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Regional Offshore Geology of Central and Western Solomon Islands and Bougainville, Papua New Guinea

The central and western Solomon Islands and the Bougainville regions are parts of a complex island-arc system that includes an intra-arc basin and remnants of both forearc and back-arc depositional wedges. These features formed in response to episodic Cenozoic tectonism along the convergent boundary between the Pacific and Australia-India plates. Presumed early Tertiary southwest-directed subduction of the Pacific plate and associated arc magmatism were curtailed by impingement of the leading edge of the Ontong Java Plateau. Aprons of back-arc and forearc sediment were derived from highstanding parts of the arc during the late Oligocene and early Miocene. Late Tertiary arc-polarity reversal and northeastward-directed subduction of the Woodlark spreading system caused a renewal of island-arc magmatism that completed the construction of the Central Solomons Trough as an enclosed intra-arc basin.

Interpretations of multichannel profiles from 1982 and 1984 CCOP/SOPAC Tripartite Cruises of the research vessel R/V S. P. Lee indicate that the Central Solomons Trough is a composite intra-arc basin containing as much as 5.5 km of late Oligocene(?) and younger sedimentary rocks. As many as five lenticular seismic-stratigraphic units can be identified on the basis of unconformities and abrupt velocity changes. Late Miocene and younger folds and faults deform the northeast and southwest flanks of the basin. Profiles across the Kilinailau Trench show Ontong Java Plateau rocks covered by 2-4 km of trench sediment. The inner trench wall consists of folded, upfaulted, and rotated blocks of trench and forearc strata. The deep-water basin northwest of Bougainville is a southeastward extension of the New Ireland forearc basin, the southern margin of which is formed by a subsided part of the early Cenozoic arc. There, Oligocene(?) and younger basin strata, as much as 7 km thick, are deformed by pre-Pliocene faults and folds. The Buka-Green Island Ridge east of the basin is part of the late Cenozoic arc that cuts across the older arc beneath Bougainville.

Most of the conditions essential for hydrocarbon accumulation and entrapment are present in the Central Solomons Trough. However, the occurrence of suitable source and reservoir rocks has not been demonstrated. Water depths of more than 800 m pose a further deterrent to exploratory drilling.