Poster 13

Towards a geodynamic model for Peninsular Malaysia: evidence from high Ba-Sr rocks from the Central Belt of Peninsular Malaysia

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Peninsular Malaysia has been divided into three belts, namely the Western, Central and Eastern Belt. The boundary between the Western and Central belts has been drawn by joining occurrences of serpentinite bodies into a line called the Bentong-Raub Line (Hutchison, 1975, 1977). Recently, Metcalfe (2000) proposed this line to represent a suture zone which forms a boundary between the Gondwana derived Sibumasu and Indochina terrane. New trace elements data from the gabbro, syenite and monzonite of the Central Belt of Peninsular Malaysia showed that they have very high LIL elements i.e. Ba (2401–10,744 ppm; mean: 4,590 ppm) and Sr (578–2,340 ppm; mean: 1,000 ppm). The elements are nearly 1,000 times rock/mantle. Further north, Cobbing *et al.* (1992) recorded a sample from the Boundary Range batholith (near Kuala Krai area) has 9,836 ppm Ba and 344 ppm Sr, (Sr content, however much less than the Raub rocks). Occurrence of high Ba and Sr rocks from the Raub area may indicate the influence of mantle plume. The high Ba and Sr values probably result from the penetration of the lower lithosphere by a small volume of the mantle material that is enriched in those elements (cf. Green and Wallace, 1988; Ionov *et al.*, 1993; Rudnick, 1993). Evidence of the interactions with mantle material is provided by the occurrence of mafic enclaves and mafic synplutonic dykes everywhere in this area.

The data is consistent with melting of cooler, thickened, metasomatised mantle lithosphere when a hot plume-like asthenospheric linear diapir impinged against a mafic lower crust. Some of these mantle magma stalled and crystallized at the base of the crust and subsequently partial melting formed the granitic magma as the asthenospheric upwelling increased. Any tectonic model of Peninsular Malaysia must be refined to take into account the mantle underplating beneath the Central Belt.

Subduction-Collision models (Mitchell, 1977) must be refined to include the rise of hot asthenosphere. One likely explanation is a 'slab breakoff' model which is a natural consequence of ocean closure which is plausible from strength and buoyancy consideration. This would account for the long linear belt of high-K, calc-alkaline magma some with high characteristic trace elements signatures such as high Ba and Sr. However other characteristics of 'slab breakoff' such as the presence of picrites, komatiite and exhumation of high P continental slices have yet to be demonstrated for Peninsular Malaysia.

'Aborted rift' (Tan, 1976; Khoo & Tan, 1983) and 'Mantle plume' models can explained the rise of the hot asthenosphere due to a mantle plume. The crust underwent crustal thinning leading to the formation of the graben structures. However this model need to invoke a subsequent continental subduction that engulfed a small or narrow ocean of limited extent to account for the absence of mantle derived magma and the emplacement of a large volume of peraluminous type magma in the Western Belt. Other features such as the presence of picrite and komatites have yet to be demonstrated. Magmatic provinces associated with mantle plumes have equant shapes and sizes which fit the Central Belt granite but the long linear arrangement is more difficult to explain.