rocks and sediments, *in* Honza, E., ed., Geological investigation of the Okhotsk and Japan Seas off Hokkaido, June-July 1977 (GH77-3 Cruise): Geological Survey of Japan Cruise Report 11, p. 50-53.
Zhen, T., and Xu, F., 1982, The remains of shells and paleogeographic environment of late Pleistocene on the continental shelf of the East China Sea, *in* Department of Marine Geology of the Institute of Oceanology of Academia Sinica, Geology of the Yellow Sea and East China Sea: Beijing, Science Publishers, p. 198-207.
Zhen, T., and Zhang, Y., 1982, Primary study of characteristics of topography and sedimentation on the Taiwan Bank and its neighborhood, *in* Department of Marine Geology of Institute of Oceanology of Academia Sinica, Geology of the Yellow Sea and East China Sea: Beijing, Science Publishers, p. 52-66.
Zhong, J., and Huang, J., 1979, A preliminary analysis of the grain size and composition of the loose sediments in the Xisha Islands, Guandong Province, China: Oceanologia et Limnologia Sinica, v. 10, p. 125-135.

SOUTHEAST QUADRANT

Andersen, N.R., and Malahoff, A., eds., 1977, The fate of fossil fuel CO_2 in the oceans: New York, Plenum Press, p. 429-454.
Andrews, J.E., 1972, Investigations of ferromanganese deposits from the central Pacific: Hawaii Institute of Geophysics Report HIG-72-73, 133 p.
Andrews, J.E., 1973, Sediment core descriptions; R/V *Mahi 1970* cruise, western Pacific: Hawaii Institute of Geophysics Data Report 24, HIG-73-7, 11 p.
Andrews, J.E., and Foreman, J.A., 1976, Sediment core descriptions; R/V *Kana Keoki* 1972 cruise, eastern and western Pacific Ocean: Hawaii Institute of Geophysics Data Report 32, HIG-76-13, 112 p.
Andrews, J.E., and others, 1974, Ferromanganese deposits of the ocean floor; Cruise Report MN-74-01, R/V *Moana Wave:* Hawaii Institute of Geophysics Report HIG-74-9, 194 p.
Aoki, S., Kohyama, N., and Sudo, T., 1979, Mineralogical and chemical properties of smectites in a sediment core from the southeastern Pacific: Deep-Sea Research, v. 26A, p. 893-902.
Armada, A., 1974, Sedimentologla de la plataforma continental Argentina texturas: Servicio de Hidrografia Naval, H. 669/1.
Arrhenius, G., 1952, Sediment cores from the east Pacific: Reports of the Swedish Deep-Sea Expedition, v. 5, p. 1-227.
Aubouin, J.H., and others, 1973, Esquisse paleogeographique et estructurale des Andes Meridionales: Revue Géographie Physique et de Géologie Dynamique, ser. 2, v. 15, fasc. 1-2, p. 5-72.

Bandy, O.L., and Rodolfo, K.S., 1964, Distribution of foraminifera and sediments, Peru-Chile Trench area: Deep-Sea Research, v.11, p. 817-837.

Barsczus, H.G., 1981, Bibliographie géophysique Polynésie Française (géomagnetisme, séismologie, gravimetrie, tectonophysique, géochronologie, géologie, petrographie, géochimie, minéralogie, volcanologie, géomorphologie), Notes et Documents (Géophysique): 1981/17, Centre ORSTOM de Tahiti, Observatoire de Géophysique Pamatai, B.P. 529, Papeete (Polynesie Française), 229 p.

Bender, M., and others, 1971, Geochemistry of three cores from the East Pacific Rise: Earth and Planetary Science Letters, v. 12, p. 425-433.

Berger, W.H., Adelseck, C.G., Jr., and Mayer, L.A., 1976, Distribution of carbonate in surface sediments of the Pacific Ocean: Journal of Geophysical Research, v. 81, p. 2617-2627.

Biscaye, P.E., Kolla, V., and Turekian, K.K., 1976, Distribution of calcium-carbonate in surface sediments of the Atlantic Ocean: Journal of Geophysical Research, v. 81, p. 2595-2603.

Bonatti, E., 1971, Manganese fluctuations in Caribbean sediment cores due to post-depositional remobilization: Bulletin of Marine Science, v. 21, p. 510-518.

Bouma, A.H., and others, 1972, Deep-sea sedimentation and correlation of strata off Magdalena River and in Beata Strait: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 430-438.

Broda, J.E., Franks, C.E., and Keith, D.J., eds., 1981, Descriptions of Woods Hole Oceanographic Institution (WHOI) sediment cores, v. 6: Woods Hole Oceanographic Institution, Bibliography of Technical Reports, WHOI-81-77, 704 p.

Broecker, W.S., 1971, Calcite accumulation rates and glacial to interglacial changes in oceanic mixing, *in* Turekian, K.K., ed., The late Cenozoic glacial ages: New Haven, Conn., Yale University Press, p. 239-265.

Bullivant, J.S., and McCann, C., 1974, Contributions to the natural history of Manihiki Atoll, Cook Islands: New Zealand Oceanographic Institution Memoir 31, 63 p.

Burnett, W.C., 1971, Trace element variations in some central Pacific and Hawaiian sediments: Hawaii Institute of Geophysics Technical Report HIG-71-6, 112 p.

Burnett, W.C., 1975, Trace element geochemistry of biogenic sediments from the western equatorial Pacific: Pacific Science, v. 29, p. 219-225.

Busch, W.H., and Keller, G.H., 1981, The physical properties of Peru-Chile continental margin sediments–the influence of coastal upwelling on sediment properties: Journal of Sedimentary Petrology, v. 51, p. 705-719.

Carr-Brown, B., 1972, Plioceno-Cuaternario, Geología Marina-Pliocene-Quaternary, in Marine geology; the Holocene/Pleistocene contact in the offshore area east of Galeota Point, Trinidad, West Indies: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 381-397.

Case, J.E., and Holcombe, T.L., 1980, Geologic-tectonic map of the Caribbean region: U.S. Geological Survey Miscellaneous Investigations Series, Map 1-1100, scale 1:2,500,000.

Cassidy, D.S., and others, 1977, USNS *Eltanin* and inventory of core location data with core locations maps and cruise 55 core descriptions: Antarctic Research Facility, Florida State University, Sedimentology Research Laboratory, Contribution 44, 90p.

Cohee, G.V., Gaessner, M.F., and Hedberg, H.D., eds., 1978, Contributions to the geologic time scale: American Association of Petroleum Geologists Studies in Geology, no. 6, 388 p.

Corliss, B.H., and Hollister, C.D., 1979, Cenozoic sedimentation in central north Pacific: Nature, v. 282, p. 707-709.

Corvalán D., J., 1979, Rasgos geológico-estructurales y metalogénicas relacionados con la segmentación de los Andes: II Congreso Geológico Chileno, Actas II, v. 4, p. 45-75.

Cox, M.E., and McMurtry, G.M., 1981, Vertical distribution of mercury in sediments from the East Pacific Rise: Nature, v. 289, p.789-792.

Damuth, J.E., 1977, Late Quaternary sedimentation in the western equatorial Atlantic: Geological Society of America Bulletin, v. 88, p. 695-710.

Deep Sea Drilling Project, 1972-1981, Initial core descriptions, legs 27-78: La Jolla, University of California at San Diego, Scripps Institution of Oceanography.

Dowding, L.G., 1977, Sediment dispersal within the Cocos Gap, Panama Basin: Journal of Sedimentary Petrology, v. 47, p. 1132-1156.

Driscoll, A.H., and Rush, S.M., 1975, Woods Hole Oceanographic Institution (WHOI) geological samples data file, v. 1, 1957-1973: Woods Hole Oceanographic Institution Report WHOI-75-37, 278 p.

Dymond, J., 1981, Geochemistry of Nazca Plate surface sediments: an evaluation of hydrothermal, biogenic, detrital, and hydrogenous sources: Geological Society of America Memoir 154, p. 133-174.

Dymond, J., and Corliss, J.B., 1980, Part II, Chemical composition of Nazca Plate surface sediments: Geological Society of America Map MC-34, scale 1:1,095,706.

El Wakeel, S.K., and Riley, J.P., 1961, Chemical and mineralogical studies of deep-sea sediments: Geochimica et Cosmochimica Acta, v. 25, p. 110-146.

Embley, R.W., and Johnson, D.A., 1980, Acoustic stratigraphy and biostratigraphy of Neogene carbonate horizons in the north equatorial Pacific: Journal of Geophysical Research, v. 85, p. 5423-5437.

Emery, K.O., and Uchupi, E., 1972, Western north Atlantic Ocean: topography, rocks, structure, water, life, and sediments: American Association of Petroleum Geologists Memoir 17, 532 p.

Exon, N.F., 1981, Manganese nodules in the Cook Islands region, southwest Pacific: South Pacific Marine Geological Notes, v. 2, p. 47-65.

Finger, K.L., 1976, Submarine sedimentary facies at Deception Island, South Shetland Islands: Antarctic Journal, v. 11, p. 162-163.

Forstner, U., and Stoffers, P., 1981, Chemical fractionation of transition elements in Pacific pelagic sediments: Journal of the Geochemical Society and Meteoritical Society, v. 45, p. 1141-1146.

Fox, P.J., and Heezen, B.C., 1975, Geology of the Caribbean crust, *in* Nairn, A.E.M., and Stehli, F.G., eds., The ocean basins and margins: New York, Plenum Press, v. 3, p. 421-466.

Frakes, L.A., 1971, USNS *Eltanin* core descriptions, cruises 32-45: Antarctic Research Facility, Florida State University, Contribution 33, 105 p.

Frakes, L.A., 1973, USNS *Eltanin* sediment descriptions, cruises 4-45: Antarctic Research Facility, Florida State University, Contribution 37, 259 p.

Frazer, J.Z., Hawkins, D.L., and Arrhenius, G., 1972, Surface sediments and topography of the north Pacific: Scripps Institution of Oceanography, Geological Data Center, Charts 1-10, scale 1:3,630,000.

Gardner, J.V., Dean, W.E., and Vallier, T.L., 1980, Sedimentology and geochemistry of surface sediments, outer continental shelf, southern Bering Sea: Marine Geology, v. 35, p. 299-329.

Glockhoff, C., 1978, Description of cores from the Pacific and Indian Oceans taken on *Antipode* expedition: Scripps Institution of Oceanography Reference series 78-17.

Glockhoff, C., and Helms, P.B., 1974, Description of cores from the central Pacific taken on *Styx* expedition: Scripps Institution of Oceanography Reference Series 74-16, 29 p.

Glockhoff, C., and Helms, P.B., 1975, Description of cores from the tropical central Pacific taken on *Amphitrite* expedition: Scripps Institution of Oceanography Reference Series 75-29, 43 p.

Goldberg, E.D., and Arrhenius, G.O.S., 1958, Chemistry of the Pacific pelagic sediments: Geochimica et Cosmochimica Acta, v. 13, p. 153-212.

Goll, R.M., and Bjorklund, K.R., 1974, Radiolaria in surface sediments of the south Atlantic: Micropaleontology, v. 20, p. 38-75.

Goodell, H.G., 1965, Marine geology, USNS *Eltanin* cruises 9-15: Antarctic Research Facility, Sedimentary Research Laboratory, Florida State University, Contribution 11, 237 p.

Goodell, H.G., 1968, USNS *Eltanin* core descriptions, cruises 16-27: Antarctic Research Facility, Sedimentary Research Laboratory, Department of Geology, Contribution 25, 247 p.

Goodell, H.G., and others, 1973, Marine sediments of the southern oceans: American Geographical Society, Antarctic Map Folio Series, Folio 17, 9 pl., 18 p.

Griffen, J.J., and Goldberg, E.D., 1969, Recent sediments of Caribbean Sea: AAPG Memoir 11, p. 258-268.

Heath, G.R., and Dymond, J., 1977, Genesis and transformation of metalliferous sediments from the East Pacific Rise, Bauer Deep, and central basin, northwest Nazca Plate: Geological Society of America Bulletin, v. 88, p. 723-733.

Heath, G.R., and Dymond, J., 1981, Metalliferous-sediment deposition in time and space: East Pacific Rise and Bauer Basin, northern Nazca Plate: Geological Society of America Memoir 154, p. 175-198.

Hecker, B., and Paul, A.Z., 1979, Abyssal community structure of the benthic infauna of the eastern equatorial Pacific, Domes A, Band C, *in* Bishoff, J.L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province: New York, Plenum Press, p. 287-308.

Hishida, H., and Uchio, T., 1981, Sedimentological and geochemical studies of manganese micronodules and the associated sediments in some piston cores in the north Pacific Ocean: University of Tokyo Journal of the Faculty of Engineering, v. 36, p. 463- 522.

Horn, D.R., Horn, B.M., and Delach, M.N., 1970, Sedimentary provinces of the north Pacific, *in* Hays, J.D., ed., Geological investigations of the north Pacific: Geological Society of America Memoir 126, p. 1-21.

Ingle, J.C, Jr., Keller, G., and Kolpack, R.L., 1980, Benthic foraminiferal biofacies sediments and water masses of the southern Peru-Chile Trench area, southeastern Pacific ocean: Micropaleontology, v. 26, p. 113-150.

Jarrard, R.D., and Clague, D.A., 1977, Implications of Pacific Island and seamount ages for the origin of volcanic chains: Review of Geophysics and Space Physics, v. 15, p. 57-76.

Johnson, D.A., 1972, Ocean-floor erosion in the equatorial Pacific: Geological Society of America Bulletin, v. 83, p. 3121-3144.

Johnson, D.A., and Driscoll, A.H., eds., 1975, Descriptions of Woods Hole Oceanographic Institution (WHOI) sediment cores, v. 1-4: Woods Hole Oceanographic Institution Report WHOI-75-8, 2937 p.

Johnson, D.A., and Driscoll, A.H., eds., 1977, Description of Woods Hole Oceanographic Institution (WHOI) sediment cores, v. 5: Woods Hole Oceanographic Institution Report WHOI-77-26, 796 p.

Johnson, T.C., 1976, Biogenic opal preservation in pelagic sediments of a small area in the eastern tropical Pacific: Geological Society of America Bulletin, v. 87, p. 1273-1282.

Johnson, T.C., and Glockhoff, C., 1974, Description of cores from the Pacific Ocean taken on *Scan* expedition: Scripps Institution of Oceanography Reference 74-22, 39 p.

Kanaya, T., 1969, Diatom micropaleontology and deep-sea stratigraphy of the north Pacific: Societe Franco-Japonaise d'Oceanographie Bulletin, v. 7, p. 182-196.

Keller, G.H., and others, 1972, Mass physical properties of Tobago Trough sediments: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 405-408.

Kobayashi, K., and others, 1971, Magnetic and micropaleontological study of deep-sea sediments from the west-central equatorial Pacific: Deep-Sea Research, v. 18, p. 1045-1062.

Kornicker, L.S., and Bryant, W.R., 1969, Sedimentation on the continental shelf of Guatemala and Honduras, *in* Tectonic relations of northern Central America and the western Caribbean, the *Bonacca* expedition: American Association of Petroleum Geologists Memoir 11, p. 244-257.

Kowsmann, R.O., 1973, Coarse components in surface sediments of the Panama Basin, eastern equatorial Pacific: Journal of Geology, v. 81, p. 473-494.

Krishnaswami, S., 1976, Authigenic transition elements in Pacific pelagic clays: Geochimica et Cosmochimica Acta, v. 40, p. 425-434.

Kulm, L.D., and others, 1981, Late Cenozoic carbonates on the Peru continental margin; lithostratigraphy, biostratigraphy, and tectonic history: Geological Society of America Memoir 154, p. 469-507.

Kuznetsov, Y.V., Alterman, E.I., and Lisitzin, A.P., 1981, Sedimentation rates of metalliferous sediments in the southeastern part of the Pacific Ocean: Okeanologia, v. 21, p. 308-317.

Landergren, S., 1964, On the geochemistry of deep-sea sediments: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 10: Special Investigations no. 4, p. 60-154.

Landmesser, C.W., and others, 1976, Manganese nodules from the south Penrhyn Basin, southwest Pacific: South Pacific Marine Geological Notes, v. 1, p. 17-39.

Larson, R.L., Golovchenko, X., and Pitman, W.C., III, 1981, Geomagnetic polarity time scale, *in* Corvalán D., J., Plate-tectonic map of the circum-Pacific region, southeast quadrant: Tulsa, Okla., American Association of Petroleum Geologists, scale 1:10,000,000, 14 p.

Lewis, K.B., and others, 1980, The origin of channel-fill sands and gravels on an algal-dominated reef terrace, Rarotonga, Cook Islands: South Pacific Marine Geological Notes, v. 2, p. 1-23.

Lineberger, P.H., 1975, Sedimentary processes and pelagic turbidites in the eastern central Pacific basin: Hawaii Institute of Geophysics Report HIG-75-24, 124 p.

Lisitsyn, A.P., 1972, Sedimentation in the world ocean: Society of Economic Paleontologists and Mineralogists Special Publication 7, 218 p.

Lisitsyn, A.P., and Petelin, V.P., 1967, Features of distribution and modification of $CaCO_3$ in bottom sediments of the Pacific Ocean: Lithology and Mineral Resources 5, p. 565-578.

Lonsdale, P., and Klitgord, K.D., 1978, Structure and tectonic history of the eastern Panama Basin: Geological Society of America Bulletin, v. 89, p. 981-999.

Lonsdale, P., and Malfait, B., 1974, Abyssal dunes of foraminiferal sand on the Carnegie Ridge: Geological Society of America Bulletin, v. 85, p. 1697-1712.

Lonsdale, P., Normark, W.R., and Newman, W.A., 1972, Sedimentation and erosion on Horizon Guyot: Geological Society of America Bulletin, v. 83, p. 289-316.

Lozano, J.A., and Hays, J.D., 1976, Relationship of radiolarian assemblages to sediment types and physical oceanography in the Atlantic and western Indian Ocean sectors of the Antarctic Ocean, *in* Cline, R.M., and Hays, J.D., eds., Investigation of late Quaternary paleo-oceanography and paleoclimatology: Geological Society of America Memoir 145, p. 303-336.

MacIlvaine, J.C., and Ross, D.A., 1973, Surface sediments of the Gulf of Panama: Journal of Sedimentary Petrology, v. 43, p. 215-223.

Marchig, V., 1978, Brown clays form the central Pacific metalliferous sediments or not?: Geologisches Jahrbuch, ser. D, no. 30, p. 3-25.

McMurtry, G.M., and Yeh, M.-W., 1981, Hydrothermal clay mineral formation of East Pacific Rise and Bauer Basin sediments: Chemical Geology, v. 32, p. 189-205.

Mizuno, A., and Chujo, J., eds., 1975, Deep-sea mineral resources investigation in the eastern central Pacific basin, August-October 1974 (GH74-5 cruise): Geological Survey of Japan Cruise Report 4, 103 p.

Mizuno, A., and Moritani, T., eds., 1977, Deep-sea mineral resources investigation in the eastern central Pacific basin, January-March 1976 (GH76-1 cruise): Geological Survey of Japan Cruise Report 8, 217 p.

Moore, T.C., Heath, G.R., and Kowsmann, R.O., 1973, Biogenic sediments of the Panama Basin: Journal of Geology, v. 81, p. 458-472.

Moritani, T., ed., 1979, Deep-sea mineral resources investigation in the western central Pacific basin, January-March 1977 (GH77-1 Cruise): Geological Survey of Japan Cruise Report 12, 256 p.

Murray, J., and Renard, A.F., 1891, Report on deep-sea deposits based on the specimens collected during the voyage of H.M.S. *Challenger* in the years 1872 to 1876, *in* Thomson, C.W., and Murray, J., eds., Report on the scientific results of the voyage of H.M.S. *Challenger* during the years 1873-1876: New York, Johnson Reprint Corporation, p. 80-147.

Newell, N.D., 1956, Geological reconnaissance of Raroia (Kon Tiki) Atoll, Tuamotu archipelago: American Museum of Natural History Bulletin, v. 109, p. 317-372.

Ninkovich, D., and Shackleton, N.J., 1975, Distribution, stratigraphic position and age of ash layer "L", in the Panama Basin region: Earth and Planetary Science Letters, v. 27, p. 20-34.

Ollausson, E., 1960, Sediment cores from the West Pacific; reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 161- 164.

Pettersson, H., ed., 1952-1956, Sediment cores from the east Pacific: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 5, p.1-227.

Pettersson, H., ed., 1954-1960, Sediment cores from the West Pacific: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 1-214.

Prell, W.L., 1978, Upper Quarternary sediments of the Colombia Basin: Geological Society of America Bulletin, v. 89, p. 1241-1255.

Rawson, M.D., and Ryan, W.B.F., 1978, Ocean floor sediment and polymetallic nodules: Lamont-Doherty Geological Observatory and U.S. Department of State, scale 1:23,230,300.

Reinemund, J.A., 1975, Circum-Pacific Map Project summary report: Menlo Park, Calif., Circum-Pacific Map Project, unpublished report, 24 p.

Revelle, R.R., 1944, Marine bottom samples collected in the Pacific Ocean by the *Carnegie* on its seventh cruise, *in* Scientific results of Cruise VII of the *Carnegie* during 1928-1929 under command of Captain J.P. Ault: Department of Terrestrial Magnetism, Oceanography-II, Carnegie Institution of Washington Publication 556, 115 p.

Riedel, W.R., and Funnell, B.M., 1964, Tertiary sediment cores and micro-fossils from the Pacific Ocean floor: Geological Society of London Quarterly Journal, v. 120, p. 305-368.

Roy, K.J., and Smith, S.V., 1971, Sedimentation and coral reef development in turbid water; Fanning Lagoon: Pacific Science, v. 25, p. 234-248.

Saito, T., Burckle, L.H., and Hays, J.D., 1975, Late Miocene to Pleistocene biostratigraphy of equatorial Pacific, *in* Saito, T., and Burckle, L., eds., Late Neogene epoch boundaries: Micropaleontology Special Publication 1, p. 226-244.

Sayles, F.L., Ku, T.L., and Bowker, P.C., 1975, Chemistry of ferromanganoan sediment of the Bauer Deep: Geological Society of America Bulletin, v. 86, p. 1423-1431.

Scherer, W., and Macsotay, O., 1972, Ecologic analysis and facies distribution of the Lecherias-Manare platform area, northeastern Venezuela: Caribbean Geological Conference, VI, Margarita, Venezuela, 1971, Memorias, p. 418-422.

Shideler, G.L., 1980, Maps showing composition of surficial sediments on the insular shelf of southwestern Puerto Rico: U.S. Geological Survey Miscellaneous Field Studies 1258, scale 1:90,000.

Skornyakova, N.S., and Petelin, V.P., 1967, Sediments in the central part of the south Pacific: Oceanology, v. 7, p. 779-793.

Sohl, N.F., and Wright, W.B., 1980, Changes in stratigraphic nomenclature by the U.S. Geological Survey, 1979: U.S. Geological Survey Bulletin 1502-A, p. Al-A12.

Swift, S.A., 1977, Holocene rates of sediment accumulation in the Panama Basin, eastern equatorial Pacific: pelagic sedimentation and lateral transport: Journal of Geology, v. 85, p. 301-309.

Swift, S.A., and Wenkam, C., 1978, Holocene accumulation rates of calcite in the Panama Basin; lateral and vertical variations in calcite dissolution: Marine Geology, v. 27, p. 67-77.

Theyer, F., and others, 1977, Sediment core descriptions: R/V *Kana Keoki* 1973 north central Pacific cruise, 1974 southeastern Pacific cruise, and 1974 Mid-Atlantic Rldge IPOD site survey: Hawaii Institute of Geophysics Data Report 33, HIG-77-9, 13 p.

Thunell, R.C., 1975, Calcium-carbonate dissolution history in late Quaternary deep-sea sediments, western Gulf of Mexico: Quaternary Research, v. 6, p. 281-297.

Thunell, R.C., Keir, R.S., and Honjo, S., 1981, Calcite dissolution, an *in situ* study in the Panama Basin: Science, v. 212, p. 659-661.

Turekian, K.K., ed., 1971, The late Cenozoic glacial ages: New Haven, Connecticut, Yale University Press, 606 p.

U.S. Government Printing Office, 1970-1983, Initial reports of the Deep Sea Drilling Project: Washington, D.C., v. 4-76.

Urien, C.M., and Mouzo, F., 1974, Aspectos granulométricos y físicos de los sedimentos superficiales de la plataforma continental entre Cabo Polonio y Mar del Plata: Armada Argentina, Servicio de Hidrografía Naval, H. 653, 42 p.

van Andel, T.H., 1967, The Orinoco delta: Journal of Sedimentary Petrology, v. 37, p. 297-310.

van Andel, T.H., Heath, G.R., and Moore, T.C. Jr., 1975, Cenozoic history and paleo-oceanography of the central equatorial Pacific Ocean: Geological Society of America Memoir 143, 134 p.

Wells, J.T., and Coleman, J.M., 1978, Longshore transport of mud by waves northeastern coast of South America, *in* MacGillavry, H.J., and Rets, D.J., eds., Caribbean Geological Conference, 8th, Curaçao, 1977: Geologische Mijnbouw, v. 57, p. 353-359.

Williams, H., 1933, Geology of Tahiti, Moorea, and Maiao: B.P. Bishop Museum Bulletin 105, 89 p.

