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High Temperature Geothermal Well-Logging Techniques in Japan

A high temperature geothermal well-logging system has been developed by Japan Petroleum Exploration Co., under the sponsorship of the Japanese government. The tools developed on this project are: Multi-Spacing Electrical-SP Log (equivalent to Lateral Log); Microspherical-Caliper Log; Side Wall Acoustic-Caliper Log (P-S Wave Sonic Log); Steering Tool (Azimuth, Hole Deviation and Inclination); Optical Borehole TV; Production Logging Tools (Temperature, Pressure, Continuous Flow and Caliper, and Borehole Sampler).

The maximum operating temperature of these tools is 325°C and they can withstand pressures of 500 kg/cm$^2$, by the use of TFE teflon insulator armored cable. The tools have been subjected to field tests over 50 geothermal wells, since 1978, and all except the Optical Borehole TV were successfully operated where bottom-hole temperatures were as high as 210 to 275°C.

The side wall acoustic tool, which consists of P and S wave transducers, is very useful for the detection of formation fractures in volcanic rocks. The Optical Borehole TV could not be used where temperatures exceeded 150°C, because of heat radiation emitted from the mud and the holewall surrounding the down-hole probe, or when the tool was focused at the surface of the semiconductor imagesensor on the TV and the temperature of the image spot exceeded 120°C, even when placed in a Dewar bottle and heat sink assembly.

Super high temperature (450°C) production logging tools, using mineral insulation cable, are under construction and will be in operation by the end of August 1982. They are: Absolute and 1-meter spacing differential Temperature Survey; Continuous Pressure Measurement; Continuous Flow and Caliper Measurement; High Temperature Microphone and Accelometer, with a wall set mechanism.

The diameter of these tools is 2 inches and their maximum operating time is 30 hours at 450°C. They can withstand pressures of 500 kg/cm$^2$.

The success of this system is apparent from the summary of field results and the technical report of the super high temperature production logging tools.

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Preliminary Tectono-Stratigraphic Terrane Map of Circum-Pacific Region

The geologic evolution of the proto-Pacific Ocean (Panthalassa) underwent a major change during Middle Triassic time that involved initiation of rifting and dispersal of allochthonous terranes from equatorial paleolatitudes. Fragments of these rifted terranes are now found plastered onto cratonal margins (which locally may contain Paleozoic accreted terranes) in most parts of the Pacific basin. A preliminary map at a scale of 1:20,000,000 has now been completed for most of this margin (exclusive of parts of South America) that shows the location and character of major terranes, as well as position of suture zones and ophiolitic belts.

Combined paleomagnetic, paleobiogeographic, and lithologic data substantiate that some terranes have been displaced thousands of kilometers during the Mesozoic, but adequate data of these kinds are still lacking for many terranes. Such data are required in order to control paleogeographic reconstructions through time, and then to eluciate the tectonic evolution of the entire Pacific basin.

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Mineral Resources and Maps of New Zealand, the New Hebrides, and the Solomons

The following maps covering southwest Pacific island arcs and sedimentary basins are completed: (1) Petroleum Concession Map of New Zealand, 100 × 80 cm; (2) tectonic classification of New Zealand oil—prospective basins (map), 80 × 60 cm; (3) Cretaceous-Cenozoic sedimentary basins of New Zealand (map), 65 × 50 cm; (4) Structural Map of the New Hebrides island arc, 90 × 60 cm; and (5) Structural Map of the Solomon Islands, 90 × 70 cm.

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Southwest Pacific Island Arcs: Sedimentary Basins and Petroleum Prospects in New Hebrides and Solomons

Several thousand meters of Miocene-Pliocene sediments are predominantly fine to coarse-grained volcaniclastics deposited in shelf to deep marine environments, commonly as turbidites; coralgal reef limestones and fore-reef calcarenites formed locally. Original basins in both the Solomons and New Hebrides measured 375 to 435 mi (600 to 700 km) by 62 to 125 mi (100 to 200 km) but parts of their margins are strongly deformed, uplifted, and eroded. Cross-faulting and Holocene volcanism caused segmentation and further reduction of basinal areas. In both island arcs, the sediments are little deformed along a median structural basin which was downfaulted in Pleistocene to Recent time in the Solomons, and from Pliocene onward in the central New Hebrides; no downfaulting occurred in the northern New Hebrides.

Little is known of hydrocarbon source potential and degree of maturation. Back-reef or rapidly buried fore-reef environments may be the principal areas for source rock formation. Reefal limestones are the main potential reservoir rocks; they have, however, lost porosity locally because of recrystallization. Turbidite sandstones may form additional reservoirs, but volcanic derivation keeps permeability generally low. The main structural traps are fault-controlled near basin margins, but limited folding also occurs. The pre-Pliocene unconformity in the northern New Hebrides could generate stratigraphic traps. Water depth in the main prospective areas is several hundred to 5,000 ft (1,500 m) in the Solomons, and up to 10,000 ft (3,000 m) in the New Hebrides. Nearshore and onland prospects are extremely limited in both island arcs.

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Alternative Liquid Fuel Developments in New Zealand

Recent exploration has shown New Zealand to be an energy-rich country, except for liquid fuels. Less than one-third of the hydroelectrical and one-sixth of the geothermal potential are utilized, subbituminous coal reserves will suffice for a century or more, and very large lignite resources have been located.

The major Maui offshore gas-condensate field, found in 1969, required the commitment of large electrical generation load for its initial development. That expected load diminished, however, so that when the government established the Liquid Fuels Trust Board in 1978, to advise it on methods for reducing New Zealand's dependence on imported petroleum, the gas was