cooperation of the national geological services of the Northwest Pacific Region. While awaiting publication, new geologic maps for various areas have been published and the draft has been revised accordingly. However, the basic geologic subdivisions of the map are becoming somewhat obsolete and the Panel is exploring ways to cope with the problem.

Drafts of the Tectonic Map have been provided by the countries of the Northwest Region. The Panel is in the process of preparing a unified standard for the region.

A sample of the Mineral Resources Map with a tectonic background was prepared for the southwestern part of the Northwest Region Acquisition of published data on China and the USSR has been completed and the information is ready for plotting.

The plotting of coal occurrences for the Energy Resources Map from data provided from countries of the Northwest Region and from published information is nearing completion. There are some inconsistencies in coal classification among data received from different countries, but it is not practical to aim for complete unity throughout the region. Data on oil and gas have been acquired and can be plotted in accordance with the publication schedule. Regarding geothermal energy, published heat flow data have been plotted on a different projection.

A gravity anomaly map on a different projection has been prepared for areas with published gravity data for inclusion on the Geodynamics Map.

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Relation of Metallogenesis to Accreted Tectono-Stratigraphic Terranes in Alaska

Alaska consists of a collage of about 50 fault-bounded tectono-stratigraphic terranes of regional extent, as well as numerous smaller blocks. Each terrane possesses a characteristic stratigraphy and structure that differ markedly from those of neighboring terranes. Their grossly different stratigraphic and structural histories imply juxtaposition by large-scale transport from diverse sites of origin in various parts of the Pacific basin. The resultant mosaic of terranes records a long and complex history of accretion to the continental margin of North America. Parts of the terranes have been substantially modified by post-accretion faulting, intrusion and volcanism, and metamorphism, principally during the Cenozoic. These fundamental differences between terranes imply corresponding differences in metallogenesis, because metallogenesis is directly related to the geologic history of the rocks hosting mineral deposits. Consequently, a metallogenic model can be constructed that predicts: (1) differences in mineral deposits that formed during the origin of various dissimilar terranes; (2) differences in mineral deposits that formed during the transport and accretion of various dissimilar terranes; and (3) similarities in mineral deposits that formed within adjacent terranes after accretion. Three studies illustrate this model relating markedly different syngenetic mineral deposits, in three dissimilar terranes, to the particular origin of each terrane. The three terranes and their syngenetic mineral deposits are: (1) the Mississippian shale, chert, and tuff of the Kagvik terrane of the northwestern Brooks Range, in Arctic Alaska, which hosts extensive stratiform Zn-Pb-Ag-Ba sulfide deposits; (2) the late Paleozoic island-arc volcanic rocks of the Wrangellia terrane, in southern Alaska, which hosts volcanogenic Cu-Ag sulfide deposits; and (3) the Triassic silicic volcanic rocks of the Alexander terrane in southeastern Alaska, which hosts volcanogenic Zn-Pb-Ag-Ba sulfide deposits.

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Geologic Setting of Polymetallic Sulfide Deposits on East Pacific Rise at 21°N and Juan de Fuca Ridge near 45°N

Massive sulfide deposits of zinc, copper, lead, and silver have been recovered from the East Pacific Rise (EPR) in the mouth of the Gulf of California and from the Juan de Fuca Ridge (JFR) west of Oregon. Both of these oceanic spreading centers have a separation rate of about 2.4 in./year (6 cm/year), and the metal composition of their deposits is nearly identical. In both areas, the bulk of the sulfide deposits occur on, or immediately adjacent to, the morphologic axis of spreading in a sediment-free zone underlain by fresh glassy basalt. The axial zone of the EPR at 21°N is nearly 985 ft (300 m) deeper than that of the JFR. An extensive international program at the EPR has photographed and sampled both hydrothermal fluids and mineral deposits. The existence of active hydrothermal vents at the JFR is inferred from the form and the absence of weathering of samples recovered during a recent U.S. Geological Survey cruise.

The EPR exhibits a moderate degree of morphologic symmetry, and the sulfide deposits are generally situated along a low axial pillow-basalt ridge that is flanked by slightly older crustal zones containing numerous fissures and faults. On the JFR, the massive sulfides occur within a continuous(?) depression along the center of a flat axial-valley floor 0.6 mi (1 km) wide that is underlain by extensive fresh glassy lava sheet flows; overall morphologic symmetry is strikingly developed at the JFR. Although the form and texture of the sulfide deposits are better known from the EPR, it is clear that the deposits and associated faunal communities differ between the two sites. The overall commonality of these deposits and their regional settings suggest that polymetallic sulfide deposits may be fairly common along spreading-center ridges in the East Pacific. To date, sulfide deposits have been discovered at six different widely separated sites.

OKURA, GARY N., Hawaii Electric Co.

Hawaii Deep Water Cable Program—Phase I Study

(No abstract)

OTTE, CAREL, Union Oil Co. California, La Canada, California

Geothermal Development in Pacific Basin—Problems, Issues, and Answers

Geothermal energy for power generation is being actively pursued in many countries of the Pacific basin. The largest producers of geothermal energy are, in order, the United States, Philippines, New Zealand, Japan, and El Salvador. All developments have common technical problems involving scaling, corrosion, well stimulation, excessive drilling costs, and environmental impact.