Zen, E.-A., 1959, Mineralogy and petrography of marine bottom sediment samples off the coast of Peru and Chile: Journal of Sedimentary Petrology, v. 29, p. 513-539.

SOUTHWEST QUADRANT

Anderson, J.B., Kurtz, D.D., Domack, E.W., and Balshaw, K.M., 1980, Glacial and glacial marine sediments of the Antarctic continental shelf: Journal of Geology, v. 88, p. 399-414.

Andrews, J.E., 1973, Sediment core descriptions: RV *Mahi* 1970 cruise, western Pacific Ocean: Hawaii Institute of Geophysics Data Report 24, HIG-73-7, 11 p.

Andrews, J.E., and Foreman, J.A., 1975, Sediment core descriptions: R/V *Kana Keoki* 1971 cruise, eastern and western Pacific Ocean: Hawaii Institute of Geophysics Data Report 32, HIG-75-15, 328 p.

Andrews, J.E., and Foreman, J.A., 1976, Sediment core description: R/V *Kana Keoki* 1972 cruise, eastern and western Pacific Ocean: Hawaii Institute of Geophysics Data Report 32, HIG-76-13, 112 p.

Andrews, P.B., 1973, Late Quaternary continental shelf sediments off Otago Peninsula, New Zealand: New Zealand Journal of Geology and Geophysics, v. 16, p. 793-830.

Arita, M., 1975, Bottom sediments, *in* Mizuno, A., and Chujo, J., eds., Deep-sea mineral-resources investigation in the eastern central Pacific Basin, August-October 1974 (GH74-5 Cruise): Geological Survey of Japan Cruise Report 4, p. 62-70.

Arita, M., 1977, Bottom sediments, *in* Mizuno, A., and Moritani, T., eds., Deep-sea mineral resources investigation in the central eastern part of the Central Pacific Basin, January-March 1976 (GH76-1 Cruise): Geological Survey of Japan Cruise Report 8, p. 94-117.

Basov, I.A., 1981, Benthonic foraminifers in the recent sediments of the inland seas of the Malay Archipelago: Okeanologiya, v. 21, p. 97-104.

Berger, W.H., Adelseck, C.G., Jr., and Mayer, L.A., 1978, Distribution of carbonate in surface sediments of the Pacific Ocean: Journal of Geophysical Research, v. 81, p. 2617-2627.

Berrit, G.R., and Rotschi, H., 1956, Chemical analyses cores from the central and west equatorial Pacific: Reports of the Swedish Deep Sea Expedition, v. 6, p. 53-56.

Branson, J.C., 1978, Evolution of sedimentary basins from Mesozoic times in Australia's continental slope and shelf: Tectonophysics, v. 48, p. 389-412.

Broda, J.E., Franks, C.E., and Keith, D.J., eds., 1981, Descriptions of Woods Hole Oceanographic Institution (WHOI) sediment cores, v. 6: Woods Hole Oceanographic Institution Bibliography of Technical Reports, WHOI-81-77, 704 p.

Brown, D.A., Campbell, K.S.W., and Crook, K.A.W., 1988, The geological evolution of Australia and New Zealand: Oxford, Pergamon Press, 409 p.

Brown, C.M., Pigram, C.J., and Skwarko, S.K., 1979-1980, Mesozoic stratigraphy and geological history of Papua New Guinea: Paleogeography, Paleoclimatology, Paleoecology, v. 29, p. 301-322.

Campbell, K.S.W., ed., 1975, Gondwana geology: Canberra, Australian National University Press, 705 p.

Campsie, J., Neumann, E.R., and Johnson, L., 1983, Dredged volcanic rocks from the southern oceans: the *Eltanin* collection: New Zealand Journal of Geology and Geophysics, v. 26, p. 31-45.

Carney, J.N., Macfarlane, A., and Mallick, D.I.J., 1985, The Vanuatu island arc; an outline of the stratigraphy, structure, and petrology: Ocean Basins and Margins, v. 7A, p. 683-718.

Carter, L., and Eade, J.V., 1980, Hauraki sediments: New Zealand Oceanographic Institute Chart, Coastal Series, scale 1:200,000.

Cassidy, D.S., Kaharoeddin, F.A., Zemmels, I., and Knapp, M.B., 1977, USNS *Eltanin*; an inventory of core location data with core location maps and Cruise 55 core descriptions: Antarctic Research Facility, Florida State University, Sedimentology Research Laboratory, Contribution 44, 90 p.

Chapman, F., 1922, Seafloor deposits from soundings: Australasian Antarctic Expedition, 1911-1914, Scientific Reports, Series A, v. II: Oceanography, pt. 1, p. 1-62.

Clarke, M.J., Farmer, N., and Gulline, A.B., 1978, Tasmania basin, Parmeneer Supergroup, *in* Leslie, R.B., Evans, H.J., and Knight, C.L., eds., Economic geology of Australia and Papua New Guinea–3. petroleum: Australasian Institute of Mining and Metallurgy Monograph Series, no. 7, p. 438-442.

Clarke, W.B., 1976, On the deep oceanic depression off Moreton Bay: New South Wales, Journal of the Proceedings of the Royal Society, v. 10, p. 75-82.

Cochran, J.K., and Osmond, J.K., 1976, Sedimentation patterns and accumulation rates in the Tasman Basin: Deep-Sea Research, v. 23, p. 193-210.

Colwell, J.B., and von Stackelberg, U., 1981, Sedimentological studies of Cainozoic sediments from the Exmouth and Wallaby Plateaus, off northwest Australia: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 6, p. 43-50.

Conolly, J.R., 1969, Western Tasman sea floor: New Zealand Journal of Geology and Geophysics, v. 12, p. 310-343.

Conolly, J.R., and Payne, R.R., 1972, Sedimentary patterns within a continent–mid-oceanic ridge–continent profile: Indian Ocean south of Australia, *in* Hayes, D.E., ed., Antarctic oceanology II: the Australian-New Zealand sector: American Geophysical Union, Antarctic Research Series, v. 19, p. 295-315.

Conolly, J.R., and Von der Borch, C.C., 1967, Sedimentation and physiography of the sea floor south of Australia: Sedimentary Geology, v. 1, p. 181-220.

Cook, P.J., Veevers, J.J., Hiertzler, J.R., and Cameron, P.J., 1978, The sediments of the Argo abyssal plain and adjacent areas, Northeast Indian Ocean: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 3, p. 113-124.

Cooper, R.A., 1979, Lower Paleozoic rocks of New Zealand: Royal Society of New Zealand Journal, v. 9, p. 29-84.

Cooper, R.A., and Grindley, G.W., 1982, Late Proterozoic to Devonian sequences of southeastern Australia, Antarctica, and New Zealand and their correlation: Geological Society of Australia Special Publication 8, 103 p.

Corvalán D., J., 1985, Geologic map of the circum-Pacific region, southeast quadrant: Tulsa, Okla., American Association of Petroleum Geologists, scale 1:10,000,000, 36 p.

Cox, M.E., 1980, Areal distribution of marine sediment mercury in the region around Fiji: South Pacific Marine Geological Notes, v. 1, p. 111-122.

Craddock, C., 1989, Geologic map of the circum-Pacific region, Antarctica sheet: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 21 p.

Cronan, D.S., and others, 1981, Sediments from the Braemar Ridge and Yasawa Trough, northwest of Fiji: South Pacific Marine Geological Notes, v. 2, p. 25-35.

Cullen, D.J., 1967, The submarine geology of Foveaux Strait: New Zealand Oceanographic Institute Memoir 33, Department of Scientific and Industrial Research Bulletin 184, 67 p.

Cullen, D.J., and Gibb, J.G., 1966, Foveaux sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

D'Addario, G.W., Cameron, R.L., and Wedgebrow, J.M., 1976, Cainozoic geology of the Northern Territory, Australia: Australia Bureau of Mineral Resources, Geology and Geophysics, scale 1:2,500,000.

D'Addario, G.W., Dow, D.B., and Swoboda, R., 1976, Geology of Papua New Guinea: Australia Bureau of Mineral Resources, Geology, and Geophysics, scale 1:2,500,000.

D'Addario, G.W., Palfreyman, W.D., and Bultitude, J.M., 1979, Cainozoic cover and weathering: Earth Science Atlas of Australia, scale 1:10,000,000 (commentary by G.W. D'Addario).

D'Addario, G.W., Palfreyman, W.D., and Bultitude, J.M., 1979, Main rock types: Earth Science Atlas of Australia, scale 1:10,000,000.

D'Addario, G.W., Palfreyman, W.D., and Bultitude, J.M., 1979, Major structural elements: Earth Science Atlas of Australia, scale 1:10,000,000 (commentary by H.F. Doutch).

D'Addario, G.W., Palfreyman, W.D., and Bultitude, J.M., 1980, General geology: Earth Science Atlas of Australia, scale 1:10,000,000 (commentary by G.M. Derrick).

D'Addario, G.W., Palfreyman, W.D., and Bultitude, J.M., 1980, Solid geology: Earth Science Atlas of Australia, scale 1:10,000,000 (commentary by G.M. Derrick).

D'Addario, G.W., and others, 1982, Australia geology, *in* Atlas of Australian Resources, ser. 3: Canberra, Division of National Mapping, scale 1:5,000,000.

D'Addario, G.W., and others, 1976, Geology of the Northern Territory: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin, scale 1:2,500,000.

Damuth, J.E., 1980, Quaternary sedimentation processes in the South China Basin as revealed by echo-character mapping and piston-core studies, in Hayes, D.E. ed., The tectonic and geologic evolution of southeast Asia seas and islands: American Geophysical Union, Geophysical Monograph 23, p. 105-125.

Davies, P.J., 1979, Marine geology of the continental shelf off southeast Australia: Australia Bureau of Mineral Resources, Geology and Geophysics Bulletin 195, scale 1:1,000,000, 48 p.

Day, R.W., and others, 1983, Queensland geology: Geological Survey of Queensland Publication 383, 194 p.

Domack, E.W., Fairchiled, W.W., and Anderson, J.B., 1980, Lower Cretaceous sediment from the East Antarctic continental shelf: Nature, v. 287, p. 625-626.

Douglas, J.G., and Ferguson, J.A., eds., 1976, Geology of Victoria: Geological Society of Australia Special Publication no. 5, scale 1:1,000,000, 528 p.

Doutch, H.F., and Nicholas, E., 1978, The Phanerozoic sedimentary basins of Australia and their tectonic implications: Tectonophysics, v. 48, p. 365-388.

Dow, D.B., 1977, A geological synthesis of Papua New Guinea: Australia Bureau of Mineral Resources, Geology and Geophysics Bulletin 201, 41 p.

Dow, D.B., 1986, Geologic map of Irian Jaya, Indonesia: Bandung, Indonesia, Geological Research and Development Centre Special Publication, scale 1:1,000,000.

Doyle, A.C., and others, 1979, Bay of Plenty sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Drummond, K.J., 1983, Geologic map of the circum-Pacific region, northeast quadrant: Tulsa, Okla., American Association of Petroleum Geologists, scale 1:10,000,000, 72 p.

Eade, J.V., 1974, Poor Knights sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Eade, J.V., and van der Linden, W.J.M., 1970, Sediments and stratigraphy of deep-sea cores from the Tasman Basin: New Zealand Journal of Geology and Geophysics, v. 13, p. 228-268.

Emery, K.O., 1969, Distribution pattern of sediments on the continental shelves of western Indonesia: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 2, p. 79-82.

Emery, K.O., 1971, Bottom sediment map of Malacca Strait: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 4, p. 149-152.

Emery, K.O., and Niino, H., 1963, Sediments of the Gulf of Thailand and adjacent continental shelf: Geological Society of America Bulletin, v. 74, p. 541-554.

Exon, N.F., 1981, Manganese nodules in the Cook Islands region, southwest Pacific: South Pacific Marine Geological Notes, v. 2, p. 47-65.

Exon, N.F., Moreton, D., and Hicks, G., 1980, Manganese nodules from the Tasman Sea off Sydney: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 5, p. 67-68.

Exon, N.F., and others, 1981, Morphology, water characteristics, and sedimentation in the silled Sulu Sea, southeast Asia: Marine Geology, v. 39, p. 165-195.

Fairbridge, R.W., ed., 1975, The encyclopedia of world regional geology, Part 1: western hemisphere (including Antarctica and Australia), *in* Encyclopedia of earth sciences, v. 8: Stroudsburg, Penn., Dowden, Hutchinson, and Ross, Inc., p. 21-108.

Falvey, D.A., and Mutter, J.C., 1981, Regional plate tectonics and the evolution of Australia's passive continental margins: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 6, p. 1-29.

Flint, R.B., and Parker, A.J. (compilers), 1982, Tectonic map, South Australia: Geological Survey of South Australia, Department of Mines and Energy, scale 1:2,000,000.

Forstner, U., and Stoffers, P., 1981, Chemical fractionation of transition elements in Pacific pelagic sediments: Geochimica et Cosmochimica Acta, v. 45, p. 1141-1146.

Frakes, L.A., 1971, USNS *Eltanin* core descriptions: Cruises 32-45, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 33, 105 p.

Frakes, L.A., 1973, USNS *Eltanin* sediment descriptions: Cruises 4-45, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 37, 259 p.

Frazer, J.Z., Hawkins, D.L., and Arrhenius G., 1972, Surface sediments and topography of the north Pacific: Scripps Institution of Oceanography, Geological Data Center, Charts 1-10, scale 1:3,630,000.

Gee, R.D., and others, 1979, Geological map of Western Australia: Geological Survey of Western Australia, scale 1:2,500,000.

Geological Society of Australia, 1971, Tectonic map of Australia and New Guinea: scale 1:5,000,000.

Geological Society of Australia, 1973, Australian code of stratigraphic nomenclature: Journal of the Geological Society of Australia, v. 20, p. 105-112.

Geological Survey of Western Australia, 1974, Geology of Western Australia: Western Australia Geological Survey Memoir 2, 541 p.

Goodell, H.G., 1964, Marine geology of the Drake Passage, Scotia Sea, and South Sandwich Trench: Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 7, 277 p.

Goodell, H.G., 1965, Marine geology: USNS *Eltanin* Cruises 9-15, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 11, 237 p.

Goodell, H.G., 1968, USNS *Eltanin* core descriptions: Cruises 16-27, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 25, 247 p.

Goodell, H.G., and others, 1973, Marine sediments of the southern oceans: Antarctic Map Folio Series, Folio 17, American Geographical Society, 9 pl., 18 p.

Guilcher, A., 1965, Geomorphologie et sedimentologie du Grand Recif Sud et des recifs et du lagoon de Tuo: Expedition Française sur les recifs coralliens de la Nouvelle-Caledonie, 1960-1963, v. l, p. 140-240.

Hayes, D.E., and Ringis, J., 1973, Seafloor spreading in the Tasman Sea: Nature, v. 243, p. 454-458.

Henderson, R.A., and Stephenson, P.J., eds., 1980, The geology and geophysics of northeastern Australia: Brisbane, Geological Society of Australia, Queensland Division, 468 p.

Herzer, R.H., 1979, Banks sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Hinz, K., and others, 1978, Geoscientific investigations from the Scott Plateau off northwest Australia to the Java Trench: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 3, p. 319-340.

Huang, T.-W., and Chen, P.-Y., 1975, The abyssal clay minerals in the west Philippine Sea: Acta Oceanographica Taiwanica 5, Science Reports of the National Taiwan University, p. 37-63.

Hughes, G.N., 1982, Solomon Islands: United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) Atlas of Stratigraphy, Mineral Resources Development Series, no. 48, p. 115-130.

Hunter, D.R., ed., 1981, Precambrian of the southern hemisphere: Developments in Precambrian Geology, v. 2, 1005 p.

Inoue, E., 1988, Geologic map of the circum-Pacific region, northwest quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 30 p.

Inoue, E., Suzuki, T., Matsumoto, E., and Yuasa, M., 1972, Deep-sea sediments, *in* Takeda, H., ed., Deep sea mineral resources investigations in northwest Pacific, November-December 1972: Geological Survey of Japan Cruise Report l, p. 20-33.

Jarrard, R.D., and Clague, D.A., 1977, Implications of Pacific island and seamount ages for the origin of volcanic chains: Reviews of Geophysics and Space Physics, v. 15, p. 57-76.

Johnson, B.D., Powell, C., and Veevers, J.J., 1980, Early spreading history of the Indian Ocean between India and Australia: Earth and Planetary Science Letters, v. 47, p. 131-143.

Johnson, R.W., 1979, Geotectonics and volcanism in Papua New Guinea: a review of the late Cainozoic: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 4, p. 181-207.

Johnson, T.C., and others, 1977, Physical properties of calcareous ooze: control by dissolution at depth: Marine Geology, v. 24, p. 259-277.

Jones, H.A., 1973, Marine geology of the northwest Australian continental shelf: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 136, scale 1:1,000,000, 102 p.

Jones, H.A., and Burgis, W., 1974, Timor Sea continental shelf sediments map: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 83A, scale 1:1,000,000.

Jongsma, D., 1974, Marine geology of the Arafura Sea: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 157, scale 1:1,000,000, 73 p.

Kanaya, T., 1969, Diatom micropaleontology and deep-sea stratigraphy of the North Pacific: Societe Franco-Japonaise d'Oceanographie Bulletin, La Mer, v. 7, p. 183-196.

Katz, H.R., 1980, Cretaceous-Cenozoic sedimentary basins of New Zealand; prospectus for petroleum exploration of New Zealand: Wellington, New Zealand, Ministry of Energy.

Katz, H.R., 1982, Plate-margin transition from oceanic arc-trench to continental system: the Kermadec-New Zealand example: Tectonophysics, v. 87, p. 49-64.

Keller, G.H., and Richards, A.F., 1967, Sediments of the Malacca Strait, southeast Asia: Journal of Sedimentary Petrology, v. 37, p. 102-127.

Kidd, R.B., and Davies, T.A., 1978, Indian Ocean sediment distribution since the Late Jurassic: Marine Geology, v. 26, p. 49-70.

Knight, C.L., ed., 1975, Economic geology of Australia and Papua New Guinea–I. metals: Australasian Institute of Mining and Metallurgy Monograph Series, no. 5, 1126 p.

Kobayashi, K., ed., 1981, Preliminary report of R/V *Hakuho Maru* cruise KH 80-3: University of Tokyo, Ocean Research Institute, 210 p.

Kobayashi, K., Kitazawa, K., Kanaya, T., and Sakai, T., 1971, Magnetic and micro-paleontological study of deep-sea sediments from the west-central equatorial Pacific: Deep-Sea Research, v. 18, p. 1045-1062.

Kobayashi, K., Tonouchi, S., Furuta, T., and Watanabe, M., 1980, Paleomagnetic results of deepsea sediment cores collected by R/V *Hakuho Maru* in the period 1968-1977, compiled with associated information: University of Tokyo, Ocean Research Institute Bulletin 13, 148 p.

Kolla, V., Be, A.W.H., and Biscaye, P.E., 1976, Calcium-carbonate distribution in the surface sediments of the Indian Ocean: Journal of Geophysical Research, v. 81, p. 2605-2616.

Kolla, V., and Biscaye, P.E., 1977, Distribution and origin of quartz in the sediments of the Indian Ocean: Journal of Sedimentary Petrology, v. 47, p. 642-649.

Kolla, V., and Hays, J.D., 1974, Sedimentation in the Indian Ocean, *in* Inderbitzen, A.L., ed., Deep-sea sediments; physical and mechanical properties, Marine Science, v. 2, p. 401-415.

Kolla, V., Henderson, L., Sullivan, L., and Biscaye, P.E., 1978, Recent sedimentation in the southeast Indian Ocean with special reference to the effects of Antarctic bottom water circulation: Marine Geology, v. 27, p. 1-17.

Krause, D.C., 1966, Geology and geomagnetism of the Bounty region east of the South Island, New Zealand: New Zealand Oceanographic Institute Bulletin 170, Department of Scientific and Industrial Research Memoir 30, 33 p.

Krause, D.C., 1967, Bathymetry and geologic structure of the northwestern Tasman Sea–Coral Sea–South Soloman Sea area of the south-western Pacific Ocean: New Zealand Oceanographic Institute Bulletin 183, Department of Scientific and Industrial Research Memoir 41, 46 p.

Krishnaswami, S., 1976, Authigenic transition elements in Pacific pelagic clays: Geochimica et Cosmochimica Acta, v. 40, p. 425-434.

Kudrass, H.R., Wiedicke, M., Cepek, P., Kreuzer, H., and Muller, P., 1986, Mesozoic and Cainozoic rocks dredged from the South China Sea (Reed Bank area) and Sulu Sea and their significance for plate-tectonic reconstructions: Marine and Petroleum Geology, v. 3, p. 19-30.

Landergren, S., 1964, On the geochemistry of deep-sea sediments: Reports of the Swedish Deep Sea Expedition, 1947-1948, v. 10: Special Investigations no. 4, p. 60-154.

Landmesser, C.W., and others, 1976, Manganese nodules from the south Penrhyn Basin, southwest Pacific: South Pacific Marine Geological Notes, v. 1, p. 17-39.

Leslie, R.B., Evans, H.J., and Knight, C.L., eds., 1976, Economic geology of Australia and Papua New Guinea–3. petroleum: Australasian Institute of Mining and Metallurgy Monograph Series, no. 7, 541 p.

Lewis, K.B., and Gibb, J.G., 1970, Turnagain sediments: New Zealand Oceanographic Institute Chart, Coastal Series, scale 1:200,000.

Lewis, K.B., and Kohn, B.P., 1973, Ashes, turbidites, and rates of sedimentation on the continental slope off Hawkes Bay: New Zealand Journal of Geology and Geophysics, v. 16, p. 439-454.

Lewis, K.B., and Mitchell, J.S., 1980, Cook Strait sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Lisitsyn, A.P., and Petelin, V.P., 1967, Features of distribution and modification of $CaCO_3$ in bottom sediments of the Pacific Ocean: Lithology and Mineral Resources 5, p. 565-578.

Ludbrook, N.H., 1980, A guide to the geology and mineral resources of South Australia: South Australia Department of Mines and Energy, 230 p.

Markham, N.L., and Basden, H., eds., 1975, The mineral deposits of New South Wales: Sydney, Geological Survey of New South Wales, 682 p.

Marshall, J.F., 1977, Marine geology of the Capricorn Channel area: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 163, scale 1:1,000,000, 81 p.

Marshall, J.F., 1980, Continental shelf sediments: Southern Queensland and northern New South Wales: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 207, scale 1:1,000,000, 39 p.

Marshall, J.F., and Davies, P.J., 1978, Skeletal carbonate variation on the continental shelf of eastern Australia: Australia Bureau of Mineral Resources Journal of Australian Geology and Geophysics, v. 3, p. 85-92.

Maxwell, W.G.H., 1968, Atlas of the Great Barrier Reef: Amsterdam, Elsevier Publishing Company, 258 p.

Maxwell, W.G.H., 1968, Relict sediments, Queensland continental shelf: Australian Journal of Science, v. 31, p. 85-86.

Maxwell, W.G.H., 1973, Sediments of the Great Barrier Reef province, *in* James, O.A., and Endean, R., eds., Biology and geology of coral reefs, v. 1, Geology I: New York, Academic Press, p. 299-345.

McDougall, J.C., 1972, Carbonate variations in slope sediments, Kaipara, New Zealand: New Zealand Journal of Geology and Geophysics, v. 15, p. 558-571.

McDougall, J.C., 1975, Cook sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:1,000,000.

McDougall, J.C., 1979, Three Kings sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:1,000,000.

McDougall, J.C., 1982, Bounty sediments: New Zealand Oceanographic Institute Oceanic Series, map scale 1:1,000,000.

McDougall, J.C., and Brodie, J.W., 1967, Sediments of the western shelf, North Island, New Zealand: New Zealand Oceanographic Institute Memoir 40, New Zealand Department of Scientific and Industrial Research Bulletin 179, 54 p.

McDougall, J.C., and Gibb, J.G., 1970, Patea sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Murray, J.W., and Grundmanis, V., 1980, Oxygen consumption in pelagic marine sediments: Science, v. 209, p. 1527-1530.

Murray, J., and Renard, A.F., 1891, Report on deep-sea deposits based on the specimens collected during the voyage of H.M.S. *Challenger* in the years 1872 to 1876, *in* Thomson, C.W., and Murray, J., eds., Report on the scientific results of the voyage of H.M.S. *Challenger* during the years 1873-1876: New York, Johnson Reprint Corporation, p. 80-147.

Nakao, S., 1979, Bottom sediments, in Moritani, T., ed., Deep-sea mineral resources investigations in the western central Pacific basin, January-March 1977 (GH 77-I Cruise): Geological Survey of Japan Cruise Report 12, p. 131-151.

Nayudu, Y.R., 1971, Lithology and chemistry of surface sediments in sub-Antarctic regions of the Pacific Ocean, *in* Reid, J.L., ed., Antarctic oceanology I: American Geophysical Union, Antarctic Research Series 15, p. 247-282.

Neeb, G.A., 1943, Bottom samples, sect. 2, geological results; the *Snellius* expedition in the eastern part of the Netherlands East Indies, 1929-1930: v. 5., pt. 3, p. 55-268.

New Zealand Geological Survey, 1972, Geological map of New Zealand: New Zealand Department of Scientific and Industrial Research, 2 sheets, scale 1:1,000,000.

