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.

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

No abstract available.