

Most of Antarctica is ice-covered, and rock exposures comprise only some 2 to 3% of the area of the entire continent. Antarctica is divisible into two regions with different geological characteristics. East Antarctica (lying mainly in east longitudes) is the larger region, and West Antarctica the smaller. The Transantarctic Mountains, which cross the continent and pass near the South Pole, mark the inland border of East Antarctica.

East Antarctica is a continental shield that was a central piece of Gondwanaland in early Mesozoic time. The basement rocks are mainly of Precambrian age although lower Paleozoic rocks are also present in the Transantarctic Mountains. Archean rocks in the charnockite-enderbite terrane along the Indian Ocean coast have yielded apparent ages as great as 4.0 billion years. The basement complex is unconformably overlain by the subhorizontal Gondwana sequence of Devonian-Jurassic age.

West Antarctica is a younger region that makes up a segment of the Circum-Pacific mobile belt. Definite Precambrian rocks are known from only one locality, and the ice sheet-bedrock contact is below sea level throughout much of West Antarctica. Sedimentary rocks, mainly or entirely of Phanerozoic age, crop out extensively in the Antarctic Peninsula, the Ellsworth Mountains, and western Marie Byrd Land. Diverse Phanerozoic igneous and metamorphic rocks are widely distributed across West Antarctica, especially Mesozoic (Andean) intrusive bodies and Cenozoic volcanic rocks.

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Geophysical Surveys in Northeast Pacific

The major tectonic and geological boundaries in the Northeast Pacific off British Columbia have been delineated by multiparameter geophysical surveys conducted by the Pacific Geoscience Centre. Systematic magnetic, gravity, bathymetric, and seismic surveys on 5 mi (8 km) lines run perpendicular to the shelf edge to a distance of 224 mi (360 km) offshore, supplemented by detailed surveys, heat flow, ocean bottom magnetic and seismic measurements, sedimentological and geological studies, have been used to produce an integrated picture of this very complex environment.

Major components include: the Queen Charlotte transform boundary, a complex continental slope averaging 19 mi (30 km) wide with an associated -70 mgal free air anomaly centered over the outer part of the slope suggesting that the slope is largely composed of sedimentary material; adjacent ocean floor with characteristic north-south-trending magnetic linears which are complicated by anomalies associated with the Kodiak-Bowie seamount chain and transform discontinuities, and the northern Juan de Fuca and Explorer plate region, an area of short spreading ridges with a history of plate fragmentation, rotation, and subduction beneath the North American plate.

These studies have resulted in a revised model of the evolution of the western Canadian continental shelf, which has implications for petroleum exploration and potential. Designers of petroleum exploration strategies for all active margins must be cognizant of plate dynamics. Recent reports of ridge axis polymetallic sulfide mineralization also illustrate the potential economic importance of regional studies of plate boundaries and behavior.

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Geology and Potential Development of Queensland Oil Shales

Stimulated by recent interest in oil shale as an alternative source of oil, exploration since 1978 has revealed that the Ter-

tiary and Cretaceous oil shale deposits of Queensland are of considerable size and extent. Tertiary deposits contain inferred resources of oil totaling $2,400 \times 10^6 \text{ m}^3$ (15 billion bbls), based on average Fischer Assay yields of 60 to 80 L/t in situ, while Cretaceous deposits are perhaps one hundred times larger. However, 90% of the latter are too deeply buried to be extracted with existing technology. On present information, Jurassic, Permian, and Cambrian oil shale deposits do not appear to be of economic significance.

Cretaceous oil shales occur within the shallow marine Toolebuc Formation of western Queensland. This stratigraphic unit is thin (16 to 49 ft, 5 to 15 m) but exceedingly widespread. Tertiary oil shales, which range up to 1,970 ft (600 m) in thickness, formed in freshwater environments in several basins located in the eastern one-third of the state.

Oil shale deposits most likely to be exploited in the next decade are those of Tertiary basins close to the coast, which contain multiple seams of high oil yield, amenable to open-cut mining and with adequate supplies of water. The Condor, Rundle, Stuart, and Yaamba deposits are in this category. Mining feasibility studies of these and the Cretaceous Julia Creek deposits envisage open-cut mining and surface retorting on a large scale. Experimental retorting investigations are in progress. Extraction of oil from oil shales in areas remote from the coast probably awaits development of economic methods of in-situ retorting.

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Eruption of Mount St. Helens
(No abstract)

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International Mapping Activities of the World
(No abstract)

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Philippine Geothermal Energy Resource: An Available Indigenous Alternative

The Philippines is indeed fortunate to be located within the West Pacific Island Arc dotted by Neogene volcanic centers. The multistage development of volcanic-plutonic events in this western part of the Circum-Pacific basin has generated regions of high heat flow where known potential geothermal resources are located.

With the increasing power demands reflecting a favorable growth of the country's economy, the Philippine government embarked on an accelerated program to harness the country's geothermal energy for power utilization at the start of the energy crisis in early 70s.

For a period of 10 years (1972-81), the Philippines has successfully launched a systematic and continuing program of assessing, exploring, developing, and exploiting its vast potential geothermal resources. Of the several potential areas scattered all over the archipelago, four geothermal fields have already contributed some 501 megawatts equivalent to almost 12% of the total electrical power supply of the Philippines.

This paper deals with the geothermal resource development of