Niino, H., 1971, A study of the sediments and magnetics across the continental shelf between Borneo and Malaya Peninsula: Economic Commission for Asia and the Far East (ESCAP)/Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) Technical Bulletin, v. 4, p. 143-147.

Norris, R.M., 1964, Sediments of Chatham Rise: New Zealand Oceanographic Institute Memoir 26, Department of Scientific and Industrial Research Bulletin 159, 39 p.

Norris, R.M., 1979, Foulwind bathymetry: New Zealand Oceanographic Institute, Coastal Series, scale 1:200,000.

Norris, R.M., and Emery, K.O., 1966, Continental shelf sediments off northeastern Asia: Journal of Sedimentary Petrology, v. 36, p. 152-161.

Ollausson, E., 1960, Sediment cores from the west Pacific: Reports of Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 163-214.

Ollausson, E., 1960, Sediment cores from the Indian Ocean: Reports of Swedish Deep-Sea Expedition, 1947-1948, v. 9, p. 53-88.

Packham, G.H., ed, 1969, The geology of New South Wales: Journal of the Geological Society of Australia, v. 16, part 1, 654 p.

Page, R.W., McCulloch, M.T., and Black, L.P., 1984, Isotopic record of major Precambrian events in Australia: International Geological Congress, 27th, Moscow, 1984, Proceedings, v. 5, p. 25-72.

Paine, A.G.L., Cameron, R.L., and Sweet, I.P., 1980, Geology of Burdekin River region: Australia Bureau of Mineral Resources, Geology and Geophysics, scale 1:500,000.

Palfreyman, W.D., 1984, Guide to the geology of Australia: Australia Bureau of Mineral Resources, Geology and Geophysics Bulletin 181, 111 p.

Palfreyman, W.D., 1988, Geologic map of the circum-Pacific region, southwest quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 37 p.

Palfreyman, W.D., and others, 1976, Geology of Australia: Australia Bureau of Mineral Resources, Geology and Geophysics, 4 sheets, scale 1:2,500,000.

Palfreyman, W.D., Dow, D.B., and Sukamto, R., 1980-1981, Geological world atlas sheets 15 and 16: Commission for the Geological Map of the World, scale 1:10,000,000.

Pantin, H.M., 1966, Sedimentation in Hawke Bay: New Zealand Oceanographic Institute Memoir 28, Department of Scientific and Industrial Research Bulletin 171, 70 p.

Pantin, H.M., 1972, Internal structure in marine shelf, slope and abyssal sediments east of New Zealand: New Zealand Oceanographic Institute Memoir 60, Department of Scientific and Industrial Research Bulletin 208, 56 p.

Paris, J.P., 1981a, Carte géologie: Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), Atlas de la Nouvelle Caledonie et dependances, sheet no. 9, scale 1:1,000,000.

Paris, J.P., 1981b, Géologie de la Nouvelle Caledonie: Bureau de Recherches Géologiques et Minieres Memoir, no. 113, 278 p.

Parkin, L.W., ed., 1969, Handbook of South Australian geology: Geological Survey of South Australia, 268 p.

Pautot, G., and Melguen, M., 1979, Influence of deep-water circulation and seafloor morphology on the abundance and grade of central south Pacific manganese nodules, *in* Bischoff, J.L., and Piper, D.Z., eds., Marine geology and oceanography of the Pacific manganese nodule province, Marine Science, v. 9, p. 621-650.

Pettersson, H., ed., 1954-1960, Sediment cores from the west Pacific: Reports of the Swedish Deep-Sea Expedition, 1947-1948, v. 6, p. 1-214.

Plumb, K.A., 1985, Subdivision and correlation of late Precambrian sequences in Australia: Precambrian Research, v. 29, p. 303-329.

Pogson, D.J., 1972, Geological map of New South Wales: Geological Survey of New South Wales, 4 sheets, scale 1:1,000,000.

Rawson, M.Q., and Ryan, W.B.F., 1978, Ocean floor sediment and polymetallic nodules: Lamont-Doherty Geological Observatory and U.S. Department of State, scale 1:23,230,300.

Reinemund, J.A., 1975, Circum-Pacific Map Project summary report: Menlo Park, Calif., Circum-Pacific Map Project, unpublished report, 24 p.

Revelle, R.R., 1944, Marine bottom samples collected in the Pacific Ocean by the *Carnegie* on its seventh cruise, *in* Scientific results of Cruise VII of the *Carnegie* during 1928-1929 under command of Captain J.P. Ault: Oceanography-II: Washington, D.C., Carnegie Institution of Washington Publication 556, 115 p.

Riedel, W.R., and Funnell, B.M., 1964, Tertiary sediment cores and microfossils from the Pacific Ocean floor: Geological Society of London Quarterly Journal, v. 120, p. 305-368.

Rodda, P., 1982, Fiji: United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) Atlas of Stratigraphy, Mineral Resources Development Series, no. 48, p. 13-21.

Rodolfo, K.S., 1969, Bathymetry and marine geology of the Andaman Basin and tectonic implications for southeast Asia: Geological Society of America Bulletin, v. 80, p. 1203-1230.

Rodolfo, K.S., 1969, Sediments of the Andaman Basin, northeastern Indian Ocean: Marine Geology, v. 7, p. 371-402.

Scheibner, E., 1974, Tectonic map of New South Wales and explanatory notes: Geological Survey of New South Wales, 4 sheets, scale 1:1,000,000, p. 283.

Shirley, J., 1964, An investigation of the sediments on the continental shelf of New South Wales, Australia: Journal of the Geological Society of Australia, v. 11, p. 331-341.

Skornyakova, N.S., and Lipka, M.I., 1976, Basic and ultrabasic rocks of the Mariana Trench: Oceanology, v. 15, p. 688-690.

Skornyakova, N.S., and Petelin, V.P., 1967, Sediments in the central part of the south Pacific: Oceanology, v. 7, p. 779-793.

South Australia Department of Mines and Energy, 1982, Geological Map, South Australia: South Australia Department of Mines and Energy, scale 1:2,000,000.

Stewart, A.J., 1985, Metamorphism: Earth Science Atlas of Australia, scale 1:10,000,000.

Stice, G.D., and McCoy, F.W., 1968, The geology of the Manu'a Islands, Samoa: Pacific Science, v. 22, p. 427-457.

Strusz, D.L., 1971, Canberra geological map: Australia Bureau of Mineral Resources, Geology, and Geophysics, Geological Series Explanatory Notes, 2nd ed., sheet 51/55-16, scale 1:250,000.

Suggate, R.P., Stevens, G.R., and Te Punga, M.T., eds., 1978, The geology of New Zealand: Wellington, Government Printer, 2 v., 820 p.

Summerhayes, C.P., 1969, Marine geology of the New Zealand sub-Antarctic seafloor: New Zealand Oceanographic Institute Memoir no. 50, 90 p.

Summerhayes, C.P., 1969, Recent sedimentation around northernmost New Zealand: New Zealand Journal of Geology and Geophysics, v. 12, p. 172-207.

Sutherland, F.L., 1978, Mesozoic-Cainozoic volcanism of Australia: Tectonophysics, v. 48, p. 413-427.

Sval'nov, V.N., and others, 1979, A lithologic-stratigraphic subdivision of the bottom sediments on the profile from the Sunda Archipelago to the East Indian (Ninety East) Ridge: Oceanology, v. 18, p. 569-574.

Tasmania Department of Mines, 1976, Geological map of Tasmania: scale 1:500,000.

Taylor, G.R., 1977, Investigation of shallow submerged plateaus in the Manning Straits and southwest of Choiseul Island; result of the February 1976 expedition: South Pacific Marine Geological Notes, v. 1 p. 41-46.

Thomson, B.P. (compiler), 1980, Geological map of South Australia: South Australia Department of Mines and Energy, 2nd ed., 1983, scale 1:1,000,000.

Tiba, T., 1974, Geochemical composition of the deep-sea core from the Philipppine Sea: Tokyo, Bulletin of the National Science Museum, v. 17, p. 181-185.

Traves, D.M., and King, D., eds., 1975, Economic geology of Australia and Papua New Guinea–2. coal: Australasian Institute of Mining and Metallurgy Monograph Series, no. 6, 398 p.

Tsuchi, R., 1966, Geologic survey by the Umitakamaru International Indian Ocean Expedition in the winter of 1963-1964; general report of the participation of Japan in the International Indian Ocean Expedition: Records of Oceanographic Works in Japan, v. 8, p. 27-32.

Turner, C.C., Eade, J.V., Danitofea, S., and Oldnall, R., 1977, Gold-bearing sediments on the continental shelf, northern Guadalcanal, Solomon Islands: South Pacific Marine Geological Notes, v. l, p. 55-69.

Udintsev, G.B., and others, eds., 1975, Geological-geophysical atlas of the Indian Ocean: United Nations Educational, Scientific, and Cultural Organization (UNESCO)/Moscow, Academy of Sciences of the USSR, p. 131-135.

U.S. Army Corps of Engineers, 1956, Military geography of the Northern Marshalls: 320 p.

U.S. Government Printing Office, 1969-1987, Initial reports of the Deep Sea Drilling Project: Washington, D.C., v. 1-91.

U.S. Navy Hydrographic Office, 1951, Marine geography of Indochinese waters: Hydrographic Office Publication 754, 38 p.

Vallier, T.L., O'Connor, R.M., Scholl, D.W., Stevenson, A.J., and Quinterno, P.J., 1985, Petrology of rocks dredged from the landward slope of the Tonga Trench: Implications for middle Miocene volcanism and subsidence of Tonga Ridge: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 2, p. 109-120.

van Andel, T.H., and Veevers, J.J., 1967, Morphology and sediments of the Timor Sea: Australia Bureau of Mineral Resources, Geology and Geophysics Bulletin 83, scale 1:1,000,000, 173 p.

van Baren, F.A., and Kiel, H., 1950, Contribution to the sedimentary petrology of the Sunda Shelf: Journal of Sedimentary Petrology, v. 20, p. 185-213.

Van der Linden, W.J.M., 1969, Off-shore sediments, north-west Nelson, South Island, New Zealand: New Zealand Journal of Geology and Geophysics, v. 12, p. 87-103.

Veevers, J.J., 1984, Phanerozoic earth history of Australia: New York, Oxford University Press, 418 p.

Veevers, J.J., 1986, Breakup of Australia and Antarctica estimated as mid-Cretaceous (95 $\pm$ 5 Ma) from magnetic and seismic data at the continental margin: Earth and Planetary Science Letters, v. 77, p. 91-99.

Venkatarathnam, K., Be, A.W.H., and Biscaye, P.E., 1976, Calcium-carbonate distribution in the surface sediments of the Indian Ocean: Journal of Geophysical Research, v. 81, p. 2605-2616.

Venkatarathnam, K., and Hays, J.D., 1974, Sedimentation in the Indian Ocean, *in* Inderbitzen, A.L., ed., Deep-sea sediments: physical and mechanical properties, Marine Science, v. 2, p. 401-415.

Von der Borch, C.C., 1972, Marine geology of the Huon Gulf region, New Guinea: Australia Bureau of Mineral Resources, Geology, and Geophysics Bulletin 127, 50 p.

von Stackelberg, U., and others, 1980, Geology of the Exmouth and Wallaby Plateaus off northwest Australia; sampling of seismic sequences: Australia Bureau of Mineral Resources, Journal of Australian Geology and Geophysics, v. 5, p. 113-140.

Wells, A.T., 1985, Coal: Earth Science Atlas of Australia, scale 1:10,000,000.

Whitaker, W.G., and Green, P.M., 1980, Moreton geology: Queensland Geological Survey, Department of Mines, scale 1:500,000.

White, M.E., 1987, The greening of Gondwana: Frenchs Forest, New South Wales, Reed Books, 256 p.

Wilford, G.E., 1981, Petroleum and oil shale: Earth Science Atlas of Australia, scale 1:10,000,000.

Wilford, G.E., 1983, Phanerozoic paleogeography: Earth Science Atlas of Australia, 3 sheets, scale 1:30,000,000.

Wilford, G.E., Brown, C.M., and Bultitude, J.M., 1981, Sedimentary sequences: Earth Science Atlas of Australia, scale 1:10,000,000 (commentary by H.F. Doutch and G.E. Wilford).

Wilford, G.E., Truswell, E.M., and D'Addario, G.W., 1984, Cainozoic geology and mineral deposits: Earth Science Atlas of Australia, scale 1:10,000,000 (commentary by E.M. Truswell and G.E. Wilford).

Williams, E., 1976, Structural map of Pre-Carboniferous rocks of Tasmania: Tasmania Department of Mines, scale 1:500,000.

Williams, E., 1979, Tasman fold belt system in Tasmania (explanatory notes for the 1:500,000 structural map of pre-Carboniferous rocks of Tasmania):Tasmania Department of Mines, 29 p.

ANTARCTIC REGION

Anderson, J.B., 1971, Marine origin of sands in the Weddell Sea: Antarctic Journal of the United States, v. 6, p. 168-169.

Anderson, J.B., 1972, Nearshore glacial-marine deposition from modern sediments of the Weddell Sea: Nature; Physical Science, v. 240, p. 189-192.

Anderson, J.B., 1975, Calcium carbonate dissolution in the Weddell Sea: Antarctic Journal of the United States, v. 10, p. 253-255.

Anderson, J.B., 1975, Factors controlling $CaCO_3$ dissolution in the Weddell Sea from foraminiferal distribution patterns: Marine Geology, v. 19, p. 315-332.

Anderson, J.B., Balshaw, K., Domack, E., Kurtz, D., Milam, R., and Wright, R., 1979, Geologic survey of East Antarctic continental margin aboard USCGC *Glacier*: Antarctic Journal of the United States, v. 14, p. 142-144.

Anderson, J.B., Davis, S.B., Domack, E.W., Kurtz, D.D., Balshaw, K.M., and Wright, R., 1981, Marine sediment core descriptions; International Weddell Sea Oceanographic Expeditions (IWSOE) 68, 69, 70; Deep Freeze 79: Houston, Rice University Department of Geology, 60 p.

Anderson, J.B., Kurtz, D.D., and Weaver, F.M., 1979, Sedimentation on the Antarctic continental slope: Society of Economic Paleontologists and Mineralogists Special Publication no. 27, p. 265-283.

Anderson, J.B., Kurtz, D.D., Domack, E.W., and Balshaw, K.M., 1980, Glacial and glacial marine sediments of the Antarctic continental shelf: Journal of Geology, v. 88, p. 399-414.

Angino, E.E., 1966, Geochemistry of Antarctic pelagic sediments: Geochimica et Cosmochimica Acta, v. 30, p. 939-961.

Babcock, R.S., Plummer, C.C., Sheraton, J.W., and Adams, C.J., 1986, Geology of the Daniels Range, North Victoria Land, Antarctica, *in* Stump, E., ed., Geological investigations in northern Victoria Land, Antarctic Research Series, v. 46, American Geophysical Union, p. 1-24.

Banerji, J., Lemoigne, Y., and Torres, T., 1987, Significant additions to the Upper Triassic flora of Williams Point, Livingston Island, South Shetland Islands (Antarctica): Instituto Antártico Chileno, Ser. Científica, no. 36, p. 33-58.

Belinskaya, L.A., 1969, Geomorphology, sediments and suspended material of the shelf and continental slope of Antarctica, *in* Aver'yanov, V.G., ed., Collected papers of the Soviet Antarctic expeditions: Jerusalem, Israel Program for Scientific Translations, p. 99-108.

Berger, W.H., Adelseck, C.G., Jr., and Mayer, L.A., 1976, Distribution of carbonate in surface sediments of the Pacific Ocean: Journal of Geophysical Research, v. 81, p. 2617-2627.

Birkenmajer, K., and others, 1982, Late Cretaceous through late Oligocene K-Ar ages of the King George Island Supergroup volcanics, South Shetland Islands (West Antarctica): Bulletin de l'Academie Polonaise des Sciences, v. 30, p. 133-143.

Black, L.P., Sheraton, J.W., and James, P.R., 1986, Late Archean granites of the Napier Complex, Enderby Land, Antarctica: a comparison of Rb-Sr, Sm-Nd, and U-Pb isotopic systematics in a complex terrain: Precambrian Research, v. 32, p. 343-368.

British Antarctic Survey, 1982, Geologic map of northern Palmer Land, British Antarctic Territory: British Antarctic Survey, Series BAS 500G, scale 1:5,000,000.

British Antarctic Survey, 1984, British Antarctic Survey Annual Report 1983-84: p. 47.

British Antarctic Survey, 1985, British Antarctic Survey Annual Report 1984-85: p. 53.

British Antarctic Survey, 1985, Tectonic map of the Scotia Arc: British Antarctic Survey, Sheet BAS (misc.) 3, scale 1:3,000,000.

Campsie, J., Neumann, E.R., and Johnson, L., 1983, Dredged volcanic rocks from the southern oceans: the *Eltanin* collection: New Zealand Journal of Geology and Geophysics, v. 26, p. 31-45.

Carter, L., and Eade, J.V., 1980, Hauraki sediments: New Zealand Oceanographic Institute Chart, Coastal Series, scale 1:200,000.

Cassidy, D.S., Kaharoeddin, F.A., Zemmels, I., and Knapp, M.B., 1977, USNS *Eltanin*; an inventory of core location data with core location maps and Cruise 55 core descriptions: Antarctic Research Facility, Florida State University, Sedimentology Research Laboratory, Contribution 44, 90 p.

Cassidy, D.S., and others, 1977, ARA *Islas Orcadas* Cruise 0775; sediment descriptions: Antarctic Research Facility, Florida State University, Sedimentology Research Laboratory, Contribution 45, 74 p.

Ciesielski, P.F., and Wise, S.W., Jr., 1977, Geologic history of the Maurice Ewing Bank of the Falkland Plateau (southwest Atlantic sector of the Southern Ocean) based on piston and drill cores: Marine Geology, v. 25, p. 175-207.

Clarkson, P.D., 1982, Tectonic significance of the Shackleton Range, *in* Craddock, C., ed., Antarctic geoscience: Madison, University of Wisconsin Press, p. 835-839.

Clarkson, P.D., and Brook, M., 1977, Age and position of the Ellsworth Mountains crustal fragment, Antarctica: Nature, v. 265, p. 615-616.

Connolly, J.R., 1969, Western Tasman sea floor: New Zealand Journal of Geology and Geophysics, v. 12, p. 310-343.

Cooke, D.W., 1978, Variations in the seasonal extent of sea ice in the Antarctic during the last 140,000 years: Columbia University, Ph.D. thesis, 302 p.

Corvalán D., J., 1985, Geologic map of the circum-Pacific region, southeast quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 36 p.

Craddock, C., 1972, Geologic map of Antarctica: New York, American Geographical Society, scale 1:5,000,000.

Dalziel, I.W.D., and others, 1981, The geological significance of some Triassic microfossils from the South Orkney Islands, Scotia Ridge: Geological Magazine, v. 118, p. 15-25.

Domack, E.W., Fairchiled, W.W., and Anderson, J.B., 1980, Lower Cretaceous sediment from the East Antarctic continental shelf: Nature, v. 287, p. 625-626.

Doyle, A.C., and others, 1979, Bay of Plenty sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Drewry, D.J., ed., 1983, Antarctica: glaciological and geophysical folio: Scott Polar Research Institute, University of Cambridge, 9 sheets, various scales.

Drummond, K.J., 1983, Geologic map of the circum-Pacific region, northeast quadrant: Tulsa, Okla., American Association of Petroleum Geologists, scale 1:10,000,000, 72 p.

Echols, R.J., 1967, Distribution of Foraminifera and Radiolaria in sediments of the Scotia Sea area, Antarctic Ocean: Los Angeles, University of Southern California, Ph.D. thesis.

Ford, A.B., 1982, Sketch map of inferred boundary of Dufek intrusive: U.S. Geological Survey, scale 1:10,000,000 (unpublished).

Frakes, L.A., 1971, USNS *Eltanin* core descriptions: Cruises 32-45, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 33, 105 p.

Frakes, L.A., 1973, USNS *Eltanin* sediment descriptions: Cruises 4-45, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 37, 259 p.

Frazer, J.Z., Hawkins, D.L., and Arrhenius, G., 1972, Surface sediments and topography of the north Pacific: Scripps Institution of Oceanography, Geological Data Center, Charts 1-10, scale 1:3,630,000.

Furnes, H., and Mitchell, J.G., 1977, Age relationships of Mesozoic basalt lava and dykes in Vestfjella, Dronning Maud Land, Antarctica: Oslo, Norsk Polarinstitutt, v. 169, p. 45-68.

Gibson, G.M., and Wright, T.O., 1985, Importance of thrust faulting in the tectonic development of northern Victoria Land, Antarctica: Nature, v. 315, p. 480-482.

Gonzalez-Ferran, O., 1982, The Antarctic Cenozoic volcanic provinces and their implications in plate-tectonic processes, *in* Craddock, C., ed., Antarctic geoscience: Madison, University of Wisconsin Press, p. 687-694.

Goodell, H.G., 1964, Marine geology of the Drake Passage, Scotia Sea, and South Sandwich Trench: Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 7, 277 p.

Goodell, H.G., 1965, Marine geology: USNS *Eltahin* Cruises 9-15, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 11, 237 p.

Goodell, H.G., 1968, USNS *Eltanin* core descriptions: Cruises 16-27, Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 25, 247 p.

Goodell, H.G., and others, 1973, Marine sediments of the southern oceans: American Geographical Society, Antarctic Map Folio Series, Folio 17, 9 pl., 18 p.

Grindley, G.W., 1979, Manuscript geologic map of Victoria Land and western Marie Byrd Land: New Zealand Geological Survey, scale 1:10,000,000 (unpublished).

Grindley, G.W., and Mildenhall, D.C., 1981, Geological background to a Devonian plant fossil discovery, Ruppert Coast, Marie Byrd Land, West Antarctica, *in* Cresswell, M.M., and Vella, P., eds., Gondwana Five: Rotterdam, A.A. Balkema, p. 23-30.

Hays, J.D., Lozano, J.A., Shackleton, N., and Irving, G., 1976, Reconstruction of the Atlantic and western Indian Ocean sectors of the 18000 B.P. Antarctic Ocean: Geological Society of America Memoir 145, p. 337-372.

Herzer, R.H., 1979, Banks sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Hough, J.L., 1950, Pleistocene lithology of Antarctic ocean-bottom sediments: Journal of Geology, v. 58, p. 254-260.

Inoue, E., 1988, Geologic map of the circum-Pacific region, northwest quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 30 p.

Jarrard, R.D., and Clague, D.A., 1977, Implications of Pacific island and seamount ages for the origin of volcanic chains: Reviews of Geophysics and Space Physics, v. 15, p. 57-76.

Kaharoeddin, F.A., and others, 1978, ARA *Islas Orcadas* Cruise 1176; sediment descriptions: Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 46, 120 p.

Kaharoeddin, F.A., and others, 1979, ARA *Islas Orcadas* Cruise 1277; sediment descriptions: Antarctic Research Facility, Sedimentology Research Laboratory, Florida State University, Contribution 47, 108 p.

Kanaya, T., 1969, Diatom micropaleontology and deep-sea stratigraphy of the North Pacific: La Mer, v. 7, p. 183-196.

Katsushima, T., 1984, Geology of the Ninami-Yamato Nunataks, East Antarctica: Tokyo, Memoirs of National Institute of Polar Research, v. 33, p. 169-181.

Kellogg, T.B., and Kellogg, D.E., 1981, Pleistocene sediments beneath the Ross Ice Shelf: Nature, v. 293, p. 130-133.

Kennett, J.P., 1966, Foraminiferal evidence of a shallow calcium carbonate solution boundary, Ross Sea, Antarctica: Science, v. 153, p. 191-193.

Kobayashi, K., Kitazawa, K., Kanaya, T., and Sakai, T., 1971, Magnetic and micropaleontological study of deep-sea sediments from the west-central equatorial Pacific: Deep-Sea Research, v. 18, p. 1045-1062.

Kojima, H., Yanai, K., and Nishida, T., 1981, Geological map of the Belgica Mountains, Antarctica: Tokyo, National Institute of Polar Research, Antarctic Geological Map Series, Sheet 29, scale 1:25,000.

Kurtz, D.D., and Anderson, J.B., 1979, Recognition and sedimentologic description of recent debris flow deposits from the Ross and Weddell Seas, Antarctica: Journal of Sedimentary Petrology, v. 49, p. 1159-1170.

Laird, M.G., 1982, Manuscript geologic map of northern Victoria Land: New Zealand Geological Survey, scale 1:1,000,000 (unpublished).

Laudon, T.S., and others, 1987, Sedimentary rocks of the English Coast, Eastern Ellsworth Land, Antarctica, *in* McKenzie, G.D., ed., Gondwana Six: structure, tectonics and geophysics: Washington, D.C., American Geophysical Union, p. 183-189.

Le Masurier, W.E., 1982, Manuscript geologic map of eastern Marie Byrd Land: University of Colorado, scale 1:500,000 (unpublished).

Lozano, J.A., and Hays, J.D., 1976, Relationship of radiolarian assemblages to sediment types and physical oceanography in the Atlantic and western Indian Ocean sectors of the Antarctic Ocean: Geological Society of America Memoir 145, p. 303-336.

Mair, B.F., 1983, The Larsen Harbour Formation and associated intrusive rocks of southern South Georgia: British Antarctic Survey Bulletin, v. 52, p. 87-107.