The countries are handling development in different ways, ranging from total government enterprise to full private enterprise. Some are mixed arrangements with the high risk resource development being handled by private enterprise and power

generation by government corporation.

The paper will outline a scenario for accelerated development of geothermal energy resulting in less dependence on fossil fuels.

PARCHMAN, W. L., JR., and JOHN W. KNOX, Sunoco Energy Development Co., Dallas, Texas

Exploration for Geothermal Resources in Dixie Valley, Nevada—A Case History

After several years of reconnaissance geology in Nevada, an exploration program to evaluate the geothermal resource potential of Dixie Valley was begun in 1974.

Between 1974 and 1978, Sunoco Energy Development Co. conducted two heat flow drilling programs, a resistivity survey, a seismic emission study, a ground noise survey, two magnetotelluric surveys, a hydrology study, and a surface geology survey.

The synthesis of the data resulting from these projects into the regional geologic framework led to the acquisition of geothermal resource leases from fee property owners, through open file application of federal lands, and by participation in the federal KGRA competitive lease sale of May 1976.

On September 15, 1978, Sunedco began drilling the S.W. Lamb 1 which became the discovery well. Development drilling continues.

PARIS, J. P., and A. COLLEAU, Bur. Recherches Geologiques et Minieres, Noumea, New Caledonia, and M. ESTERLE, S.L.N., Noumea, New Caledonia

Preliminary Metallogenic Map of New Caledonia: First Part—Mineral Deposits Associated with Overthrusted Ophiolite

The economic development of New Caledonia is almost entirely dependent upon the exploitation of ore bodies emplaced within an overthrust ophiolite complex which covers about one-third of the island. The overthrust was an Eocene event and the ores are associated with its ultramafic rocks, including peridotites which have been exposed and weathering since that time. One of the world's three largest nickle deposits (with accessory cobalt) occurs in the weathering peridotite and the ultramafics have yielded 3.5 million tons of chromite.

A research project financed by the Delegation for Scientific Research of the French Ministry of Industry (DGRST) has provided an understanding of the geology of the ophiolite complex and the phenomena conducive to chromite mineralization. Economic and geologic data are being synthesized to produce a metallogenic map of the island. This will be a contribution to the metallogenic map of the ophiolite belt of the world (part of the IGPC project: ophiolites).

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Finding the Undiscovered Petroleum of the Circum-Pacific

(No abstract)

PARTEL, WILLIAM S., Ministry of Energy, New Zealand

Coal in New Zealand Energy Scene

(No abstract)

PECK, DALLAS, U.S. Geol. Survey, Reston, Virginia

The Role of the United States Geological Survey in Pacific Basin

(No abstract)

PHILIPPI, BRUNO, Comision Nacional de Energia, Santiago, Chile

Chilean Energy and Mineral Resources for the 80s

This presentation gives an account of the general approach adopted by the Chilean government for the utilization of the country's natural resources. This approach stresses the role of the private sector in the exploration, exploitation, and commercialization of the resources, within the framework of a free and competitive market. In a small country like Chile with an open economy, the economic development of resources, such as energy and minerals, should be based on foreign investment and free access to the external financial market.

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Northern New Guinea Wrench Fault System: A Manifestation of Late Cenozoic Interactions Between Australian and Pacific Plates

Cenozoic plate interactions between the Australian and Pacific plates have yielded a variety of convergent tectonic styles. Two major products of this convergence are the Sorong fault zone of Irian Jaya and the Ramu-Markham fault zone of Papua.

The Sorong fault system has been documented to extend westward more than 500 mi (800 km) from Teluk Sarera to Kep Banggai as a left-lateral strike-slip fault. The Ramu-Markham fault system is of disputed displacement and has been previously interpreted to extend from over 310 mi (500 km) just east of the Sepik River into the Huon Gulf.

A consideration of Australian-Pacific Cenozoic plate kinematics, Holocene vectors, earthquake focal mechanisms, photogeologic lineation analyses, and the assimilation of other pertinent geologic data suggests that the Ramu-Markham fault zone is an extension of the Sorong fault system and that together they represent significant left-lateral strike-slip motion in rigid crustal basement. This motion has produced large scale en echelon surface expressed faults and folds in detached overlying Neogene sediments. Furthermore, this wrench fault system has led to the transcompressional development and deformation of the Meervlakt, Piore, Sepik, and Ramu basins of northern New Guinea. An understanding of the tectonic evolution of these basins is tantamount to an assessment of their evolving hydrocarbon potential.

PIPER, D. Z., T. R. SWINT, and V. E. MCKELVEY, U.S. Geol. Survey, Menlo Park, California, and L. SULLIVAN, Lamont-Doherty Geol. Observatory, Palisades, New York

Distribution of Manganese Nodules in Pacific Ocean

The distribution of deep-ocean manganese nodules within the Pacific Ocean has been ascertained from bottom photographs and sediment cores. In the northeast quadrant of the Pacific Ocean, three areas exhibit a sea-floor coverage that commonly exceeds 50%. One area lies between the Clarion and Clipperton