The relationship between heat flow provinces and structural patterns within the Malay Basin

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The average heat flow of the Malay Basin (85 mWm^{-2}) is found to be higher than the average heat flow of thermally subsiding rift or passive margins basin. The local highs and lows have values more than 90 mWm^{-2} and less than 65 mWm^{-2}, respectively. Past research on heat flow distribution attributed the causes of anomalies to basement types, thermal conductivity of sedimentary fill, and heat advection. This paper attempts to relate heat flow provinces, as defined by anomaly patterns, with major structures.

The interaction between thermal conductivity and geothermal gradient establishes the heat flow regime of a province. Heat flow types can be broadly classified as conductive and advective. A negative correlation between thermal conductivity and geothermal gradient strongly suggests conduction heat transfer, whereas positive correlation indicates advective heat transfer.

Based on heat flow information, six heat flow provinces have been demarcated. Four provinces occupy the basin axis. They are, from northwest to southeast, the north western sector (sector 1), the central sector (sector 2), the south sector (sector 3) and the south-eastern sector (sector 4). The two other provinces are north eastern edge sector (sector 5) and south western edge sector (sector 6). These two provinces are located on the northeast margin and southwest margin of the basin, respectively. The statistics of the heat flow parameters are shown in the table below.

There are three major fault systems/zones in the NW-SE orientated Malay Basin: Hinge fault system; Axial Malay fault zone and; Central Malay fault system. The first two fault systems are curvilinear and run parallel to the basin axis. The Hinge fault system delimits the western margin of the basin and Axial Malay fault zone is situated along the basin axis. Central Malay fault system consists mostly of northerly trending faults. It lies on the northeast margin of the basin. The northerly trending Kapal-Bergading tectonic line marks the boundary for two major types of fold patterns in the Malay Basin. Succinctly, west of tectonic line, folds are mostly north trending, and east of this line is the site of east-west trending folds.

The heat flow provinces are further investigated in terms of their dominant heat transfer process. Five categories of heat transfer processes are classified. The classification is along a continuum: from high conductive to high advective. These heat transfer patterns are then superimposed onto the major structural features. Attempts are made to interpret the control of the structures on the heat transfer patterns.

	Thermal Conductivity		Geothermal Gradient		Heat Flow	
Sector	W/m°K	σ	°C/km	σ	mWm^{-2}	σ
1	1.88	0.08	48	6	90	12
2	1.80	0.13	49	6	88	11
3	1.86	0.09	48	3	89	8
4	1.86	0.09	45	4	84	8
5	1.71	0.09	46	4	79	6
6			no data			
Malay Basin	1.84	0.11	47	5	86	10

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