Malmgren, B.A., and Cronblad, H.G., 1978, Planktonic foraminiferal dissolution at high latitudes of the southwestern Atlantic: Antarctic Journal of the United States, v. 13, p. 107-109.

McDougall, J.C., 1975, Cook sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:1,000,000.

McDougall, J.C., 1979, Three Kings sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:1,000,000.

McDougall, J.C., 1982, Bounty sediments: New Zealand Oceanographic Institute Oceanic Series, scale 1:1,000,000.

McDougall, J.C., and Gibb, J.G., 1970, Patea sediments: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Norris, R.M., 1979, Foulwind bathymetry: New Zealand Oceanographic Institute Chart, Coastal Series, Department of Scientific and Industrial Research, scale 1:200,000.

Oliver, R.L., James, P.R., Collerson, K.D., and Ryan, A.B., 1982, Precambrian geologic relationships in the Vestfold Hills, Antarctica, *in* Craddock, C., ed., Antarctic geoscience: Madison, University of Wisconsin Press, p. 435-444.

Palfreyman, W.D., 1988, Geologic map of the circum-Pacific region, southwest quadrant: Houston, Circum-Pacific Council for Energy and Mineral Resources, scale 1:10,000,000, 37 p.

Pankhurst, R.J., Storey, B.C., Millar, I.L., Macdonald, D.I., and Vennum, W.R., 1988, Cambrian-Ordovician magmatism in the Thiel Mountains, Transantarctic Mountains, and implications for the Beardmore orogeny: Geology, v. 16, p. 246-249.

Ravich, M.G., and Grikurov, G., 1976, Geological map of Antarctica: Leningrad, Ministry of Geology of the USSR, SEVMORGEO, scale 1:5,000,000.

Ravich, M.G., Grikurov, G., and Craddock, C., 1979, Antarctica: geological world atlas: Paris, Commission for the Geological Map of the World, Sheet 17, scale 1:10,000,000.

Rawson, M.Q., and Ryan, W.B.F., 1978, Ocean floor sediment and polymetallic nodules: Lamont-Doherty Geological Observatory and U.S. Department of State, scale 1:23,230,300.

Riedel, W.R., and Funnell, B.M., 1964, Tertiary sediment cores and microfossils from the Pacific Ocean floor: Geological Society of London Quarterly Journal, v. 120, p. 305-368.

Rowley, P.D., 1982, Manuscript geologic map of southern Antarctic Peninsula and eastern Ellsworth Land: U.S. Geological Survey, scale 1:10,000,000 (unpublished).

Rowley, P.D., Kellogg, K.S., Vennum, W.R., Waitt, R.B., and Boyer, S.J., 1988, Geology of the southern Black Coast, Antarctic Peninsula: U.S. Geological Survey Professional Paper 1351-A, p. 1-19.

Rowley, P.D., and Williams, P.L., 1982, Geology of the northern Lassiter Coast and southern Black Coast, Antarctic Peninsula, *in* Craddock, C., ed., Antarctic geoscience: Madison, University of Wisconsin Press, p. 339-348.

Rowley, P.D., and others, 1985, Geologic studies in the English Coast, eastern Ellsworth Land, Antarctica: Antarctic Journal of the United States, v. 19, p. 34-36.

Sheraton, J.W., 1985, Geology of Enderby Land and western Kemp Land, Antarctica: Australia Bureau of Mineral Resources, scale 1:500,000.

Sheraton, J.W., Offe, L.A., Tingey, R.J., and Ellis, D.J., 1980, Enderby Land, Antarctica–an unusual Precambrian high-grade metamorphic terrain: Journal of the Geological Society of Australia, v. 27, p. 1-18.

Sheraton, J.W., and Black, L.P., 1988, Chemical evolution of granitic rocks in the East Antarctic Shield, with particular reference to post-orogenic granites: Lithos, v. 21, p. 37-52.

Shibata, K., Yanai, K., and Shiraishi, K., 1986, Rb-Sr whole-rock ages of metamorphic rocks from eastern Queen Maud Land, East Antarctica: Japan National Institute of Polar Research Memoir, v. 43, p. 133-148.

Sohl, N.F., and Wright, W.B., 1980, Changes in stratigraphic nomenclature by the U.S. Geological Survey, 1979: U.S. Geological Survey Bulletin 1502-A, p. A1-A12.

Storey, B.C., Wever, H.E., Rowley, P.D., and Ford, A.B., 1987, The geology of the central Black Coast, eastern Palmer Land: British Antarctic Survey Bulletin, no. 77, p. 145-155.

Suzuki, M., and Moriwaki, K., 1979, Geological map of Cape Omega, Antarctica: Japan National Institute of Polar Research Antarctic Geological Map Series, Sheet 21, scale 1:25,000.

Tanner, P.W.G., 1982, Geologic evolution of South Georgia, *in* Craddock, C., ed., Antarctic Geoscience: Madison, University of Wisconsin Press, p. 167-176.

Thomson, J.W., 1982, Manuscript geologic map of Antarctic Peninsula: British Antarctic Survey, scale 1:5,000,000 (unpublished).

Tingey, R.J., 1988, Schematic geological map of Antarctica: Australia Bureau of Mineral Resources, scale 1:10,000,000.

U.S. Government Printing Office, 1969-1987, Initial reports of the Deep Sea Drilling Project: Washington, D.C., v. 1-91.

Vallier, T.L., O'Connor, R.M., Scholl, D.W., Stevenson, A.J., and Quinterno, P.J., 1985, Petrology of rocks dredged from the landward slope of the Tonga Trench: Implications for middle Miocene volcanism and subsidence of Tonga Ridge: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 2, p. 109-120.

Wade, F.A., 1978, Geologic map of Antarctica: Texas Tech University, scale 1:10,000,000 (unpublished manuscript).

Wade, F.A., Cathey, C.A., and Oldham, J.B., 1977, Reconnaissance geologic maps of Alexandra Mountains quadrangle (Map A-5), Boyd Glacier quadrangle (Map A-6), and Guest Peninsula quadrangle (Map A-7), Marie Byrd Land, Antarctica: U.S. Geological Survey, scale 1:250,000.

Webb, P.N., 1978, Initial report on geological materials collected at RISP Site J9: Ross Ice Shelf Project Technical Report 78-1, 46 p.

Webb, P.N., McKelvey, B.C., Harwood, D.M., Mabin, M.C.G., and Mercer, J.H., 1987, Sirius Formation of the Beardmore region: Antarctic Journal of the United States, v. 22, p. 8-13.

White, C.M., and Craddock, C., 1987, Compositions of igneous rocks in the Thurston Island area, Antarctica: evidence for a late Paleozoic-middle Mesozoic Andinotype continental margin: Journal of Geology, v. 95, p. 669-709.

Williams, P.L., Schmidt, D.L., Plummer, C.C., and Brown, L.E., 1972, Geology of the Lassiter Coast area, Antarctic Peninsula–preliminary report, *in* Adie, R.J., ed., Antarctic geology and geophysics: Oslo, Universitetsforlaget, p. 143-148.

Wolmarans, L.G., and Kent, L.E., 1982, Geological investigations in western Dronning Maud Land, Antarctica–a synthesis: South African Journal of Antarctic Research, Supplement 2, 93 p.

Wolmarans, L.G., and Krynauw, J.R., 1981, Geological maps of the Ahlmannryggen, Borgmassivet, and Kirwanveggen areas, western Dronning Maud Land, Antarctica: South African Scientific Committee for Antarctic Research, scale 1:250,000.

Yoshida, M., 1978, Tectonics and petrology of charnockites around Lützow-Holmbukta, East Antarctica: Osaka City University, Journal of Geosciences, v. 21, p. 65-152.

Znachko-Yavorskii, G.A., and Ravich, M.G., 1969, Bottom relief and sedimentation in the East Antarctic Sea, *in* Aver'yanov, V.G., ed., Collected papers of the Soviet Antarctic expeditions: Jerusalem, Israel Programs for Scientific Translations, p. 87-98.

REFERENCES AND ADDITIONAL SOURCES OF DATA

Bryant, W. R., 1969, Escarpments, reef trends, and diapiric structures, eastern Gulf of Mexico: American Association of Petroleum Geologists Bulletin, v. 53, p. 2506-2542.

Campsie, J., Neumann, E.R., and Johnson, L., 1983, Dredged volcanic rocks from the southern oceans: The Eltanin collection: New Zealand Journal of Geology and Geophysics, v. 26, p. 31-45.

Domack, E.W., Fairchild, W.W., and Anderson, J.B., 1980, Lower Cretaceous sediment from the East Antarctic continental shelf: Nature, v. 287, p. 625-626.

Engel, C.G., and Chase, T.E., 1965, Composition of basalts dredged from seamounts off the west coast of Central America: U.S. Geological Survey Professional Paper 525-C, p. 161-163.

Fox, P.J., and Heezen, B.C., 1975, Geology of the Caribbean crust: Ocean Basins and Margins, v. 3, p. 421-466.

Gramberg, I.S., Pogrebitsky, Y.E., and Musatov, E.E., 1989, Geologic, seafloor-sediment, and offshore-geologic map of northern Russia: U.S.S.R. Ministry of Geology manuscript map for the Circum-Pacific Map Project, scale 1:10,000,000.

Hanna, G.D., 1952, Geology of the continental slope off central California: California Academy of Sciences Proceedings, v. 27, p. 325-358.

Ibrahim, A.K., Latham, G.V., and Ladd, J., 1979, Seismic refraction and reflection measurements in the Middle America Trench offshore Guatemala: Journal of Geophysical Research, v. 84, p. 5643-5649.

Jarrad, R.D., and Clague, D.A., 1977, Implications of Pacific island and seamount ages for the origin of volcanic chains: Reviews of Geophysics and Space Physics, v. 15, p. 57-76.

Kudrass, H.R., and others, 1986, Mesozoic and Cainozoic rocks dredged from the South China Sea (Reed Bank area) and Sulu Sea and their significance for plate-tectonic reconstructions: Marine and Petroleum Geology, v. 3, p. 19-30.

Lonsdale, P., and Klitgord, K.D., 1978, Structure and tectonic history of the eastern Panama Basin: Geological Society of America Bulletin, v. 89, 981-999.

Marlow, M.S., and Cooper, A.K., 1980, Mesozoic and Cenozoic structural trends under southern Bering Sea shelf: American Association of Petroleum Geologists Bulletin, v. 64, p. 2139-2155.

McDougall, J.C., 1975, Cook sediments: New Zealand Oceanographic Institute Oceanic Chart Series, scale 1:1,000,000.

McDougall, J.C., 1982, Bounty sediments: New Zealand Oceanographic Institute Oceanic Chart Series, scale 1:1,000,000.

Perfit, M.R., and Heezen, B.C., 1978, The geology and evolution of the Cayman Trench: Geological Society of America Bulletin, v. 89, p. 1155-1174.

Riedel, W.R., and Funnell, B.M., 1964, Tertiary sediment cores and microfossils from the Pacific Ocean floor: Geological Society of London Quarterly Journal, v. 120, p. 305-368.

Sheridan, R.E., Smith, J.D., and Gardner, J., 1969, Rock dredges from Blake Escarpment near Great Abaco Canyon: American Association of Petroleum Geologists Bulletin, v. 53, p. 2551-2558.

Skornyakova, N.S., and Lipka, M.I., 1976, Basic and ultrabasic rocks of the Mariana Trench: Oceanology, v. 15, p. 688-690.

Vallier, T.L., and others,1985, Petrology of rocks dredged from the landward slope of the Tonga Trench: Implications for middle Miocene volcanism and subsidence of the Tonga Ridge: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 2, p. 109-120.

Vedder, J.G., and others, 1974, Preliminary report on the geology of the continental borderland of southern California: U.S. Geological Survey Miscellaneous Field Studies MF-624, 34 p.

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

Ages in million years (Ma)

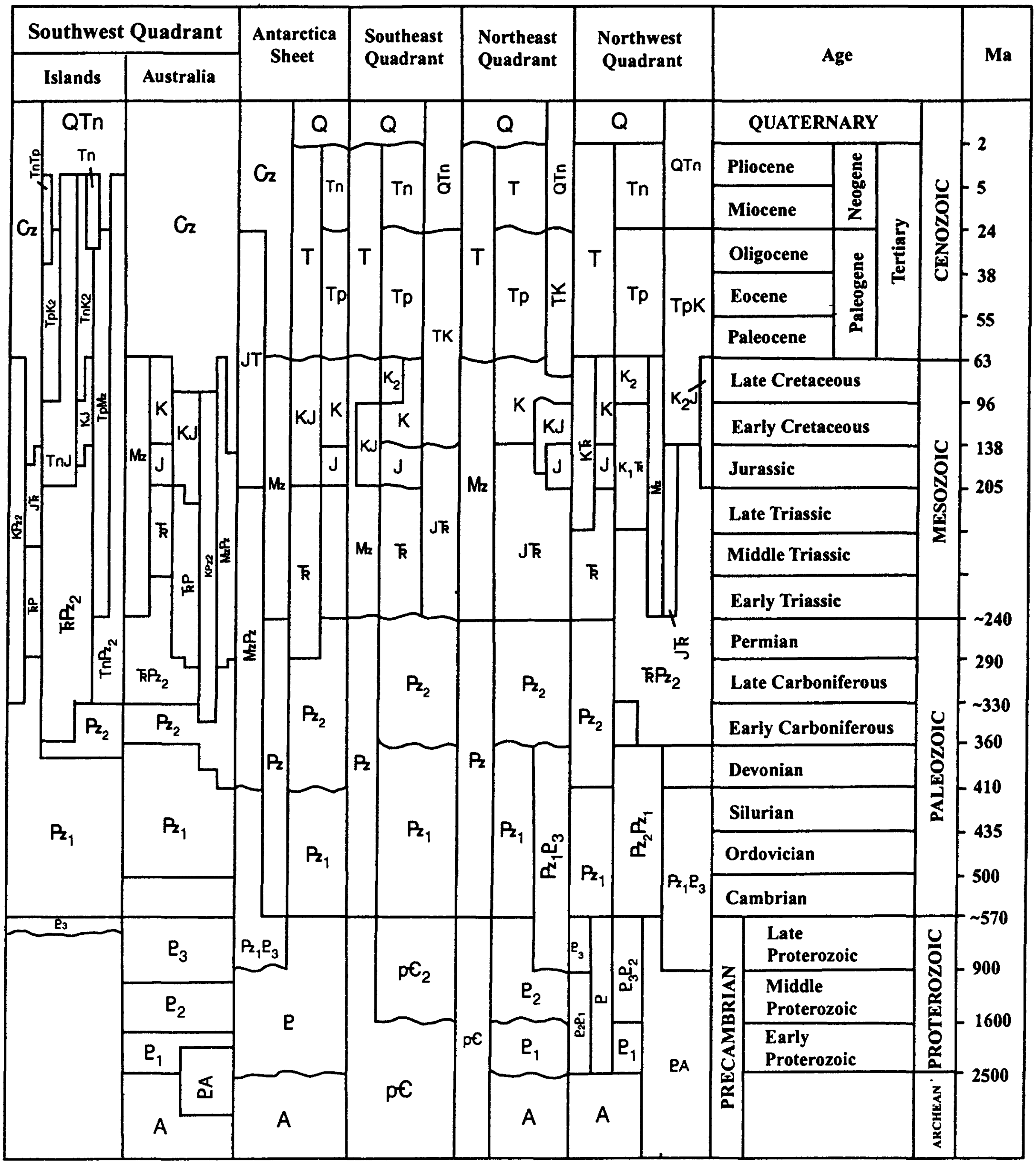


Figure 1. Correlation diagram for the five map sheets in this series.

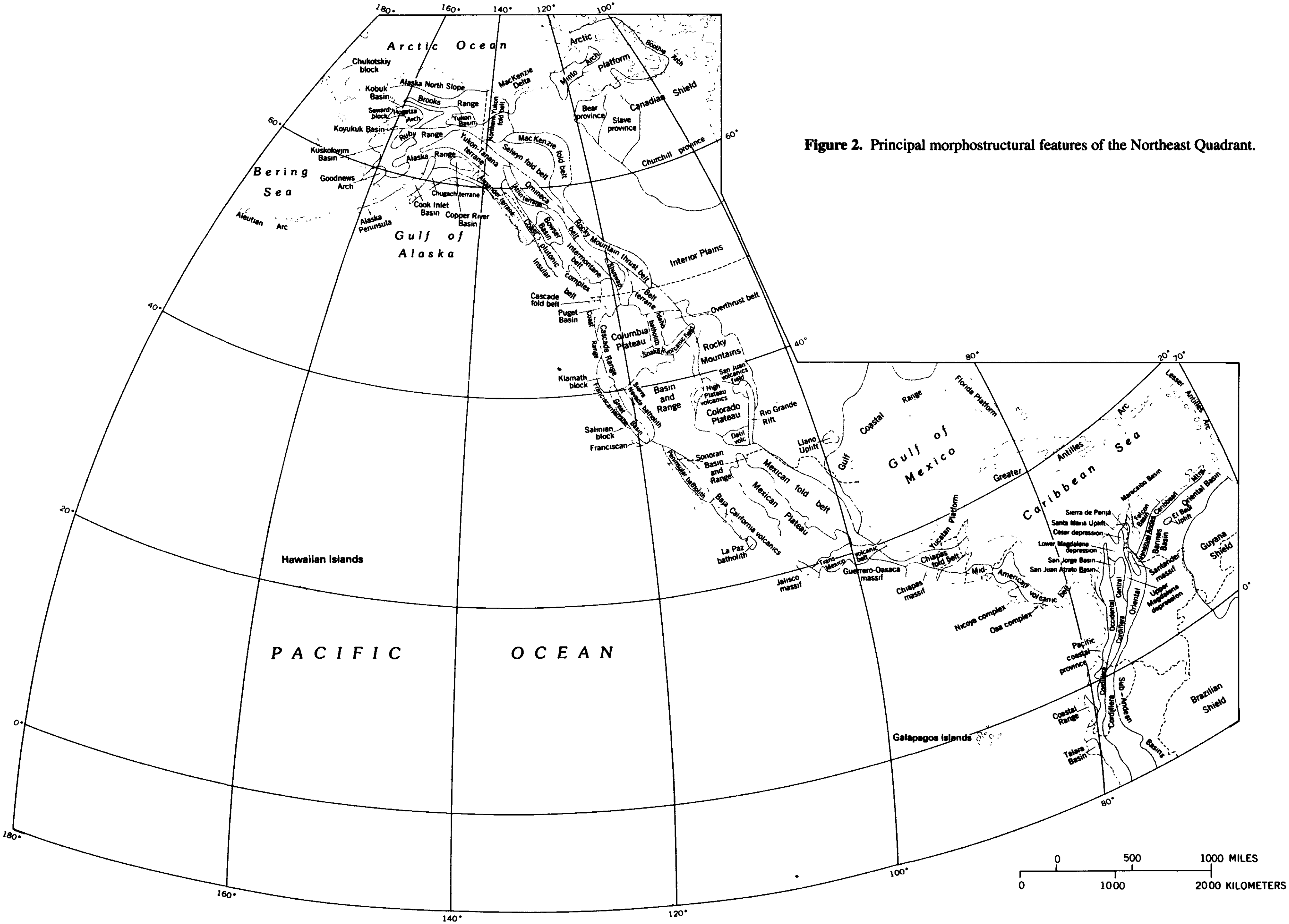


Figure 2. Principal morphostructural features of the Northeast Quadrant.

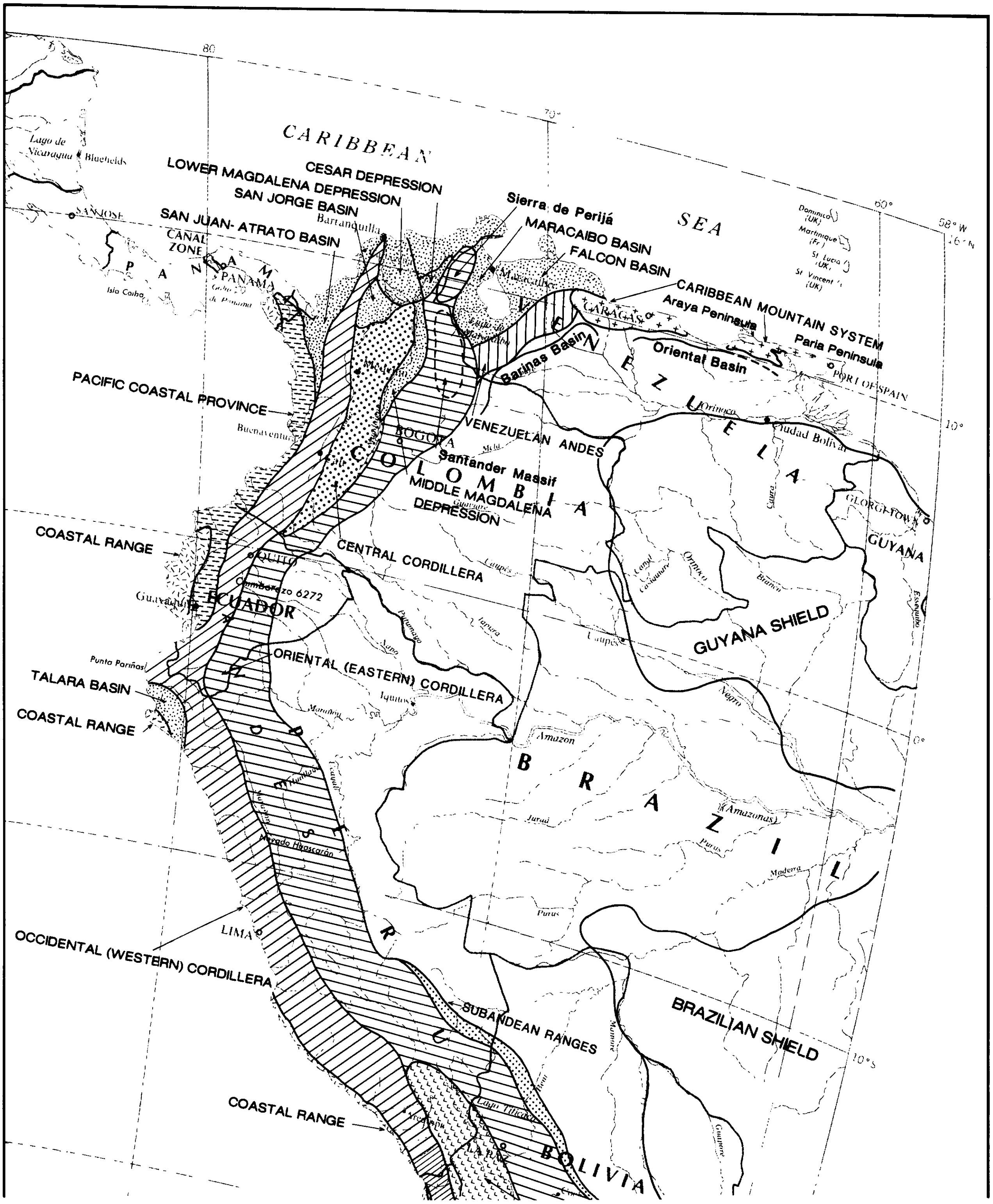


Figure 3. Principal morphostructural features of the Andean Belt adapted from Auboin and others (1973) and Corvalán (1979). Other geographic and structural features referred to in the Description of Map Units are also indicated.

