**Keynote address 3**

# Tectonic framework of the Southeast Asian Tertiary basins

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Sundaland was a large peninsular landmass, which extended from Eurasia into the Indian–Pacific Ocean at the end of the Cretaceous. It may be subdivided into two tectonically distinct regions, separated by the Cretaceous–Palaeogene Rajang marginal basin of Borneo, which accumulated a thick turbidite fan, sourced from the Mekong(?) River.

Sundaland north of the basin was cratonized during the Triassic Indosinian Orogeny, which sutured together disparate terranes of Gondwana and Cathaysia ancestry, resulting in major Early Mesozoic granites and extensive Late Mesozoic continental strata.

Sundaland south of the basin was not cratonic. It was dominated by Cretaceous volcano-plutonic arcs, ophiolite and deep water strata, microcontinents(?) and important mélange zones, together reminiscent of present day eastern Indonesia. Elimination of Early Cretaceous marginal basins by convergent tectonics is thought to have been the accretionary process for outgrowth of the landmass, from the cratonic core of the Sunda Shelf to as far eastwards as Sulawesi. Its non-cratonic nature resulted in major Late Miocene uplift of melanged ophiolitic terrains to subdivide formerly larger basins (e.g. Meratus).

The dramatic reorganization of the spreading pattern of the Indian-Pacific Ocean, 45 Ma ago (anomaly 19-20), coincided with the collision of India. Its progressive indentation into Eurasia caused clockwise oroclinal bending of Sundaland, effected by right-lateral shear on the Indosinian orogenic grain, resulting in crustal extension in the more bent regions coupled with compression elsewhere. The great Sunda arc-trench system was initiated along the margin of Sundaland, with diminished subduction northwards beneath Sumatra because it was actively dragged by India away from the impinging Indian Ocean lithosphere. It has no clearly defined Benioff Zone.

The active faulting and rifting caused river offset and capture throughout Sundaland, and the formation of major lakes, which became the beginnings of the Sundaland Tertiary basins. They first accumulated Eocene alluvium, followed by good lacustrine source rocks, before widespread marine inundation by Late Oligocene. However, basins on and to the north of the Malay Peninsula remained non-marine.

Although most basins date back to the Eocene, others were delayed till the Oligocene. The South China Sea marginal basin spreading extended from Oligocene to Middle Miocene, an extensional history shared by the Natuna, Malay and Penyu basins. The Sulu Sea marginal basin began its spreading only in the late Early Miocene, with its inter-connected rift system extending into Borneo as the Maliau and Tarakan basins.

The Rajang Basin was compressed between non-cratonic southern Sundaland and the Dangerous Grounds - Miri Zone part of Sundaland, which was pushed southwards by the Oligocene-Early Miocene opening of the South China Sea Basin. Palaeomagnetic data indicate major counter-clockwise rotation for Borneo, the mechanism of which has yet to be found—continental Australia was too far south to have caused it.

The Rajang Group was uplifted to form the Sibu Zone orogenic belt, erosion of which fed major deltas (e.g. Baram Delta), which built out over the Dangerous Grounds terrane forming the Middle Miocene to Pliocene basins of N.W. Borneo. The compression also caused topographic inversion in the West Natuna and south Malay basins.



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