HOW WIDE AND OCEANIC WAS PALAEOTETHYS?: EVIDENCE FROM PENINSULAR MALAYSIA

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Upper Palaeozoic-Mesozoic tectonic evolution of mainland Southeast Asia is complex and problematic. Speculative models which gained popularity in recent years advocate Mesozoic suturing of Gondwana-derived blocks with Laurasia/Cathaysia through progressive demise of the Permo-Triassic Palaeotethys. Such tectonic schemes regard the N-S trending Bentong-Raub Line in Peninsular Malaysia as the site along which the Palaeotethys was closed resulting in collisional suturing of the western and eastern blocks (of Gondwanan and Cathaysian ancestry respectively). The nature of the Palaeotethys that became extinct in Southeast Asia remains controversial. Tectonic models centred on subduction- collision theme either implicitly or explicitly assume a vast Palaeotethys floored by oceanic crust; related palaeogeographic reconstructions also depict a vast ocean. A minority group, on the other hand, views the Palaeotethys as nothing more than a narrow Red Sea type seaway or as an essentially ensialic sea.

The evidence from Peninsular Malaysia called upon to support or refute the assumption of a vast oceanic Palaeotethys mainly comes from (i) palaeomagnetic and palaeontological data, (ii) stratigraphic and sedimentological records, (iii) occurrence of serpentinites, and (iv) Permo-Triassic magmatism. This paper discusses these aspects to throw some light on this issue.

Available palaeomagnetic data are of uncertain value, and, as it appears, they have been interpreted according to one's own personal bias. Differing palaeontological affinity of the two blocks of Peninsular Malaysia has been emphasized in favour of a wide Palaeotethys and its subsequent extinction. Palaeontological arguments, however, are not unequivocal, and evidence against the Upper Palaeozoic Gondwanan provenance of the western block exists. It should also be realized that palaeontological contrast, by itself, is not an evidence for a wide ocean. It merely suggests the allochthonous nature of the blocks.

The geological history as recorded in the Palaeozoic-Mesozoic rocks in the Bentong-Raub suture zone are enlightening. If a vast Permo-Triassic oceanic Palaeotethys existed between the western and eastern blocks, then its disappearance has left astonishingly little trace of it in this zone. The presence of pelagic sediments has been used as an evidence for deep ocean. However, bathyal or abyssal depths do not

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necessarily imply oceanic crust, particularly in view of the fact that radiolarian cherts are not associated with spilites. The sedimentary/metasedimentary formations in the Bentong-Raub suture zone have a general easterly dip, and they are progressively younger eastward. If they represent an accretionary complex formed by scraped-off oceanic deposits, as believed by many, then such a spatial disposition is rather incongruous with easterly subduction. Of particular significance is the complete absence of Permo-Triassic deep oceanic sediments. Triassic volcaniclastic sediments are dominated by acidic tuffs suggesting strongly that Triassic basins did not develop over oceanic crust.

The single most important evidence in favour of the probable existence of a former oceanic crust comes from the occurrence of several isolated lenses of serpentinite along the Bentong-Raub suture zone. In fact the suggestion of an oceanic subduction primarily rests on this piece of evidence. Despite the presence of serpentinites, the Bentong-Raub Line does not, however, qualify to be regarded as an ophiolitic suture zone as major lithologies of an ophiolite suite (e.g. spilite/pillow basalt, cumulate basic rocks) are virtually missing. Even if it is considered as a highly dismembered ophiolitic suite, it is still difficult to explain the absence of other members, especially spilite/pillow basalt. Although amphibole schists are occasionally associated with the serpentinites, they are mostly of sedimentary parentage. Even more significant, perhaps, is the fact that serpentinite bodies are confined essentially within the Ordovician-Silurian pelitic schists. Permo-Triassic sediments are nowhere associated with ophiolitic materials in either a synsedimentary or a tectonic relationship. Evidently, the serpentinites can in no way be related to a Permo-Triassic oceanic crust. It is thus difficult to envisage a wide expanse of Permo-Triassic oceanic crust being subducted along the Bentong-Raub suture zone.

Permo-Triassic granitoid batholiths of the eastern block of Peninsular Malaysia are distinctly bimodal and are dominated by acidic rocks. They do not show any space-time-composition relationships, and Triassic potassic basic rocks occur nearer to the postulated trench site. The batholiths clearly lack characteristic features of subduction-controlled magmatism. The closure of a vast expanse of Permo-Triassic oceanic crust through easterly subduction thus seems very unlikely. The absence of typical subduction related calcalkaline magmatism in the western block of Peninsular Malaysia also precludes the possibility of westerly subduction of a Permo-Triassic oceanic crust. It is thus apparent that subducting oceanic crust was not significantly involved in the Permo-Triassic magmatism in Peninsular Malaysia.

The absence of convincing ophiolitic materials, deep oceanic sediments and subduction-type calcalkaline magamatism together clearly demonstrate that the eastern and western blocks of Peninsular Malaysia were not separated by a vast oceanic Palaeotethys. The Permo-Triassic Palaeotethys in Peninsular Malaysia was in all probability a shallow continental sea. If, however, vestiges of an oceanic crust can be seen in the serpentinites of the Bentong-Raub suture zone, then the linearity and persistent narrowness (less than 15 km in most places) of this zone point to no more than a very narrow seaway.