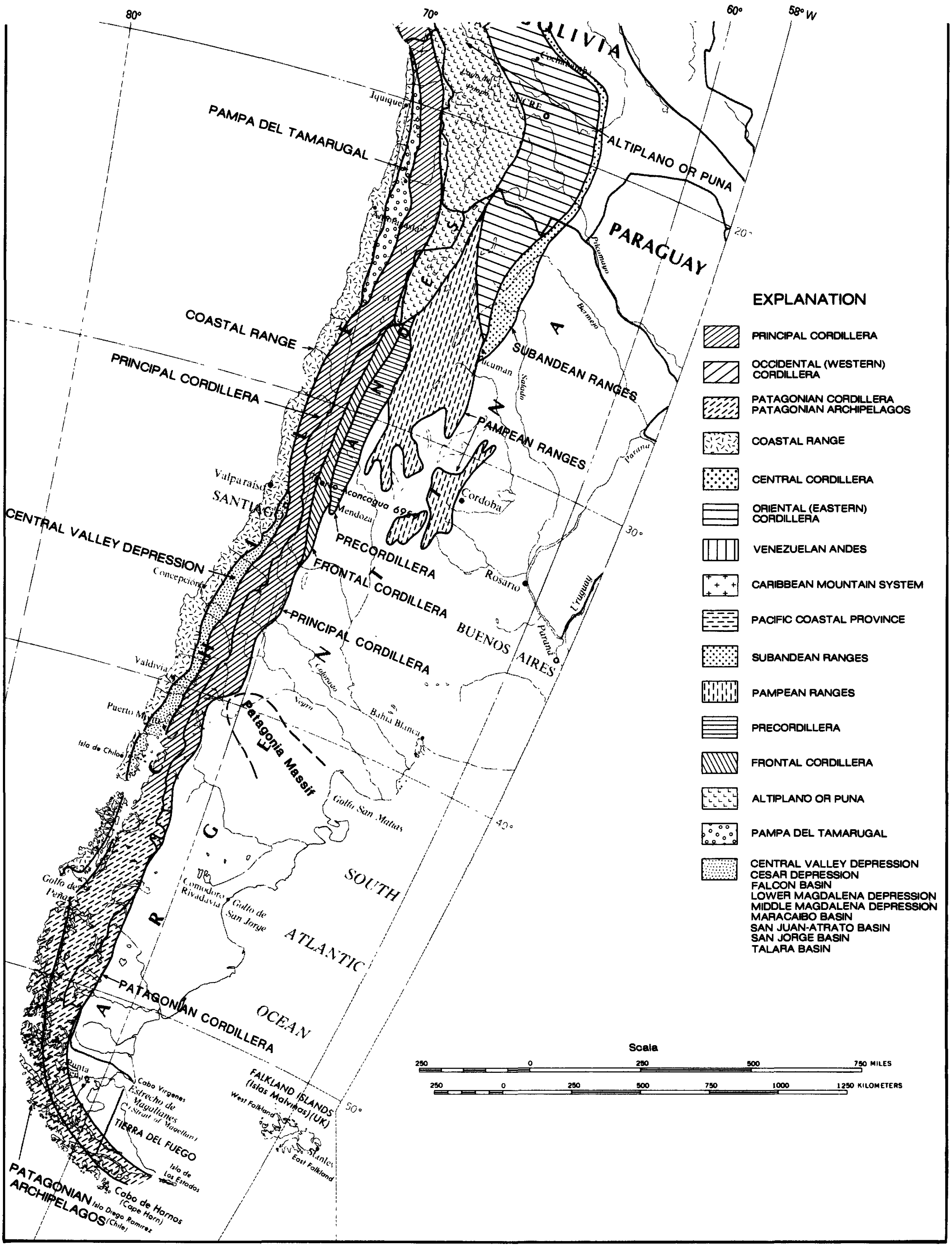


Figure 3.—continued

OROGENY	GEOLOGIC AGE	BOUNDARY AGE in Ma
PONTIAN (QUECHUA)	Pliocene	
		5
	Miocene	
INCAIC	Oligocene	
		38
	Eocene	
LARAMIAN	Paleocene	
		66
	Maestrichtian	
		73
	Campanian	
		82
PERUVIAN (SUB-HERCYNIAN)	Santonian	
		85
	Coniacian	
ARAUCANAN (NEVADAN)	Kimmeridgian	
		143
	Oxfordian	
RIO ATUEL	Hetlangian	
		195
	Rhaetian	
HERCYNIAN (APPALACHIAN)	Triassic	
		240
	Permian	
		290
	Pennsylvanian	
ACADIAN	Mississippian	
		360
	Devonian	
BRASILIAN (CARIRIAN)	Latest Precambrian	570-600
TRANSAMAZONIAN (GUAYANENSE)	Late Precambrian	1750

Figure 4. Major orogenic periods of the Southeast Quadrant. Boundary ages are principally from Cohee and others (1978), Sohl and Wright (1980), and Larson and others (1981).

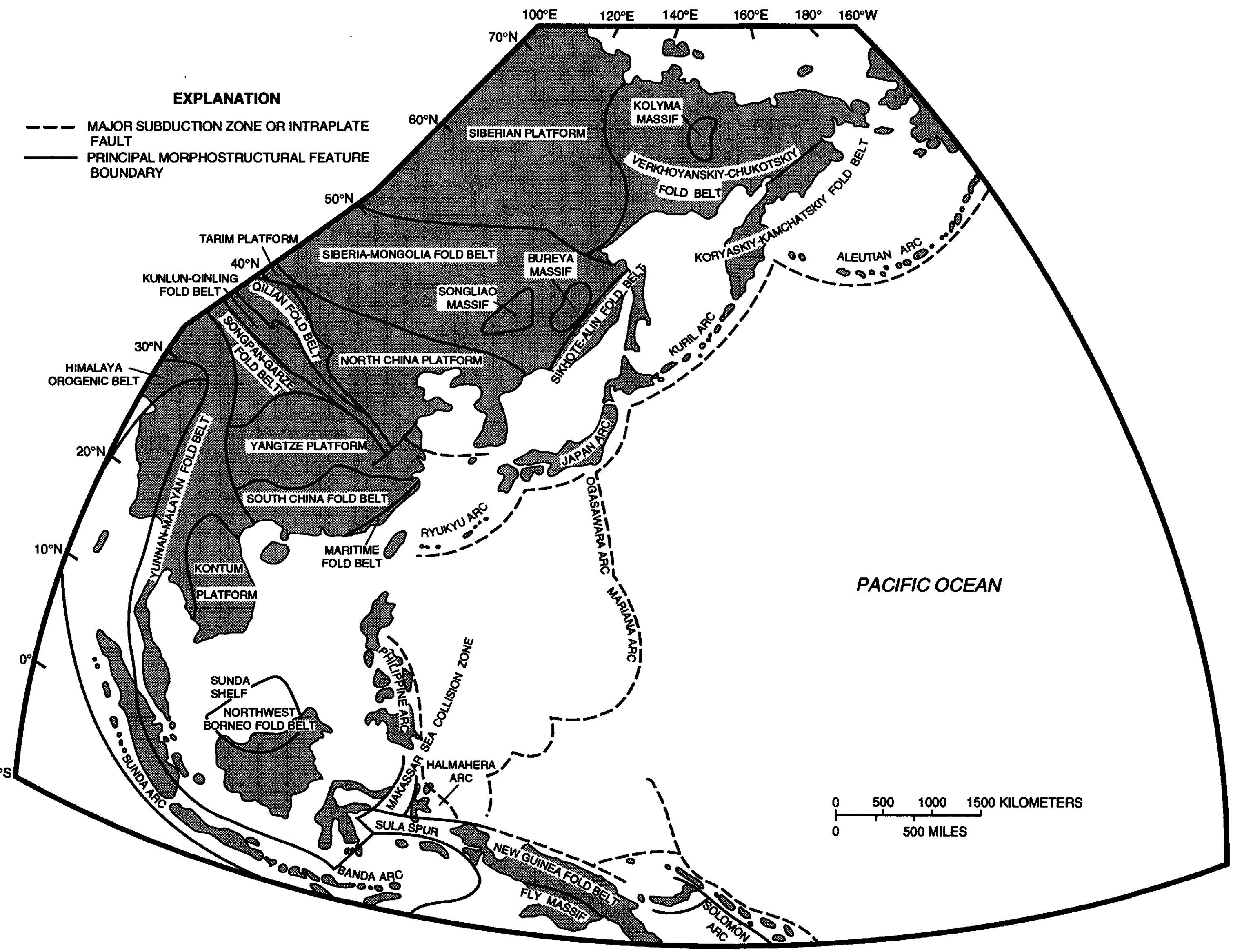


Figure 5. Principal morphostructural features of the Northwest Quadrant. Other geographic and structural features referred to in the Description of Map Units are also included.

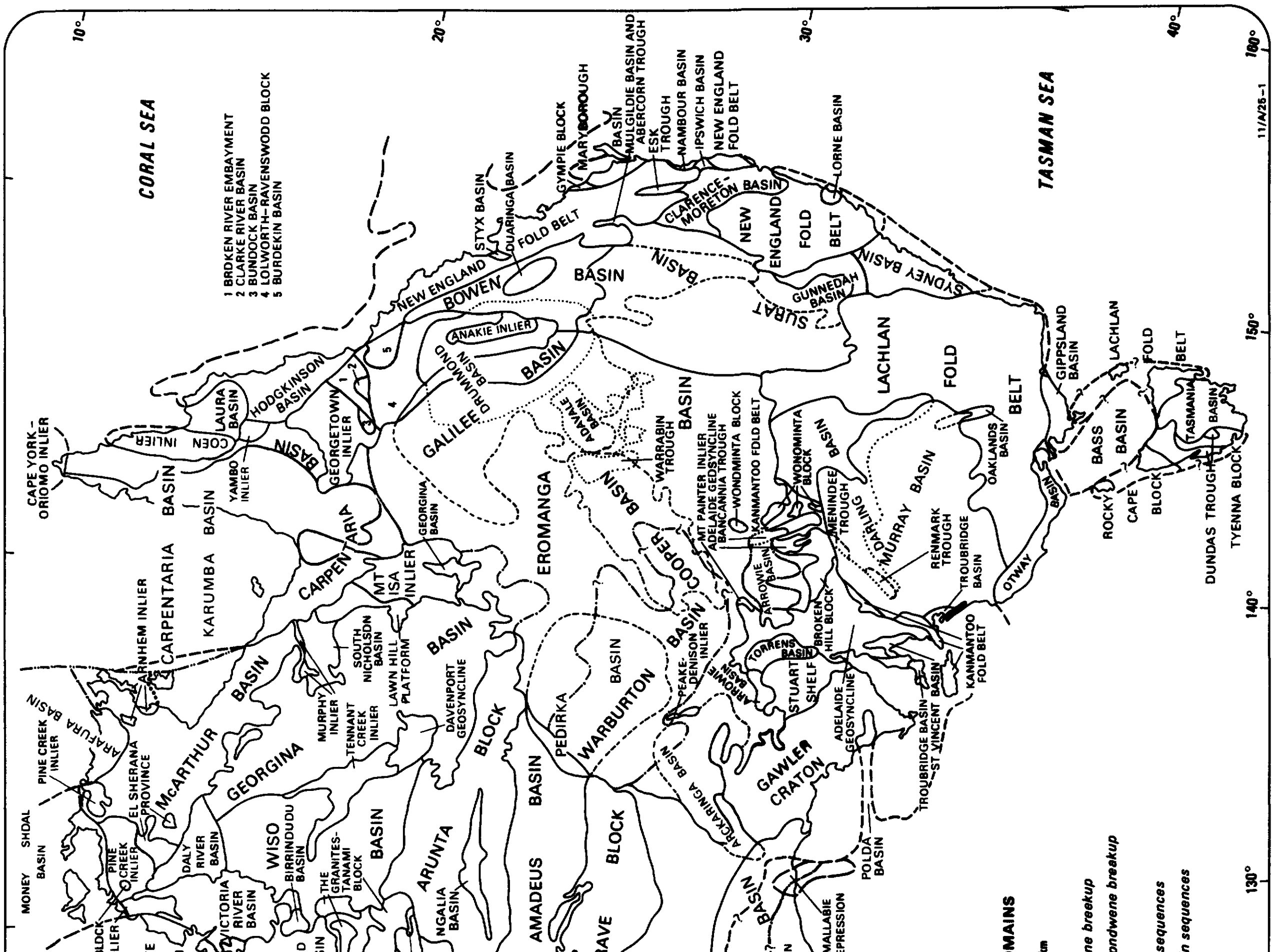


Figure 6. Principal morphostructural features of Australia.

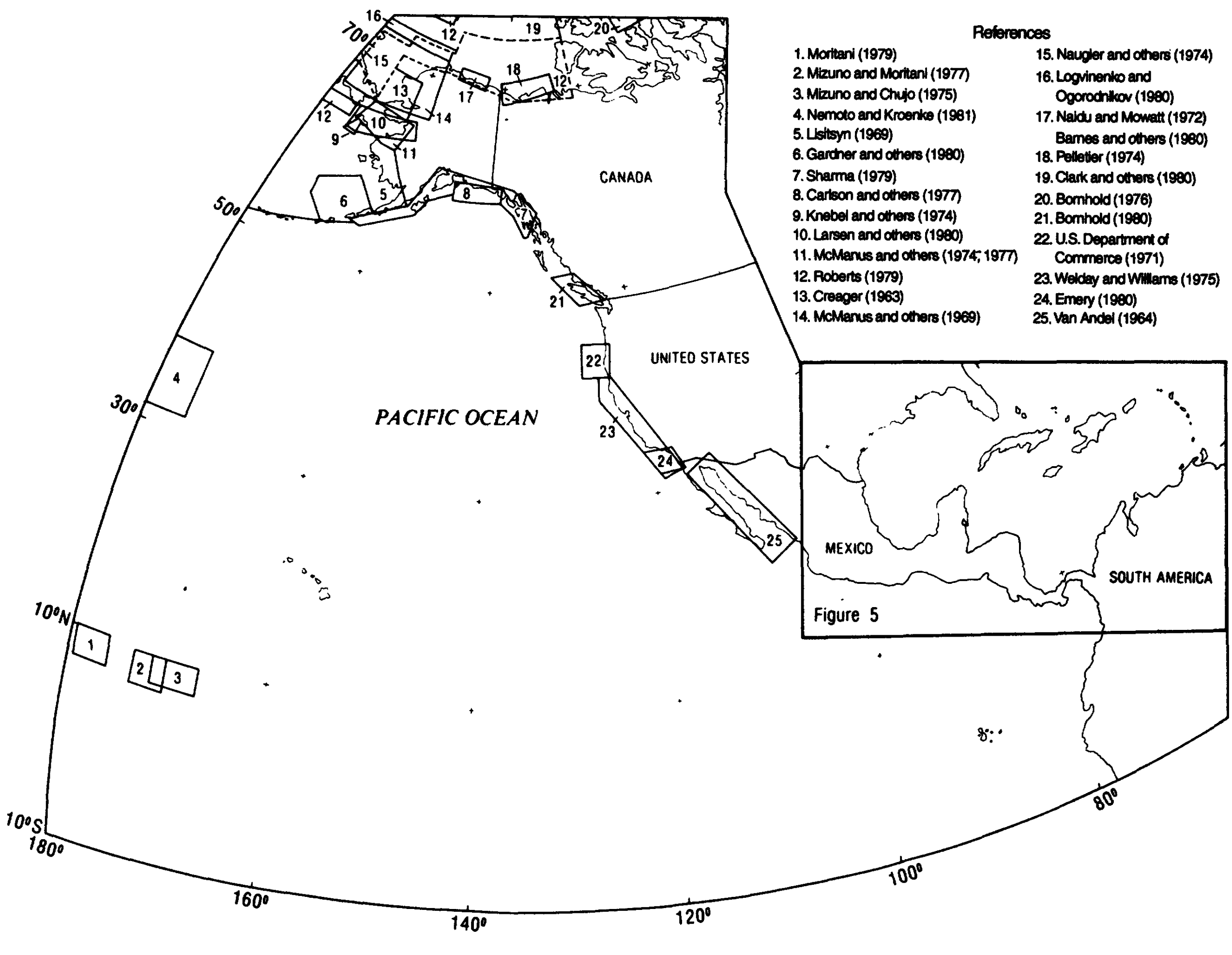


Figure 7. Index map showing selected Pacific and Arctic Ocean areas (Northeast Quadrant) in which published sediment data were used to supplement Lamont-Doherty Geological Observatory data and the secondary data set from the World Data Bank, Scripps Institution of Oceonography.

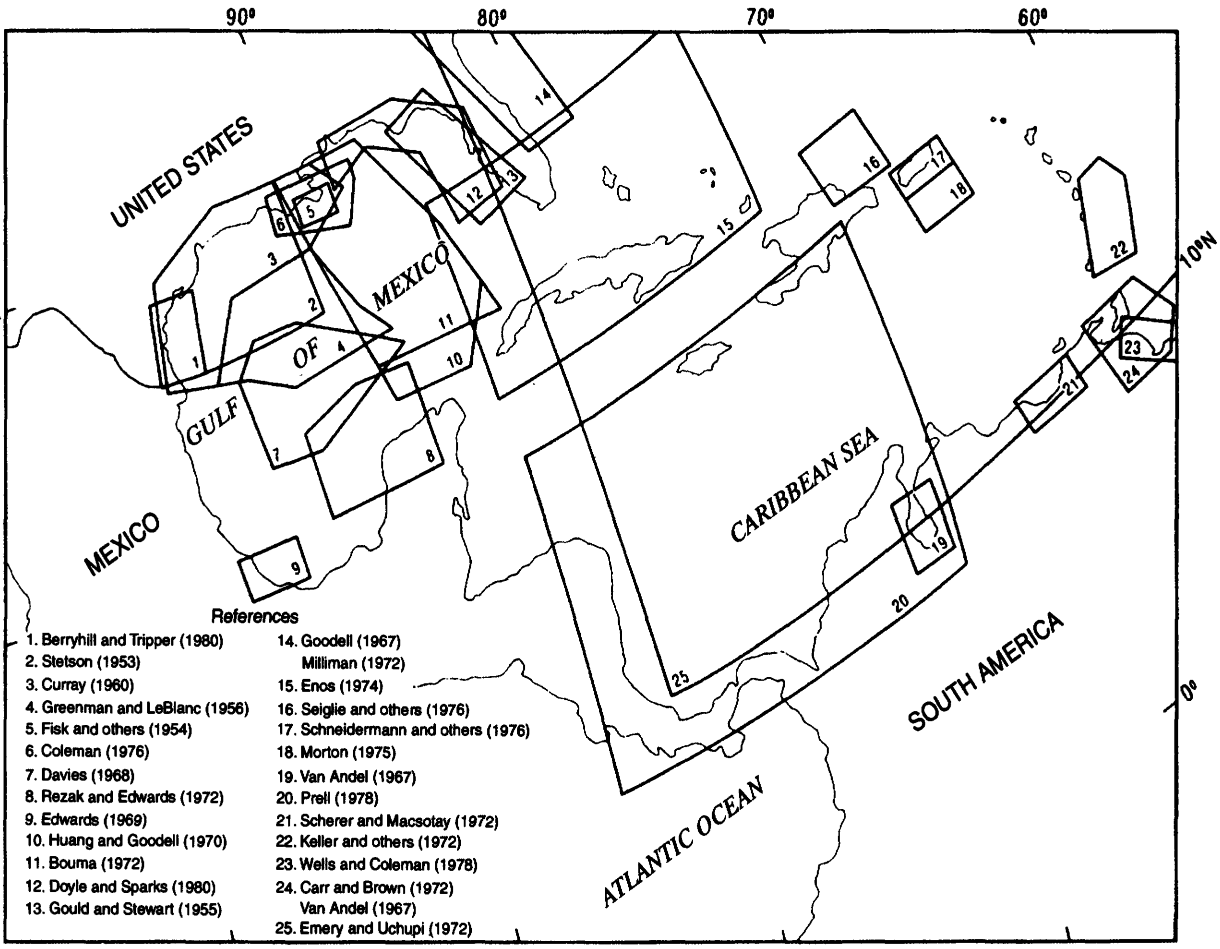
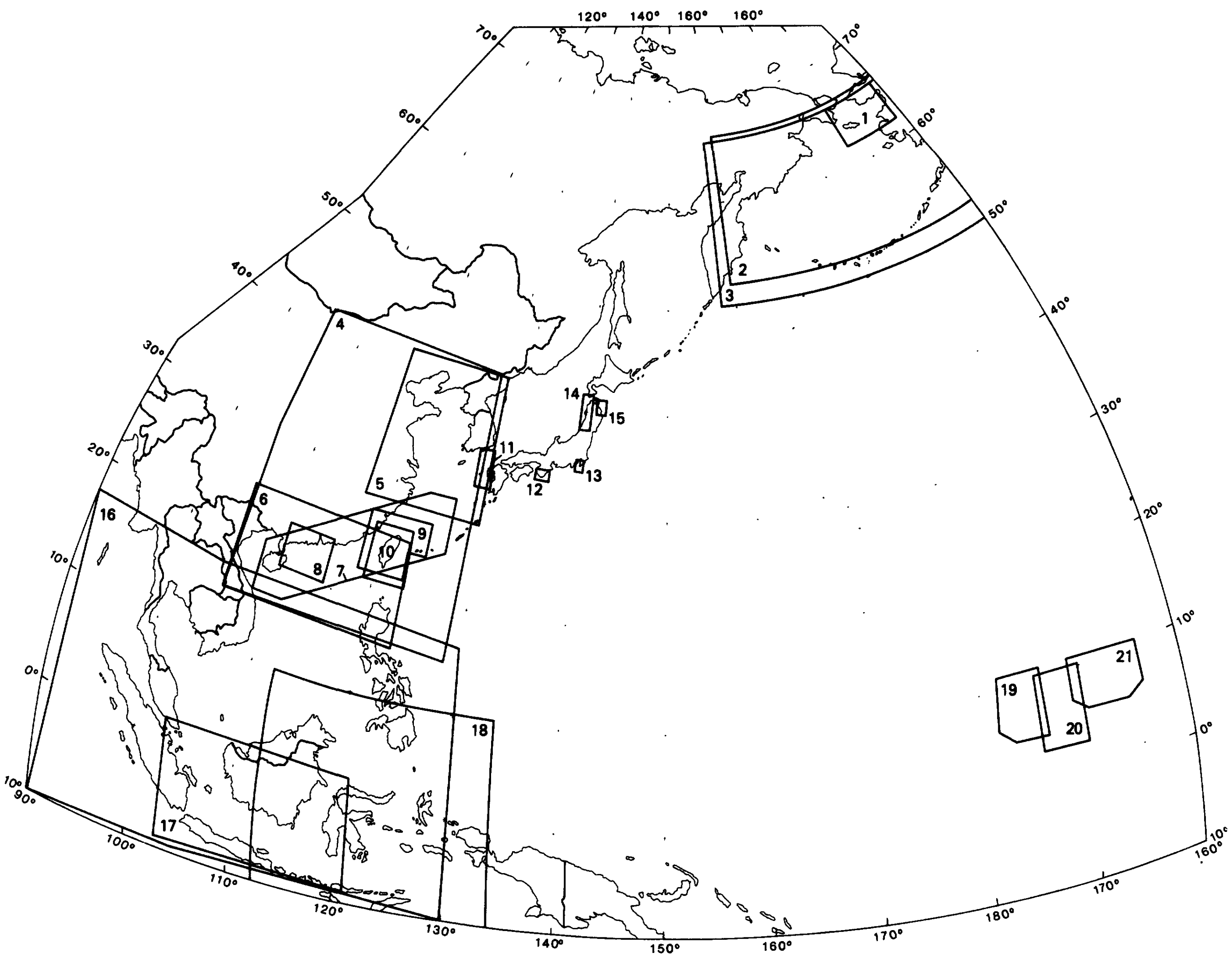


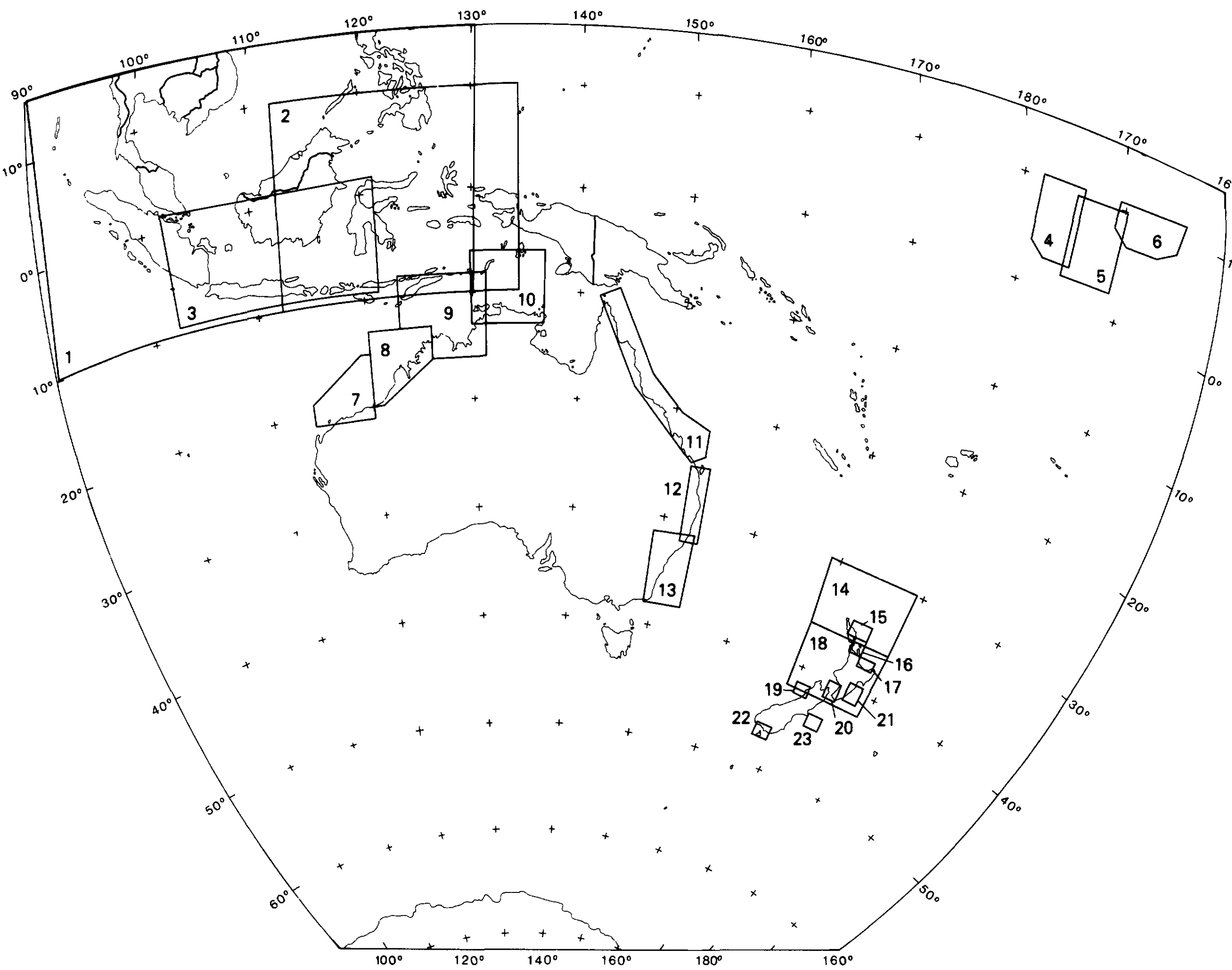
Figure 8. Index map showing selected caribbean and Antlantic Ocean areas (Northeast Quadrant) in which published sediment data were used to supplement Lamont-Doherty Geological Observatory data and the secondary data set from the World Data Bank, Scripps Institution of Oceonography.



