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SUBDUCTION-COLLISION MODELS FOR THE MALAY PENINSULA: AN APPRAISAL

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Three geologically distinct belts constitute the Malay Peninsula. The evolution and juxtaposition of these belts have been discussed in recent years in terms of subduction-collision models by a number of workers. Although extensional models have also been suggested, the basic theme of subduction-collision seems to have gained general acceptance.

The proposed subduction-collision models, which vary in details even with respect to subduction polarity and collision timing, implicitly or explicitly suggest that (i) the Bentong - Raub Line is an ophiolitic suture that marks the site of a consumed ocean basin, (ii) the Central Belt (including the eastern foothills of the Main Range) represents an accretionary complex, and (iii) subduction related arc-type calcalkaline magmatism dominates the Eastern and Central Belts. Geological evidence, however, is at variance with such assertions and casts serious doubt on the validity of such models.

Much reliance has been attached to the occurrence of serpentinite bodies in interpreting the Bentong-Raub Line as an ophiolitic suture. While serpentinites may bear testimony to the possible existence of an oceanic crust, the virtual absence of spilitic or altered basaltic lavas negates it. Serpentinite bodies,moreover, occur only within the confine of the lower Palaeozoic schists, the implication of which seems to have been overlooked. The dominance of silicic magmatism throughout the Palaeozoic and Mesozoic further testifies to the relative absence (or noninvolvement) of oceanic crust. Evidently, the different belts were not separated by a wide ocean. Proximity, however, is not supported by palaeontological mismatch which suggests wide separation. Isotopic data also indicate that the Western and Eastern Belts are underlain by different Precambrian crust. This paradox, however, disappears if transcurrent motion with large displacement is invoked.

Structural features in the Central Belt are, by and large, characteristic of an extensional terrane and not what one would expect from an accretionary complex that supposedly was squashed between the two colliding blocks. Also, the results of gravity studies suggest crustal thinning below the Central Belt contrary to the expected collisional thickening. Thus geological evidence speaks against collision, particularly during Triassic time.

Magmatism (mainly Triassic) in the Central and Eastern Belts is quite distinctive in being bimodal and predominantly subalkaline (monzonitic) type. Presence of potassic suites and lack of tonalites are also important discriminating features. This magmatic pattern contrasts with the typical arc-type calcalkaline magmas, but resembles those found usually in extensional environments such as continental rift, hot spot, back arc basin, and broadly post-orogenic setting. Back arc setting, if invoked, would require a westerly subduction along a trench located to the east of the Eastern Belt, not along the Bentong-Raub Line. Post-orogenic setting would, on the other hand, necessitate the presence of earlier calcalkaline magmatism for which presently there is no clear evidence. Spreading-ridge subduction is an interesting alternative but it is possible only if ridges are higher order tectonic features.

The geological records briefly outlined above do not support a passage from an oceanic subduction to a continental collision, instead warrant a tectonic scheme on the basis of an overall extensional framework. Currently available data are somewhat equivocal and hence no unique model can be constructed. A combination of transcurrent motion with mantle diapirism seems to provide a viable scheme. This envisages an earlier dominance of strike-slip tectonics (leaky transcurrent fault) which brought two geographically separated blocks into juxtaposition without oceanic subduction, followed by mantle diapirism which created an extensional rift-type environment with attendant crustal thinning, high heat flux and magmatism. The transition fróm transcurrent phase to diapiric phase probably occurred during Permian effecting significant changes in structural style.

Viewed in a broader perspective, the geotectonic evolutionary pattern of the Malay Peninsula seems to support the idea of a narrow Tethys and Tethyan shear.