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GEODYNAMICS OF CENOZOIC BASINS IN NORTHERN SUNDALAND AREA

K. R. CHAKRABORTY
UNIVERSITY OF MALAYA

Cenozoic basins in northern Sundaland region have developed in continental intraplate setting. Geodynamical aspects of their evolution are poorly understood, and currently available data do not permit any detailed analysis. A qualitative evaluation of the basin-forming mechanisms and relevant forces is attempted through integration of various lines of evidence including the following: (i) predominance of extensional structures, (ii) episodic magmatic events (iii) high heat flow, (iv) triple junction of rift grabens, (v) continental to marine sediment sequence in many basins. These features and other geological evidence are somewhat equivocal and can be accommodated in both time-dependent lithospheric stretching and thermal perturbation models.

The main problem of lithospheric stretching models concerns the source/ origin of the required horizontal tensional force. Transtensional force induced by "extrusion tectonics" (consequent upon collision of India) has been invoked in recent years by several workers who regard these basins as wrench basins. Available evidence, in particular the timing of rifting, argues against this interpretation. (Extrusion tectonics itself as hypothesized on the basis of model study is suspect). Although the timing of rifting is not well constrained, a Cretaceous, and possibly earlier, age can be inferred based on geological evidence (dyke injection, basin stratigraphy). Thus, the initiation of rifting predates the India-Asia collisional event, and hence the proposed transtensional forces can be discounted. Lithospheric stretching is perhaps due to membrane stresses generated by the movement of Sundaland (in response to the non-sphericity of the Earth). In expanding Earth, however, lithospheric stretching is an inevitable consequence - a viable alternative.

Pre-rift doming is expected in thermal perturbation models. Although evidence for late Mesozoic doming exists, its temporal relationship with rifting cannot be precisely ascertained. Consequently the validity of thermal perturbation models remains uncertain inasmuch as doming is also possible in lithospheric stretching models. A distinct possibility exists that in this region lithospheric stretching broadly coincided with thermal perturbation.

Multiple episodes of rifting and subsidence occurred in this area with variable effects on basins. The latest rifting episode is possibly marked by the thermal event represented by alkali basaltic volcanism (mainly Late Miocene -

Opposing rotation of Malay Peninsula – Borneo (anticlockwise) and Indochina (clockwise) would impose significant variations in stress patterns in time and space. Localised compression in overall tensional environment is likely. Subsidence and uplifts of basin centres relative to margins, narrowing and widening of basins, onlaps and offlaps, differential deformation of basin fills, etc. may be attributed to such stress variations. The evolutionary patterns of Sundaland basins, thus, can only be understood when viewed in proper time-space perspective.

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