References

1 McManus and others (1977)
2 Gershanovich (1967)
3 Lisitsyn (1969)
4 Chin (1963)
5 Niino and Emery (1966)
5 Niino and Emery (1961)
7 Chen and Chen (1971)
8 Sediment Group, Marine Geology Department, South China Sea Institute of Oceanography (1980)
9 Chou (1972)
10 Boggs and others (1979)
11 Oshima (1975)
12 Inouchi and Kinoshita (1977)
13 Arita and Kinoshita (1976)
14 Inouchi and others (1979)
15 Arita and Kinoshita (1978)
16 Keller and Richards (1967)
17 Emery (1969)
18 Neeb (1943)
19 Nakao (1979)
20 Arita (1977)
21 Arita (1975)

Figure 9. Index map showing selected areas in the Northwest Quadrant in which published sediment data were used to supplement Lamont-Doherty Geological Observatory data and the secondary data set from the World Data Bank, Scripps Institution of Oceonography.



References

1 Keller and Richards (1967)

2 Neeb (1943)

3 Emery (1969)

4 Nakao (1979)

5 Arita (1977)

6 Arita (1975)

7 Jones (1973)

8 Jones (1973)

9 Jones and Burgis (1974) and vanAndel and Veevers (1967)

10 Jongsma (1974)

11 Maxwell (1968)

12 Marshall (1980)

13 Davies (1979)

14 McDougall (1979)

15 Eade (1974)

16 Carter and Eade (1980)

17 Doyle and others (1979)

18 McDougall (1975)

19 Norris (1979)

20 Lewis and Mitchell (1980)

21 Lewis and Gibb (1970)

22 Cullen and Gibb (1966)

23 Herzer (1979)

Figure 10. Index map showing selected areas in the Southwest Quadrant in which published sediment data were used to supplement Lamont-Doherty Geological Observatory data and the secondary data set from the World Data Bank, Scripps Institution of Oceonography.

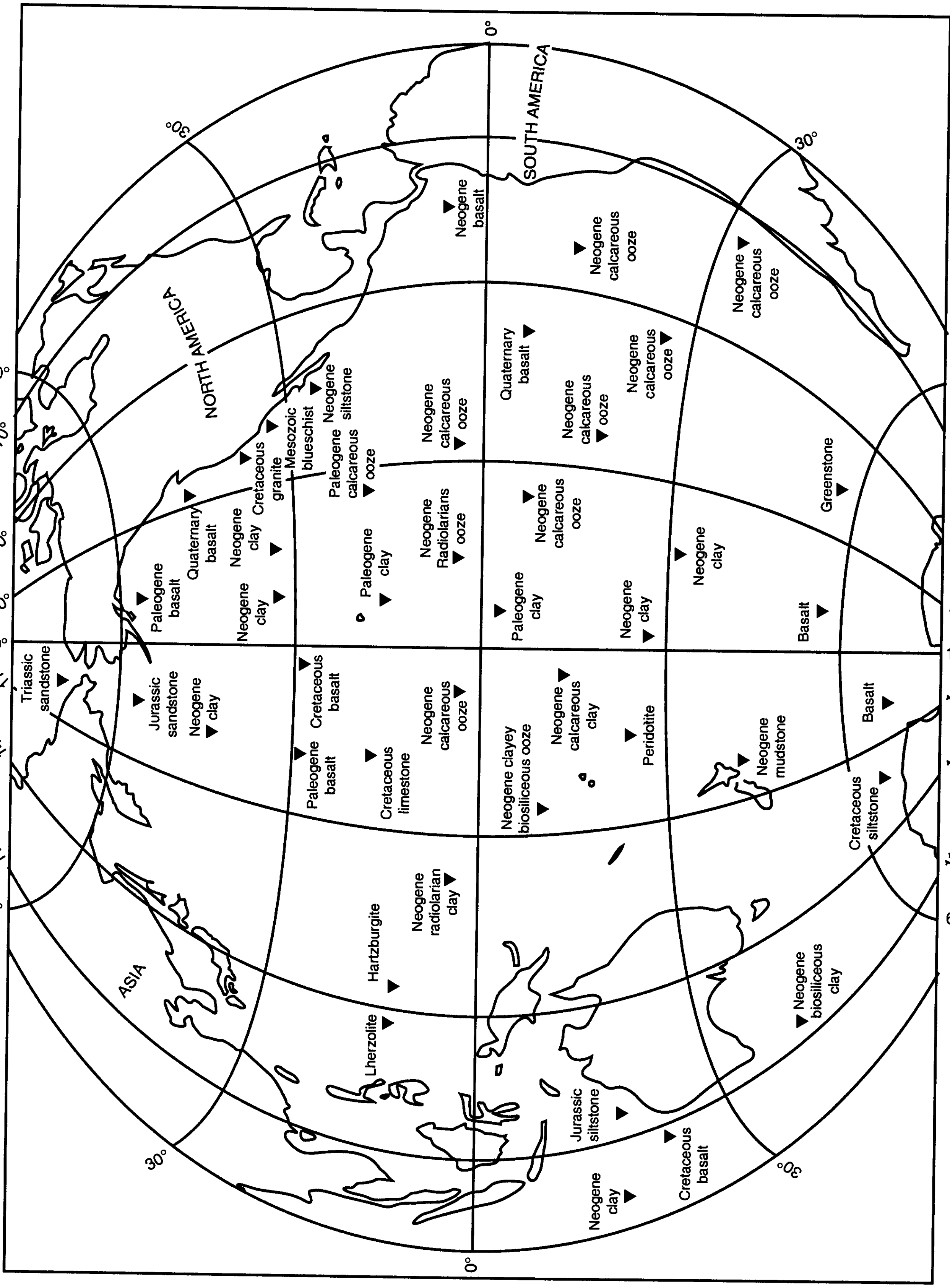


Figure 11. Locations of selected seafloor outcrops and sediment samples.

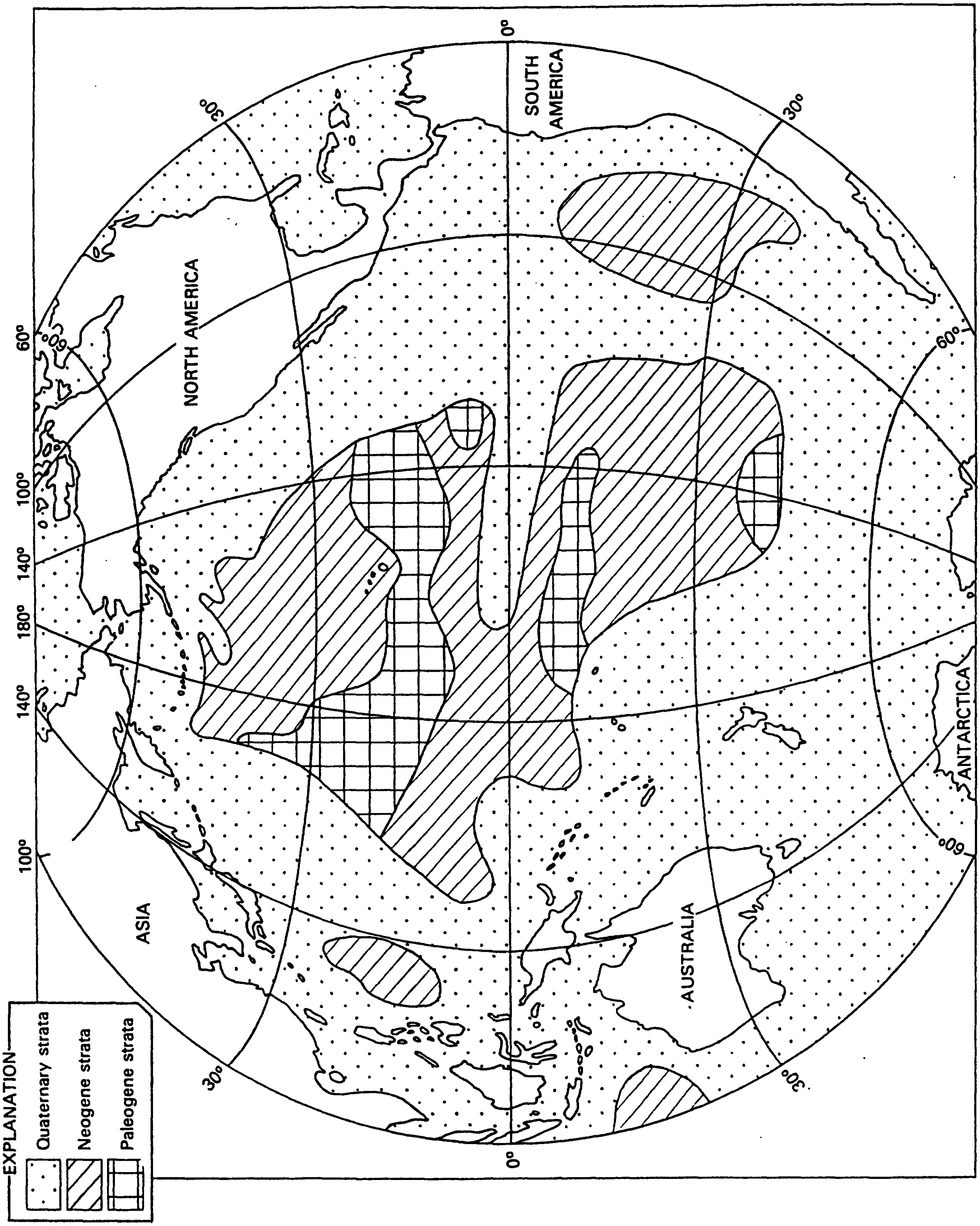


Figure 12. Areas of the Circum-Pacific region where Paleogene and Neogene strata lie within 1 m of the deep ocean floor.

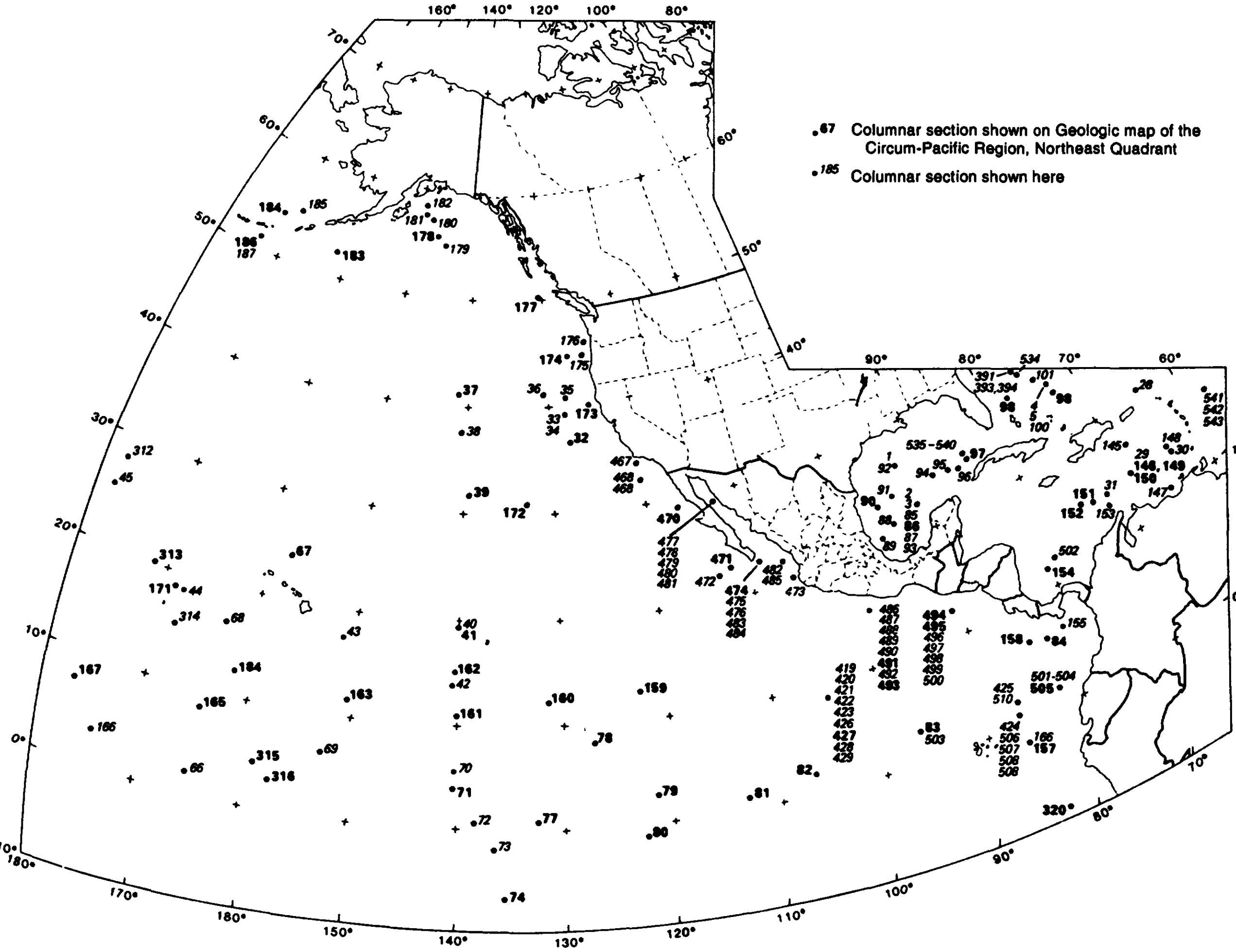


Figure 13. Index map of the Northeast Quadrant, showing location of Deep Sea Drilling Project (DSDP) boreholes.

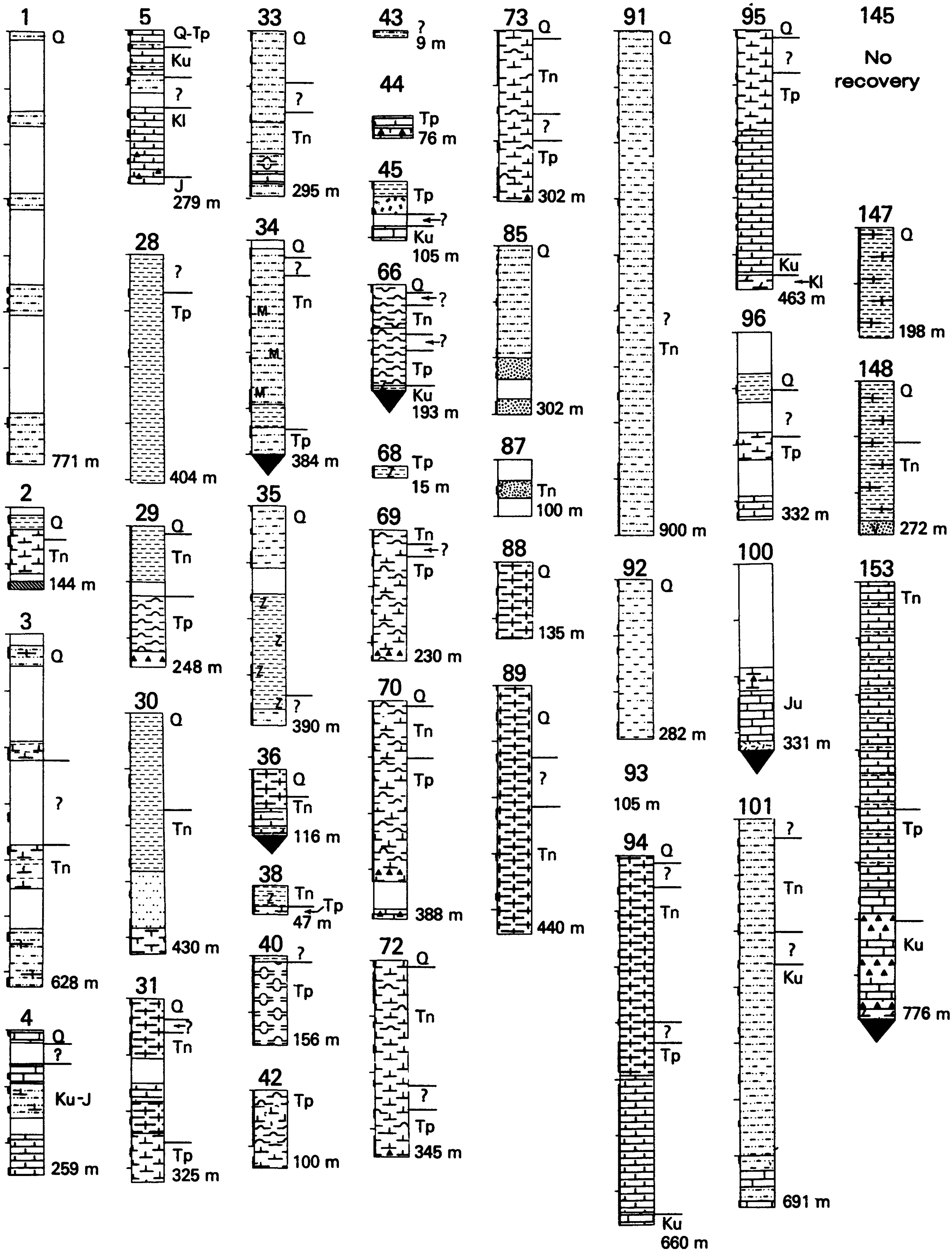


Figure 13—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.

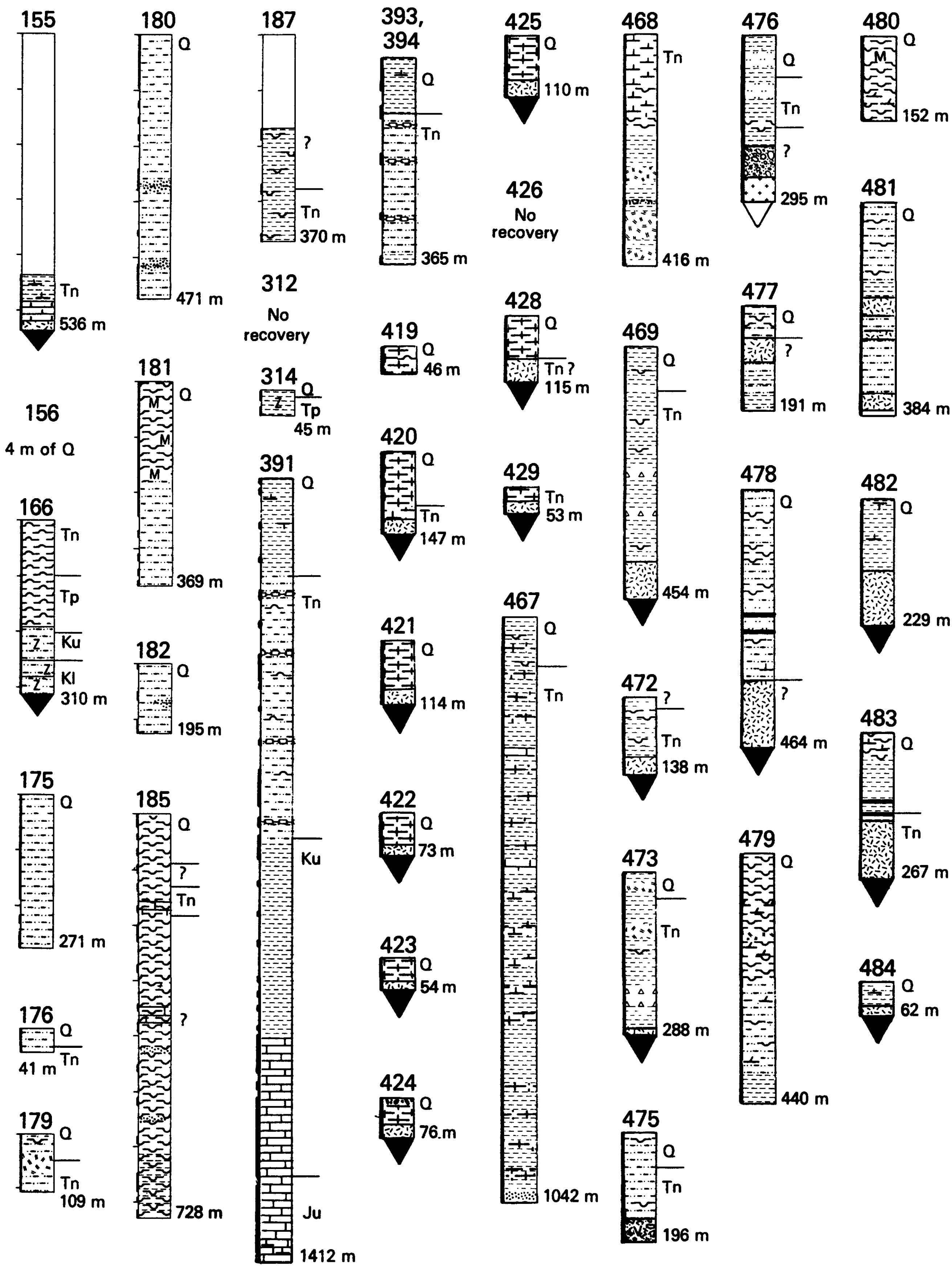


Figure 13—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.

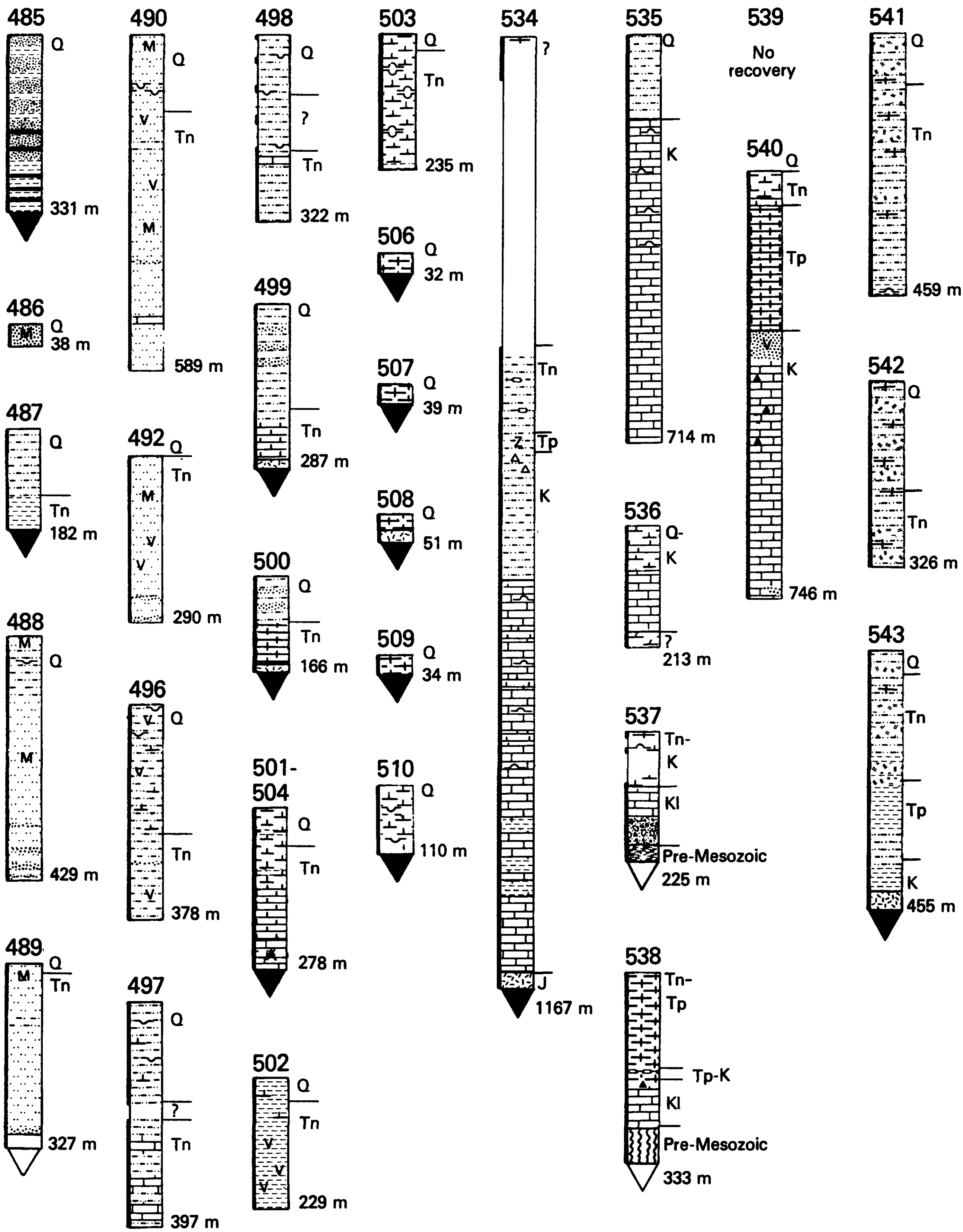


Figure 13—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.

