臺灣石油地質 第二十七號
第47-72頁，15圖，民國81年12月

PETROLEUM GEOLOGY OF TAIWAN NO.27
P.47-72, 15 FIGS., DECEMBER, 1992

Basinal Framework and Tectonic Evolution of Offshore Northern Taiwan

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ABSTRACT

The tectonics of offshore northern Taiwan has been dominated by a rifting system from late Cretaceous to Pleistocene, as opposed to the extensive folding and thrusting on the island during late Miocene to Pleistocene.

Regular variation in age in both of the pre-rift sequence and the major synrift sequence of each basin suggests that the genetic of each basin type follows the evolution hypothesis of a relic back arc basin. Relic basin near the Mainland China Massif was first generated by a back arc rifting and subsequent convection induced by subduction and finally terminated by the next collision of oceanic plate or the formation of volcanic arcs. A new basin was developed in the new back arc extension center located between the old and the new volcanic arcs (Wang, 1987). If the process repeats so that the previous back arc convection ceases and is replaced by a new one, a series of back arc or relic back arc basins with fault-controlled synrift sequences and pre-rift sequences of different stages could be formed toward the Pacific Ocean.

The Okinawa Trough was thought to be a typical symmetrical late Cenozoic back arc basin (Letouzey and Kimura, 1986). Similarly, the generation of a series of back arc basins in this area can be attributed to the back arc convection mechanism caused by the subduction of the Pacific Oceanic Plate since late Cretaceous. The Tungyintao Ridge, Pengchiahsu Platform, Northern Taiwan Ridge, and other paleohighs in the Taiwan-Sinzi Zone are considered as relic volcanic island arcs. The Taiwan Basin can be regarded as a symmetrical Oligocene relic back arc basin; the South Pengchiahsu Basin and North Pengchiahsu Basin as Eocene relic back arc basins. The Tungyintao and Tahchentao Basins are Paleocene Pannonian type back arc half graben basin dominated by listric normal faults.

In the late Cenozoic, the tectonics of offshore northern Taiwan was dominated by extention and also accompanied by some transtension and transpression in which Strike-Slip Faults A, B and C are structural features of transtension. Local transpression occurs at the curvatural middle west side of the Taiwan-Sinzi Zone. Reverse faults and anticlines were not formed directly by the extensive compressional force exerted by the collision of the Pacific Oceanic Crust, but were resulted from the motion of curved strike-slip fault, possibly an interplate boundary between the Eurasian Continental Crust and the Pacific Oceanic Crust.

Based on the study of the evolution of the relic back arc sedimentary basin in this area, it was concluded that the lower Paleocene, lower Eocene and lower Oligocene should possess good source rocks because the initial rifting phase during basin evolution was possibly dominated by a restricted, anoxic, deeper water environment, a geochemically favorable condition for the preservation of organic matters.

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