Paper 5

Inversion tectonics in the Malay Basin: Evidence and timing of events

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Pre-Oligocene half grabens of the Malay Basin suggest a tensional origin, while their uparched/folded Oligocene to upper Miocene sedimentary fills have been accepted to represent a later-stage compressional deformation. This structural inversion probably took place in middle to late Miocene time. The tensional regime has been attributed to "extrusion" of continental Southeast Asia (including the Malay Basin basement) as result of hard collision between the Indian subcontinental plate with the Asian Plate in the vicinity of Tibet. The regional compression of Miocene time was most probably the result of change in motion of the Pacific Plate from an earlier NNW direction to a westward direction combined with the buttressing effect of the northward progression of the Indo-Australian Plate. Interference by the spreading of the South China Basin may also be a factor.

New evidence of inversion tectonics in the Malay Basin comprises the following examples. (1) The planimetric shapes and patterns of fault-bounded basins along the Hinge Fault Zone on the west edge of the Malay Basin suggest them to represent pull-apart depressions formed by dextral wrenching, but the NNW-striking folds of Tertiary sediments within these depressions indicate sinistral strike-slip motion as their cause. (2) The shapes of pull-apart basins within one (Laba to Mesah) of the five major, north-trending fault zones and associated *en echelon* fracture patterns indicate sinistral wrenching, whereas drag features and approximately 30-km horizontal separation of anticlinal zones suggest dextral lateral motion. (3) The right-stepping arrays of fractures across post-Oligocene basin fill suggest sinistral wrenching on a buried NW-trending fault zone along the basin's axis. However, the east-west striking folds involving Oligocene to upper Miocene sediments display *en echelon* arrays formed by dextral transcurrent motion along the basin's axial zone.

There are indications that apart from these major changes in the regional stress regime, at least one other Late Tertiary deformational phase had occurred. Furthermore, distinct tectonic domains (characterised by different geological trends, or different patterns of folds and faults) can be recognized within the Malay Basin. For certain structural patterns it was found that the stress regimes must have been different and could not have existed contemporaneously. Hence, sequences of seismic reflectors of different domains in the Malay Basin may not be directly correlatable.

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