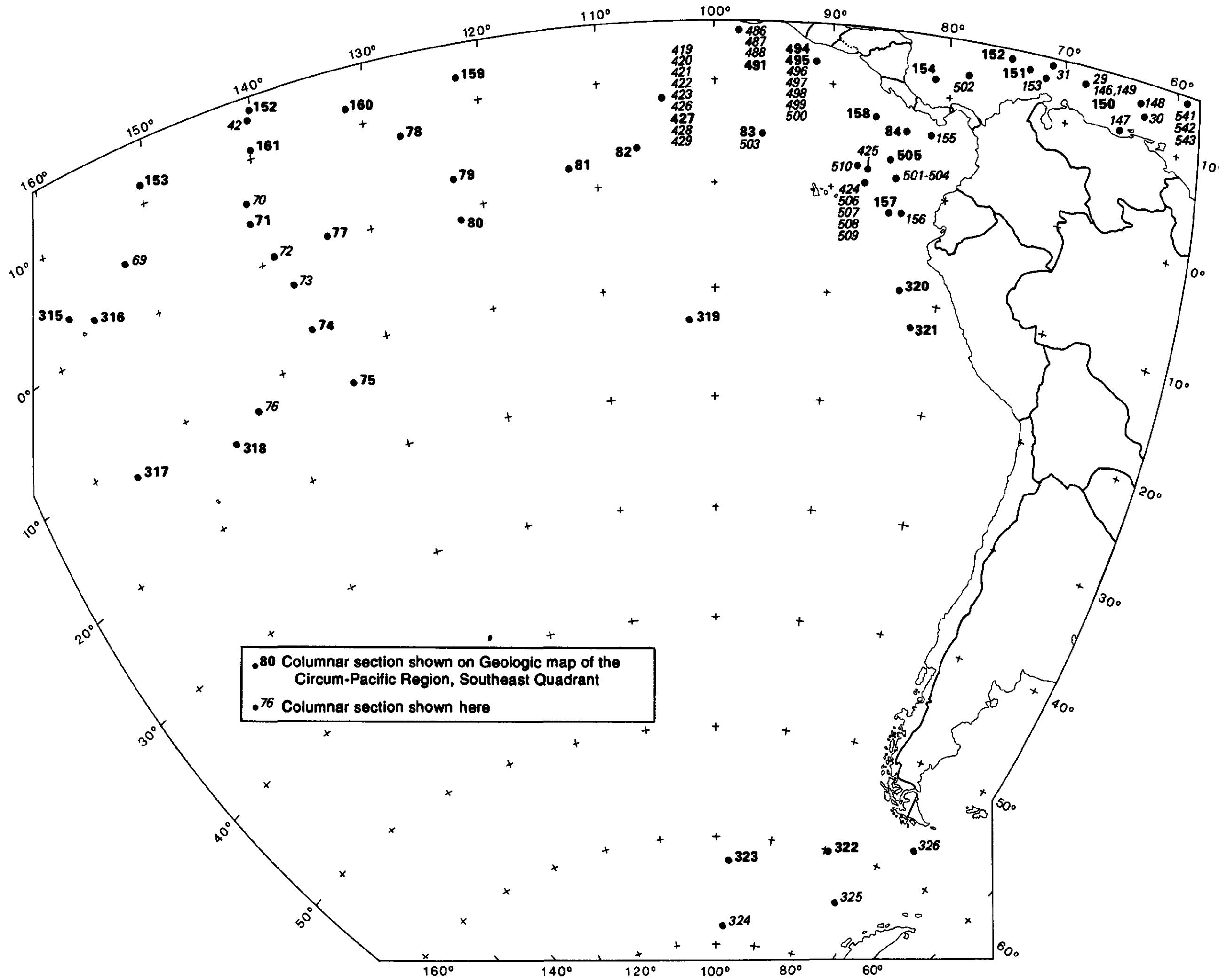


Figure 14. Index map of the Southeast Quadrant, showing location of Deep Sea Drilling Project (DSDP) boreholes.

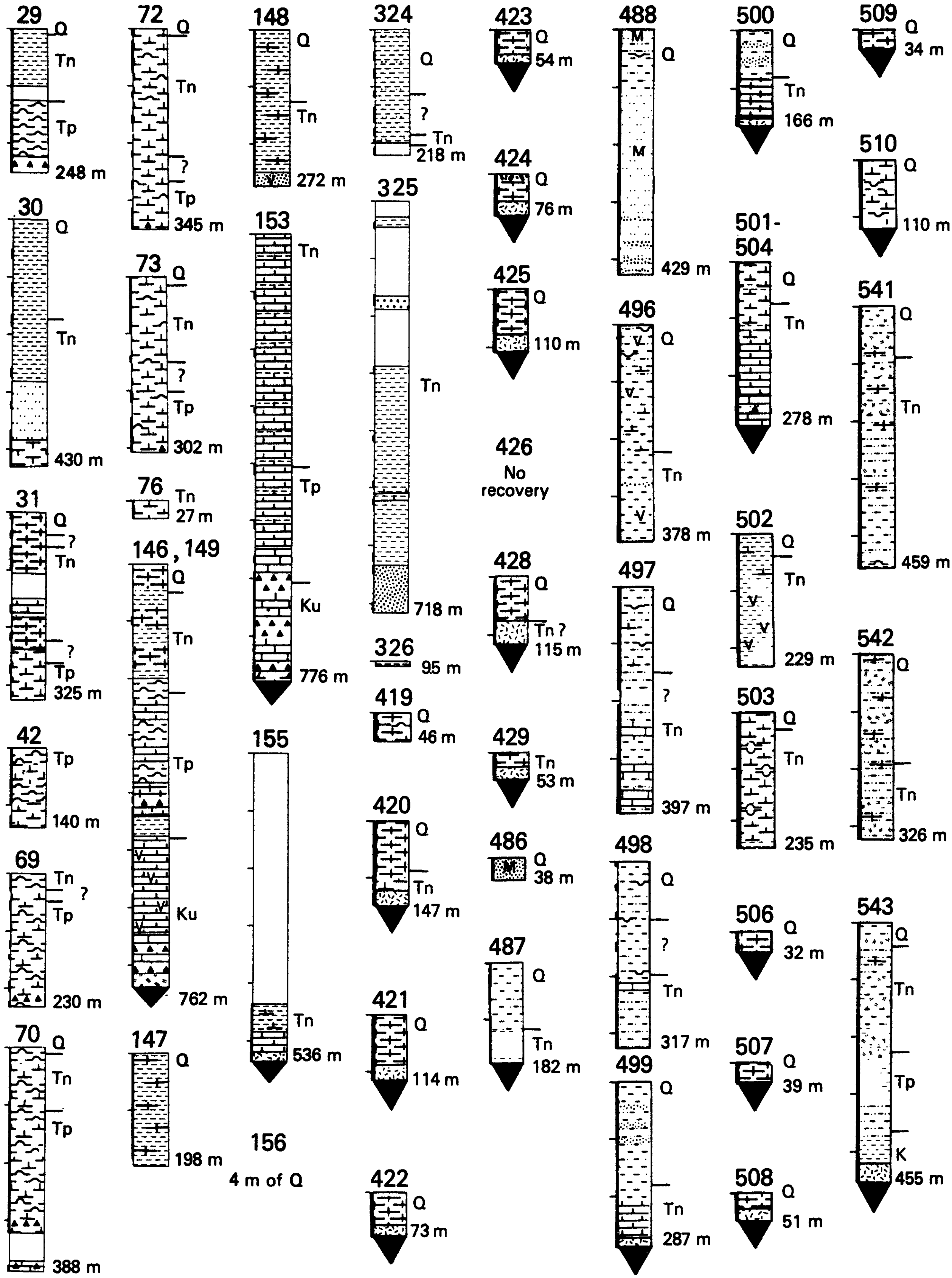
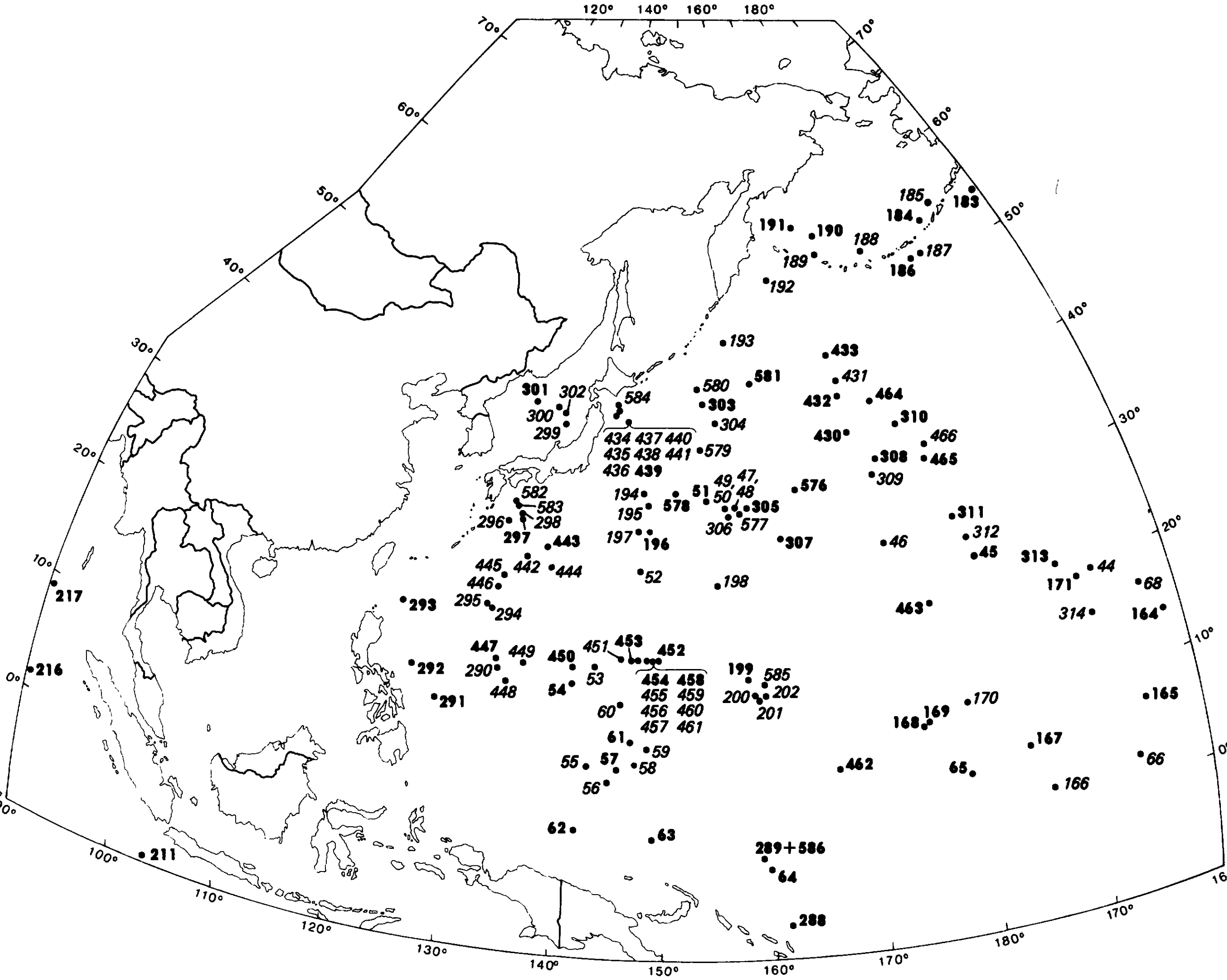


Figure 14—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.



EXPLANATION

•292 Columnar section shown on Geologic map of the Circum-Pacific Region, Northwest Quadrant

•446 Columnar section shown here

Figure 15. Index map of the Northwest Quadrant, showing location of Deep Sea Drilling Project (DSDP) boreholes.

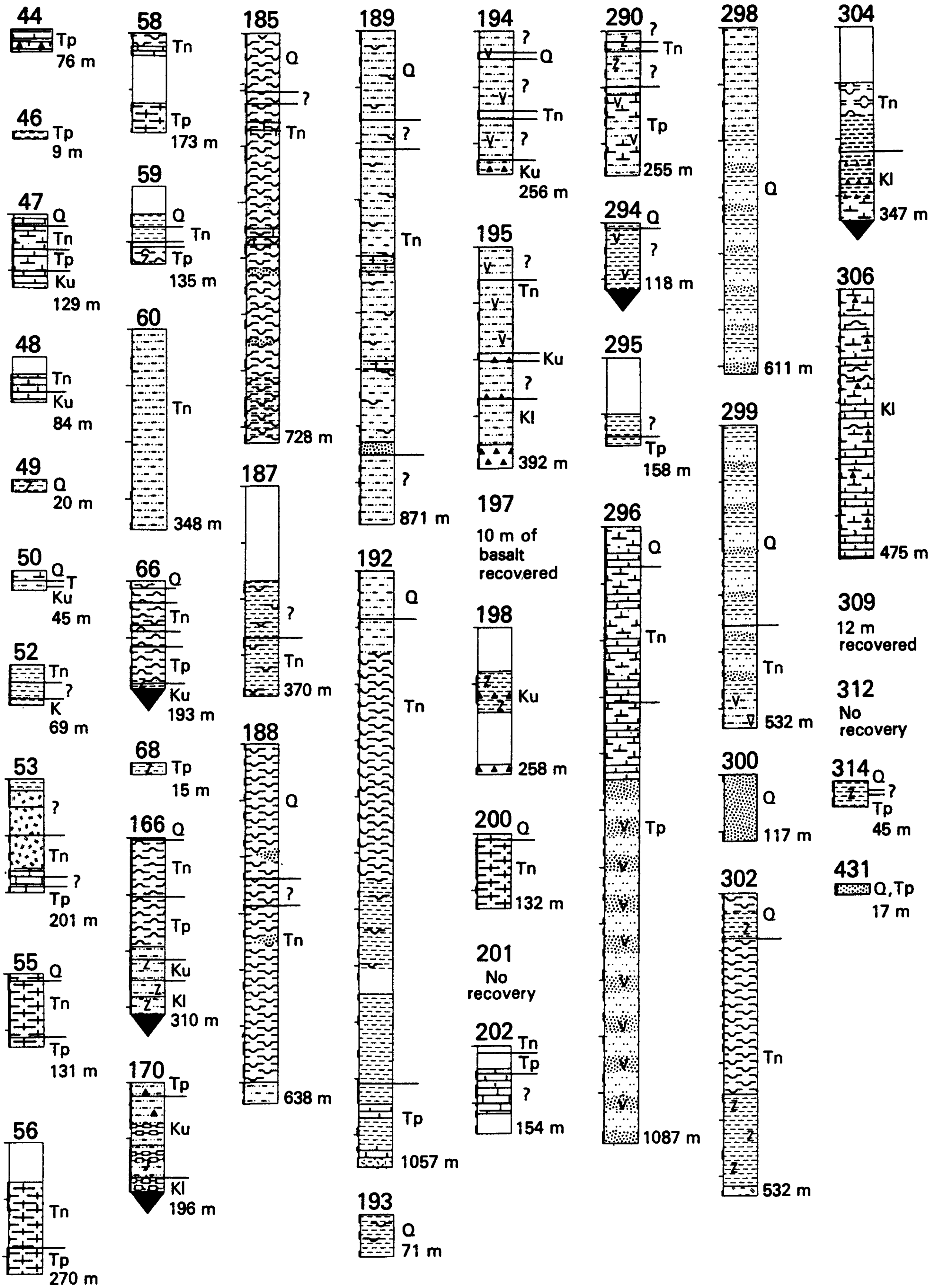


Figure 15—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.

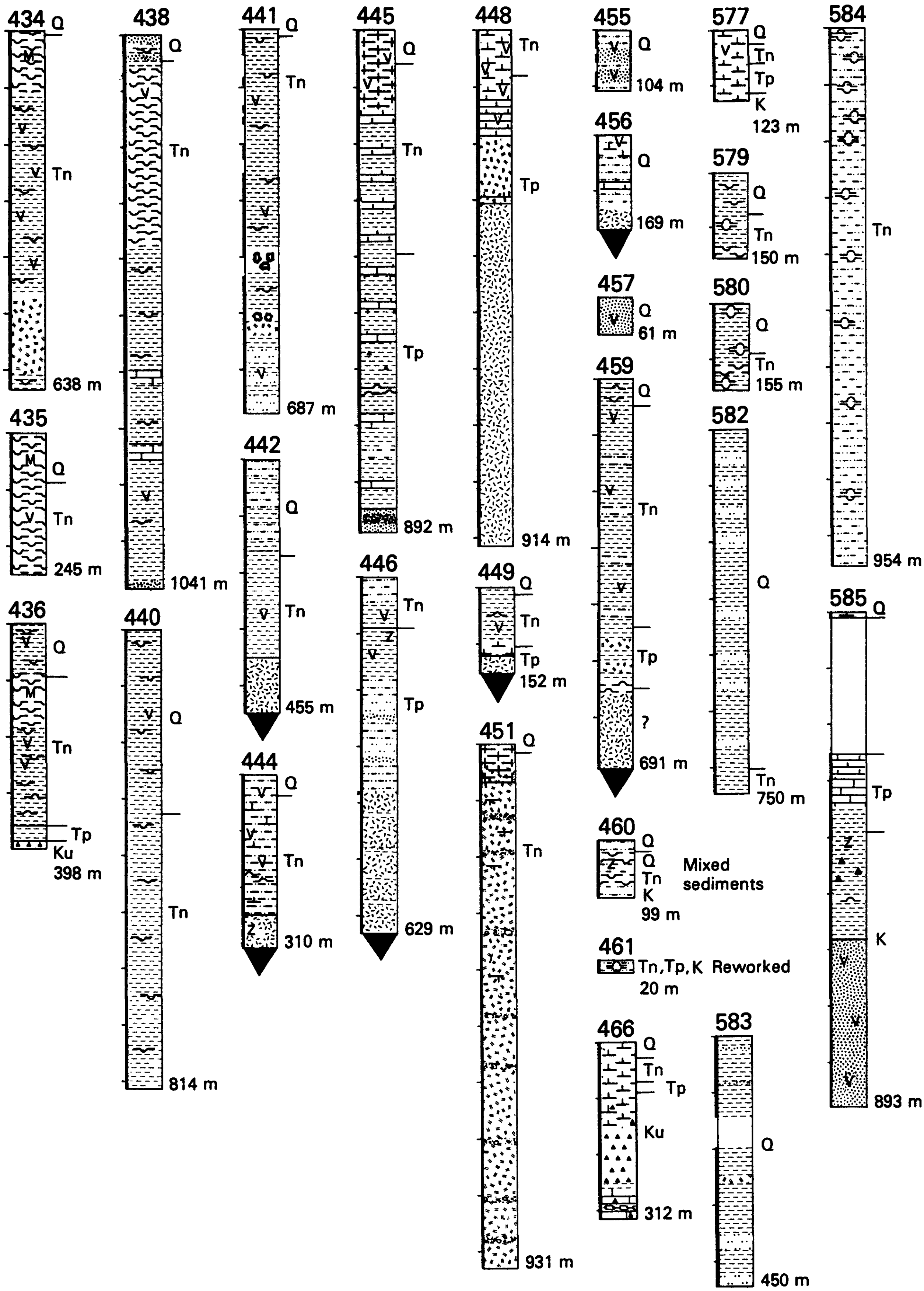
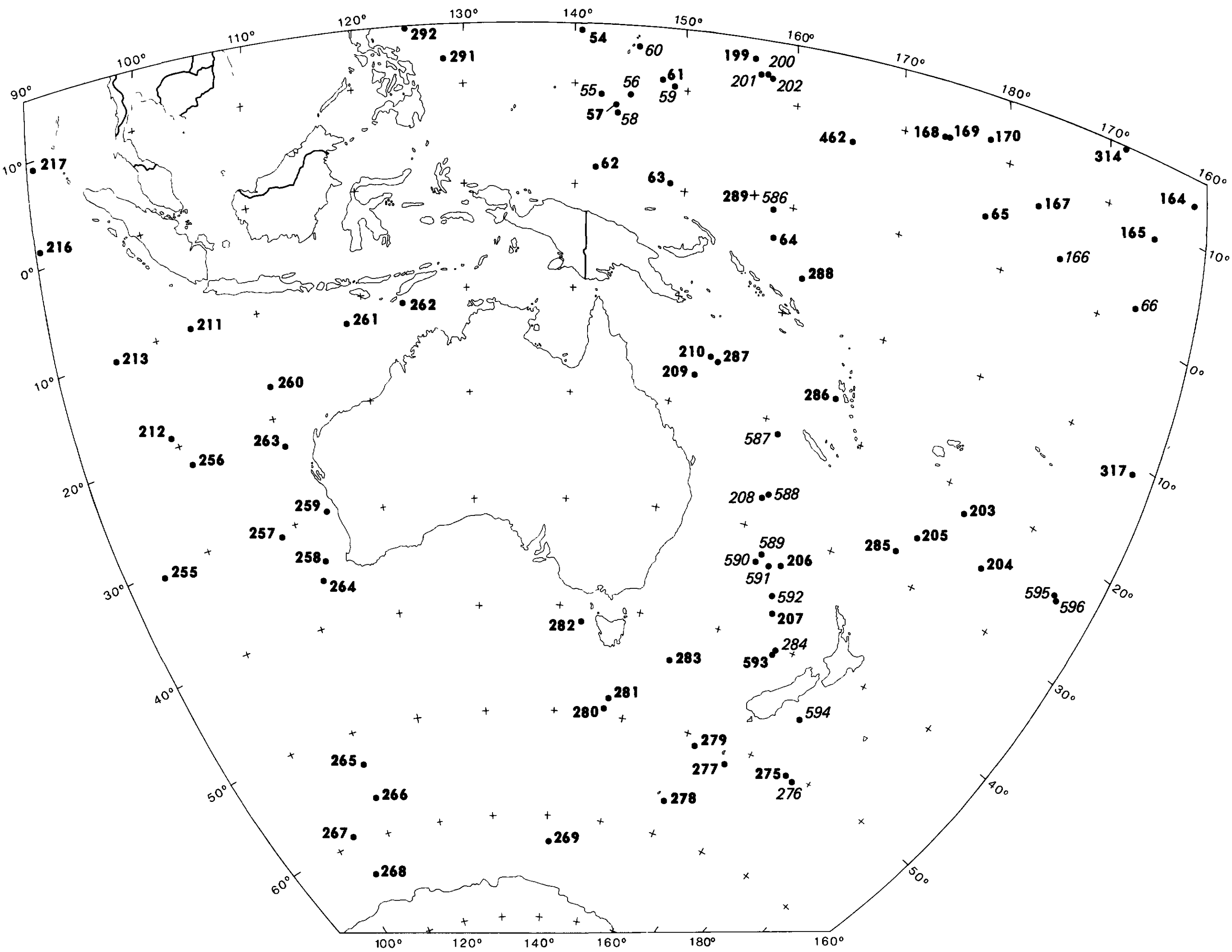


Figure 15—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.



EXPLANATION

•217 Columnar section shown on Geologic map of the Circum-Pacific Region Southwest Quadrant

•*166* Columnar section shown here

Figure 16. Index map of the Southwest Quadrant, showing location of Deep Sea Drilling Project (DSDP) boreholes.

