CRUZ, J.

POSSIBILITIES FOR DEVELOPMENT OF MINERAL RESOURCES OF COLOMBIA

No abstract available.

CRUZ, L. J.

URANIUM AND ITS PROJECTION OF ELECTRICAL NUCLEAR FUTURE OF MEXICO

No abstract available.

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SIMULATION MODEL OF HONOLULU BASAL AQUIFER

A mathematical model of the Honolulu aquifer that relates the historical head measurements to the rainfall and pumpage records has been formulated. This work is focused on determining the hydrodynamic relations between the freshwater and saline-water bodies to allow application of the best practices for management of the basal groundwater resource (a body of fresh water that floats on saline groundwater).

The Honolulu aquifer is composed of the basaltic lava flows that form the Koolau Range. These rocks have a value of hydraulic conductivity on the order of 10,000 ft/day (3,000 m/day). The Honolulu coastal-plain sediments conformably overlie the aquifer. The sediments have a low hydraulic conductivity, and restrict the flow of basal groundwater to the ocean. Alluvial deposits that have backfilled Pleistocene valleys cut deep into the aquifer, restrict lateral groundwater flow, and divide the Honolulu aquifer into three reservoirs.

The individual reservoirs are about 10 sq mi (26 sq km) in area. Pumping from each reservoir is restricted to one or two large pumping plants and the freshwater head has been measured by continuous recorders on a single well in each reservoir. The small size of the reservoirs, plus the limited historical data, make it convenient to use each reservoir as a computational cell of the mathematical model.

The mathematical model was derived by solving the mass-balance equation for discrete time steps for each of the reservoirs. Inflow and outflow elements considered were deep infiltration of rainfall, saltwater flow from the ocean to the underlying saltwater body, flow between the reservoirs, and pumpage. Best estimates of the aquifer parameters were obtained by processing part of the historical records using linear-programming techniques. The estimates of the aquifer parameters were used in the simulation model to compute freshwater head for the remaining part of the historical records. The fit between the historical head and the computed head is good, suggesting that the model could be used as a tool for estimating the effects of alternative management practices.

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MAJOR CHEMICAL CHARACTERISTICS OF TERTIARY AND QUATERNARY VOLCANISM OF BAJA CALIFORNIA—COMPARISON WITH OTHER VOLCANIC PROVINCES OF MEXICO

The volcanic series of Baja California is divided into two chemically different cycles.

A first calco-alkaline cycle is represented by deposits of highly pyroclastic andesites and dacites. This volcanism was most intense in the Miocene but started during the Oligocene. The andesitic series of Sinaloa is comparable in age to series in Baja California, but the imposing ignimbritic series of the Sierra Madre Occidental is not found at Baja California. Beginning in the Pliocene, an alkaline cycle was developed. This cycle is represented by large amounts of Hawiitan-type tuffs and is partly of Recent-Quaternary age. Some of these eruptions have occurred within historic time (Tres virgenes, close to St. Rosalia).

The chemical character of the lavas of Baja California is interpreted according to the pattern of geotectonic evolution which has been proposed for the west part of the Mexican continent, and specially in relation to the post-Pliocene opening phenomena of the Gulf of California.

A compilation of recent chemical data concerning the volcanism of Mexico was processed by computers. The program defined the petrochemical characteristics and a thesis is proposed on the petrogenetic interpretation of the three large volcanic provinces of Mexico: (1) the calco-alkaline trans-Mexican axis; (2) the calco-alkaline volcanism (alkaline at Baja California) of the Pacific Coast; and (3) the overall alkaline volcanism (with tholeiitic manifestation) of the Gulf of Mexico.

DAMIANI, O.

EVALUATION OF METALLIC AND NONMETALLIC MINERAL RESOURCES OF PERU

No abstract available.

ELY, N.

SEABED BOUNDARIES OFF COASTS OF ASIA

No abstract available.

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METALLOGENIC PROVINCES IN SOUTHEASTERN PACIFIC REGION

Mineral deposits of the southeastern Pacific region include: (1) hypogene, volcanogenic, and sedimentary deposits of the Andean region, (2) scattered copper deposits in the Antarctic Peninsula; and (3) metal-enriched sea-floor sediments and volcanic rocks. Andean metalliferous deposits are related spatially and genetically to calc-alkaline plutons and volcanic rocks emplaced during the Andean orogeny of Jurassic to Quaternary age. These deposits are components of a single metallogenic province, superimposed on two or more pre-Andean Paleozoic and Precambrian metallogenic provinces. Scattered copper deposits of the Antarctic Peninsula are similar in age and origin to deposits in the Andes and are considered to be in the Andean province. The sea-floor deposits include: (1) metal-enriched rocks and sediments that have formed at an accreting plate margin, such as the East Pacific Rise or near sea-floor volcanism; (2) sea-water precipitates; and (3) concentrations of heavy minerals in clastic sediments along the continental margin.