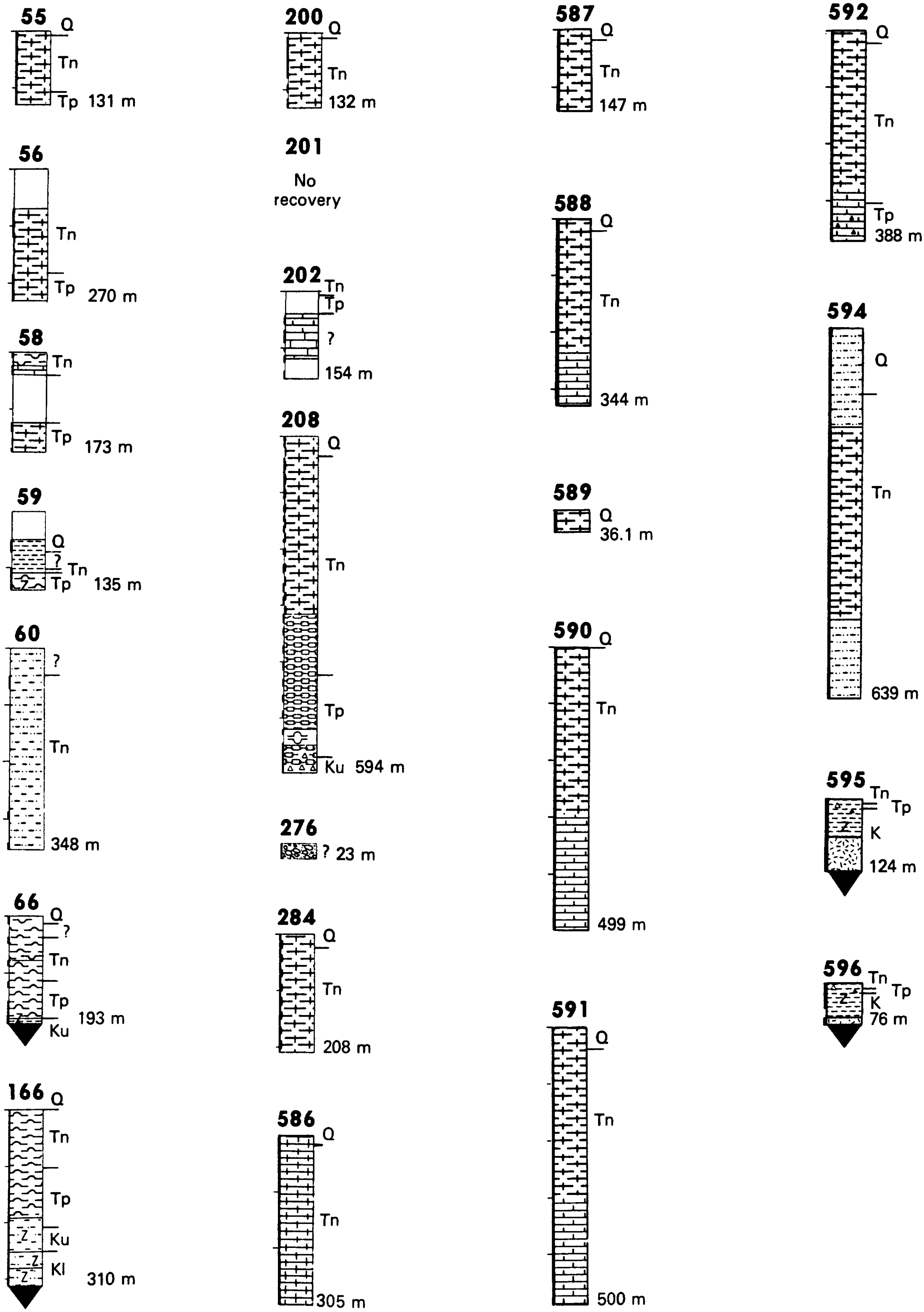
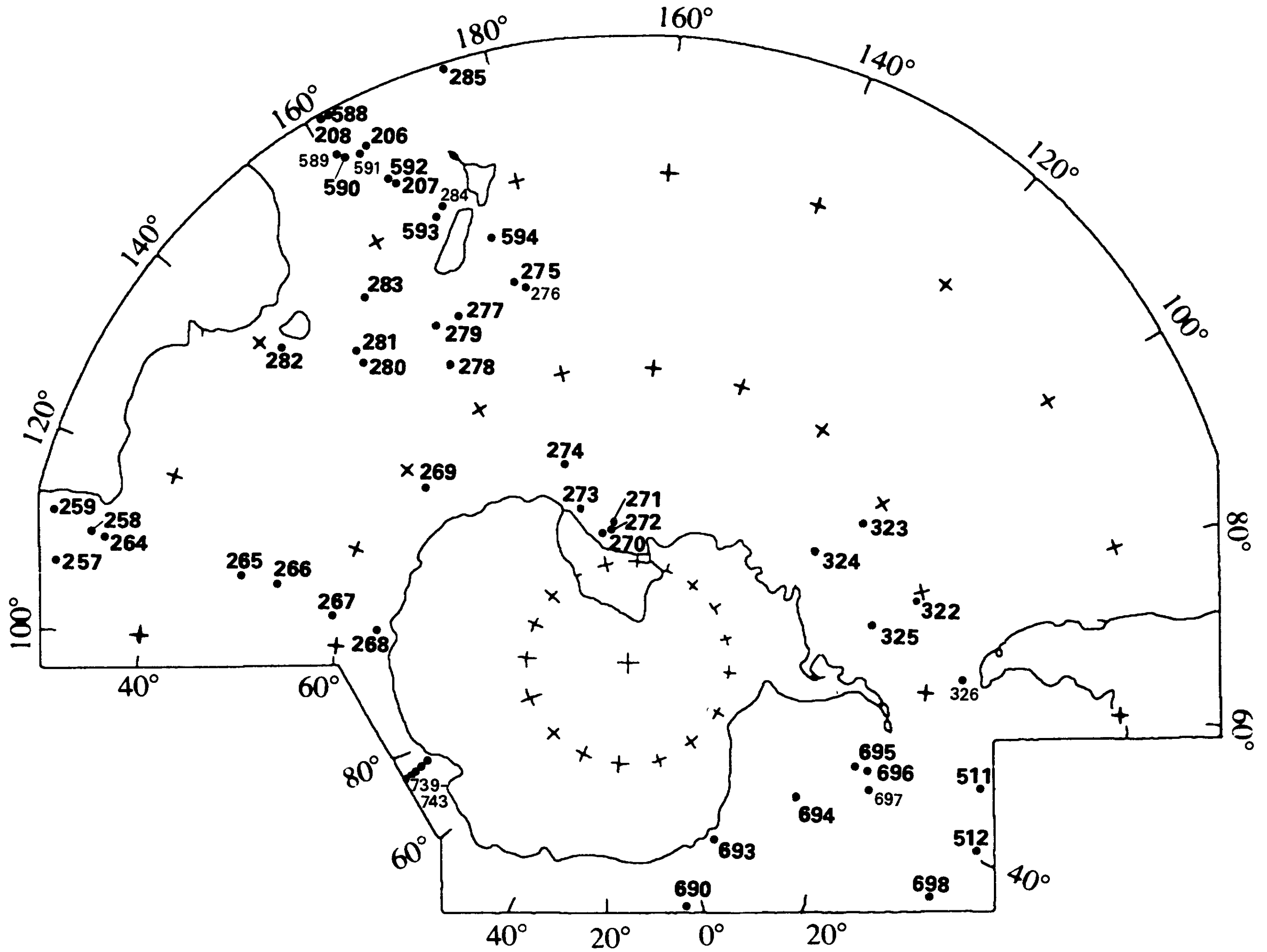


Figure 16.—continued Columnar sections of Deep Sea Drilling Project (DSDP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.



EXPLANATION

• **588** Columnar section shown on Geologic map of the Circum-Pacific Region, Antarctic Sheet

• 589 Columnar section shown here

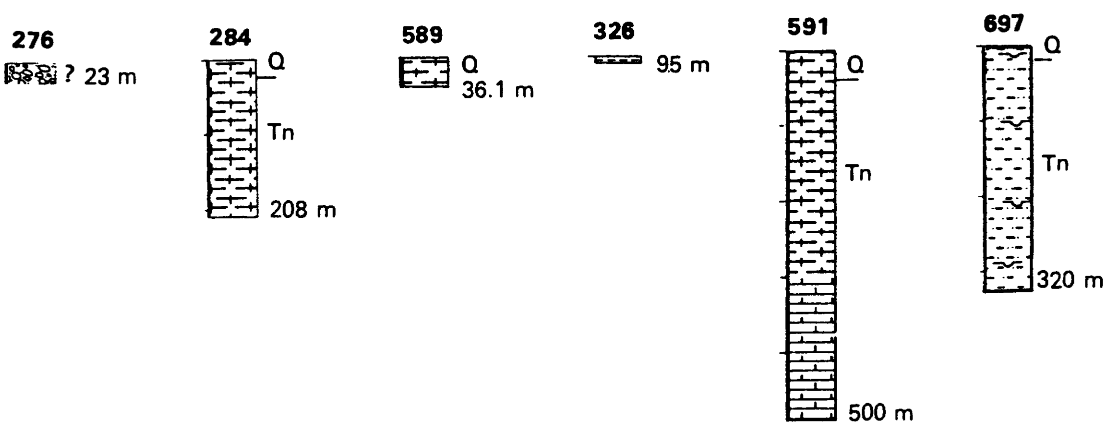


Figure 17. Index map of the Antarctic Region, showing location of Deep Sea Drilling Project (DSDP) and Ocean Drilling Project (ODP) boreholes. Sediment classification scheme is that used by the Deep Sea Drilling Project.

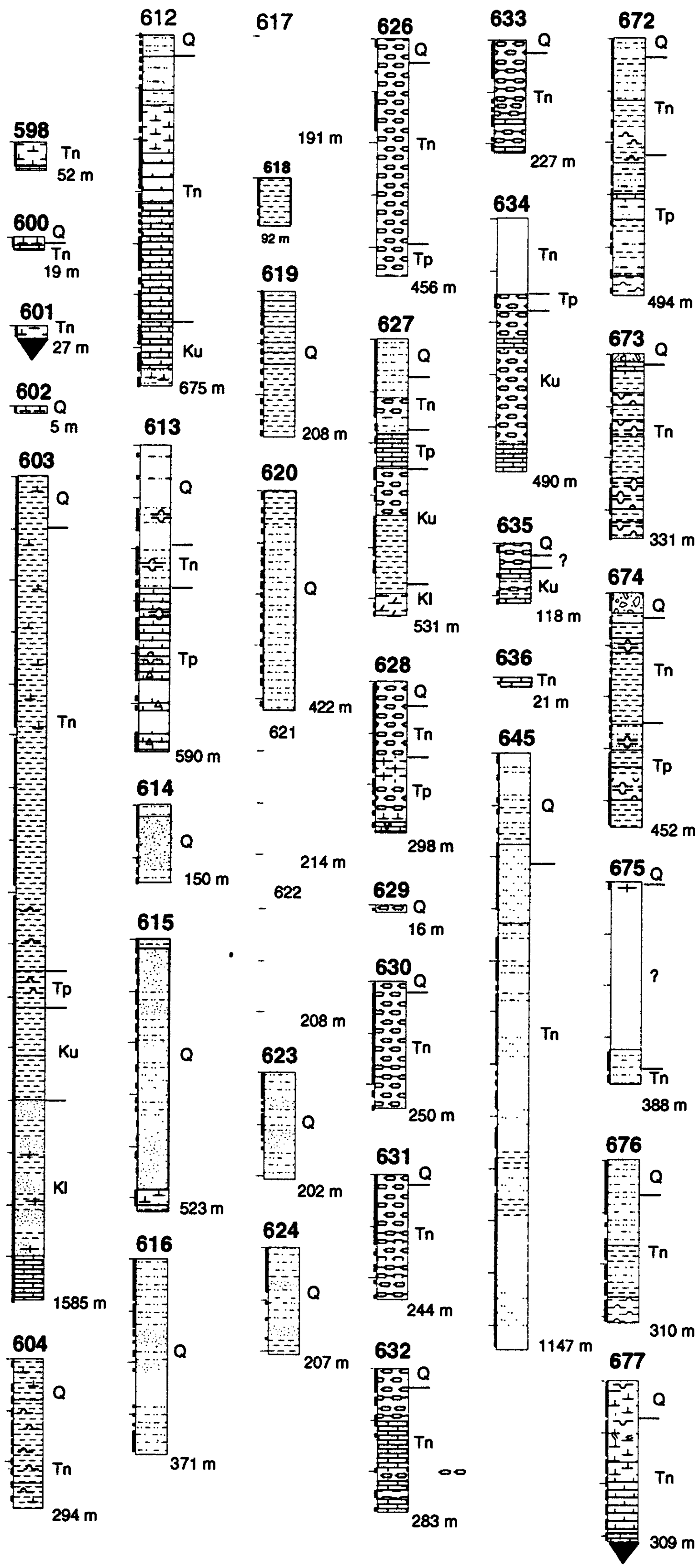


Figure 18. Columnar sections of the Deep Sea Drilling Project and Ocean Drilling Project drill sites in the Circum-Pacific region, 1982-1994.

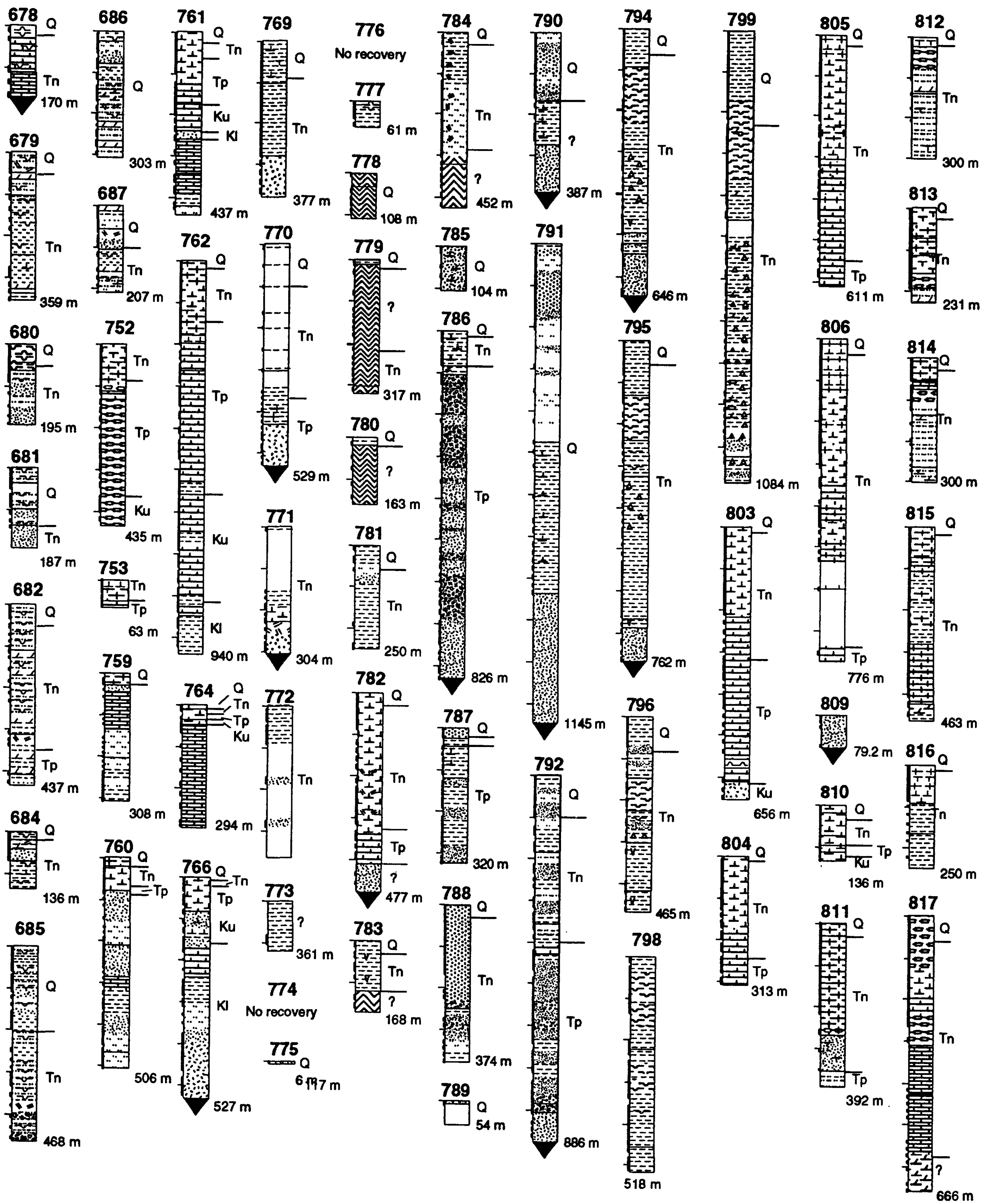


Figure 18.—continued Columnar sections of the Deep Sea Drilling Project and Ocean Drilling Project drill sites in the Circum-Pacific region, 1982-1994.

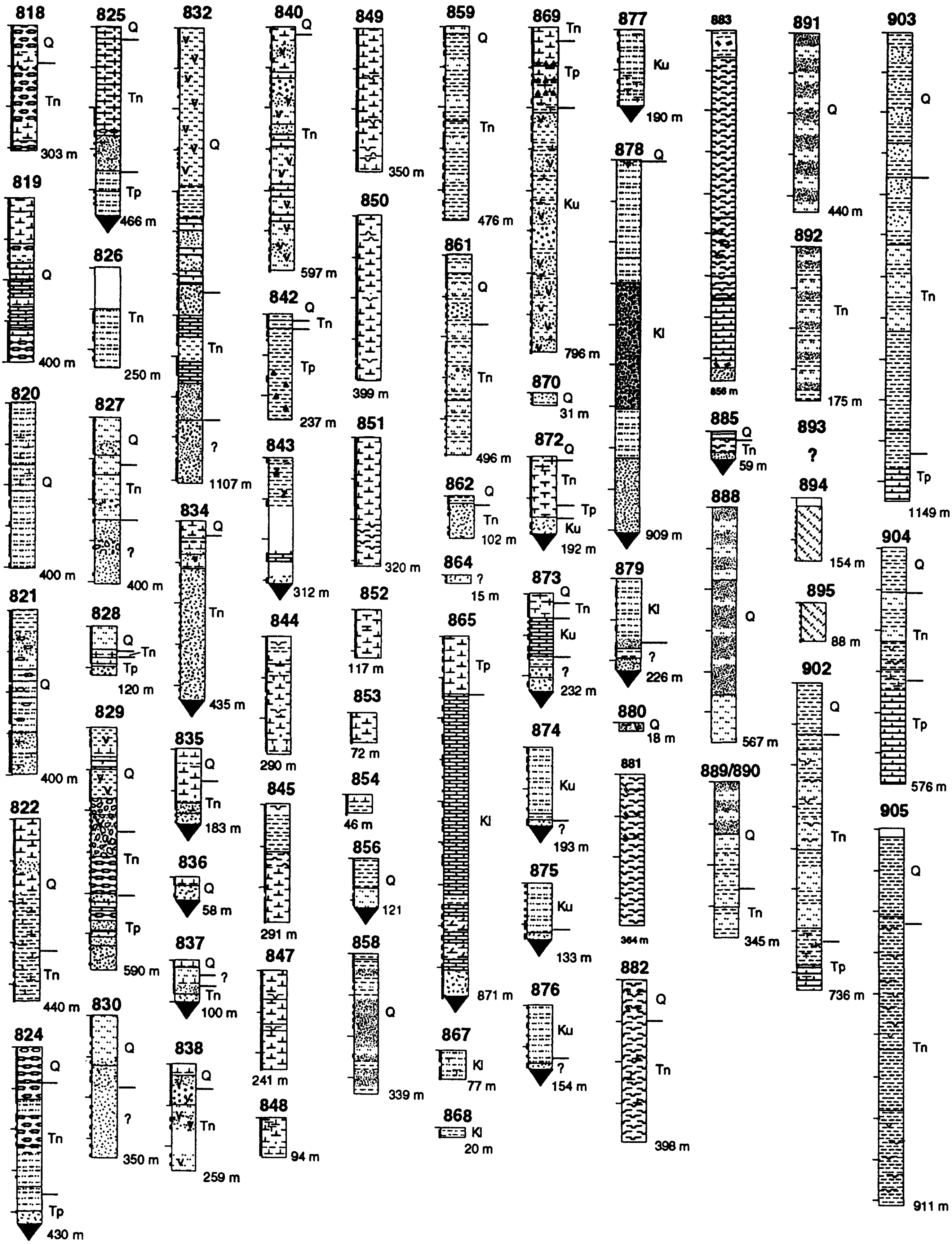


Figure 18.—continued Columnar sections of the Deep Sea Drilling Project and Ocean Drilling Project drill sites in the Circum-Pacific region, 1982-1994.

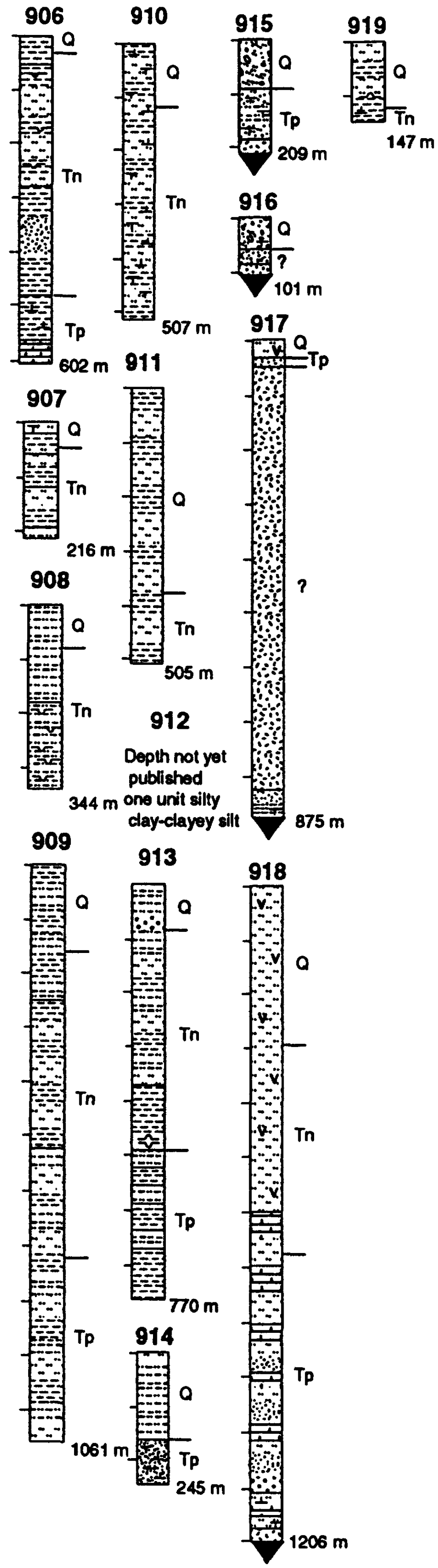


Figure 18.—continued Columnar sections of the Deep Sea Drilling Project and Ocean Drilling Project drill sites in the Circum-Pacific region, 1982-1994.

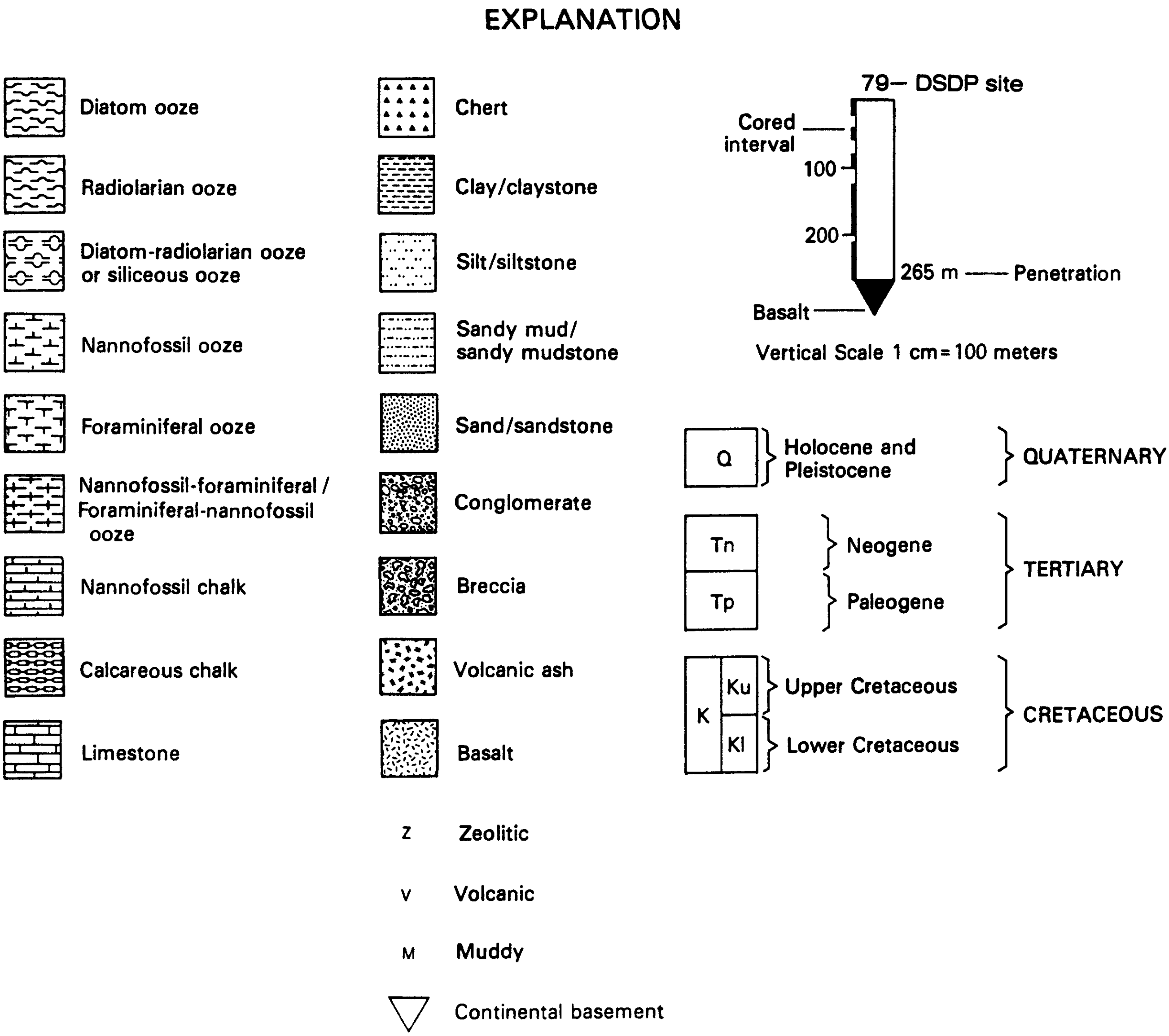


Figure 18.—continued Columnar sections of the Deep Sea Drilling Project and Ocean Drilling Project drill sites in the Circum-Pacific region, 1982-1994.

☆ U.S. GOVERNMENT PRINTING OFFICE: 2000 — 573-047 / 30004 Region No. 8