The Andean metallogenic province can be divided into dominant metal (or metals) subprovinces, each parallel with the Andes and the continental margin. The central Andes of Peru, northern Chile, and Bolivia contain the greatest concentration of exploitable deposits and greatest variety of ore types, and have five linear, partly overlapping, subprovinces. These subprovinces, from west to east, are characterized by deposits of: (1) iron; (2) copper, with or without gold; (3) polymetallic base metals (Zn, Pb, Cu), generally containing silver; (4) tin; and (5) gold. Iron deposits are near the coast from central Chile to southern Peru. The copper and polymetallic provinces are continuous throughout most of the central Andean region and extend south into Chile and north into Colombia. A discontinuous gold province, overlapping the copper and iron provinces, can be traced from central Chile to northwestern Colombia; another belt of gold deposits is in the eastern Andes from Bolivia to Ecuador. Tin deposits are restricted essentially to the eastern Andes of Bolivia.

Magmas of the calc-alkaline rocks of the Andes are believed to have formed by melting of mantle, oceanic sediments, and oceanic crust at depths of 100 to 200 km along the Benioff zone. These igneous rocks generally decrease in age from west to east, though nonuniformly. Rocks of Jurassic and Cretaceous age are most abundant near the coast, whereas those of Tertiary and Quaternary age are dominant in the Andes; but locally, rocks and ore deposits of different ages are juxtaposed. These relations suggest variations in rates of subduction, in inclination of the subduction zone, and in position relative to the continental margin. Metals associated with the calc-alkaline rocks were supplied by the source rocks in the Benioff zone; some may have been enriched in metals, and from metal-rich zones in the overlying mantle and continental crust. The rising magmas probably assimilated or caused mobilization of previously formed ore deposits.

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REVIEW OF AUSTRALIAN BAUXITE DEPOSITS

Although bauxite in Australia has been known since the late 1800s, no large-scale mining operation had been set up prior to 1945. With the establishment of the Australian Aluminium Commission in 1945 the first systematic survey of Australian bauxite reserves commenced and by the end of 1953 the known reserves were about 21 million tons and a new deposit, "Gove," had been discovered, but reserves had not been assessed. With the discovery in 1955 of the large reserves of bauxite at Weipa, world attention became focused on Australia as a potential major source of bauxite and major aluminium companies commenced exploration activities.

A total of 21 deposits now are known of which at least 12 are of sufficient size to support large-scale mining operations. Total known reserves are about 4,600 million tons. Of this total 3,200 million tons are contained in three major deposits, Weipa, Darling Range, and Gove, in which mining operations are being carried out.

The bauxite deposits are part of a widespread Tertiary laterite with the major deposits mainly in the north and west coastal regions. The bauxite is developed on different rock types including sedimentary rocks, basalts, and schists and has resulted from in situ weathering under tropical and subtropical climatic conditions.

Since 1955 the bauxite mining industry in Australia has grown from less than 1 million tons in 1966 to 19 million tons in 1973. The integrated aluminium industry growth has been no less spectacular from a total of 12,000 tons of primary metal in 1967 to a total of 232,000 tons at the end of 1972.

Australia now has joined the Caribbean area and West Africa as a major world source of bauxite. The Australian reserves, particularly the large deposits at Weipa, are strategically placed to serve the long-term need of the Pacific area, including Japan and the developing countries of southeast Asia.

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SURVEYING EARTH AND ITS ENVIRONMENT FROM SPACE

Data from the Earth Resources Technology Satellite (ERTS) are being utilized for cartographic, geologic, and other earth-science purposes by most nations of the world. The Earth Resources Observation Systems (EROS) Data Center in Sioux Falls, South Dakota, is supplying data directly to 96 nations, many from the Circum-Pacific region.

The cartographic qualities of data from ERTS, especially that from MSS (multispectral scanner), have exceeded prelaunch expectations. MSS data have been used to produce photo maps of parts of the United States that have root mean square positional errors of less than 150 m.

Structural geologic information has been obtained from Nimbus and later ERTS data have led to revision of the metallogenic map of Alaska and are providing focus on potential locations of metallic ores in other areas of the western hemisphere. Observations of the distributions, shapes, and orientations of lakes, stream valleys, and other water features as seen in the synoptic images from ERTS provide new insight into the presence of deep-seated structures that may have metals or petroleum significance. Tectolinear interpretations of ERTS-1 data, in conjunction with seismic epicentral data from other sources, may provide a new approach in defining hazardous areas for future development.

Recent work involving special processing of ERTS images of parts of Nevada have led to a capability to detect and map areas of surface alteration—a well-known guide to ore deposits.

The Data Collection System (DCS) experiment aboard ERTS is being used to receive and retransmit information from a variety of in-situ sensors, including tiltmeters and seismic event counters on 16 volcanoes in North and Central America. Precursor earthquakes of 80 events per day recently signalled the eruption of Volcan Fuego in Guatemala.

FLOWERS, B.S.

OVERVIEW OF EXPLORATION GEOPHYSICS—RECENT BREAKTHROUGHS IN GEOPHYSICS AND RECOGNITION OF CHALLENGING NEW PROBLEMS

No abstract available.