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Geothermal energy and uranium mineralization potential of the Main Range granite province, Peninsular Malaysia

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A survey of available radioelement (U, Th and K) data suggests that the voluminous Main Range Batholith of Peninsular Malaysia can be classified as high heat production (HHP) granite. Computed heat production values vary from 3.12 to 18.58 μWm⁻

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^{3} over the entire batholith. Heat production in individual pluton varies due to differing radioelement abundances caused mainly by magmatic differentiation. The mean heat production values of the different plutons range from 5.32 to 7.72 μWm^{-3} which are comparable to, and even higher than, the values of many known HHP granites.

An evaluation of the geothermal potential of the Main Range Batholith requires heat flow data which are not currently available. Consideration of the vertical extent of the radiothermal properties, however, provides some constraints on the possible magnitude of heat flow. The Main Range Batholith probably extends downwards to a depth of about 20 km as published gravity modelling studies indicate. The depth-distribution of the radioelements is uncertain, but no downward depletion is apparent for a vertical range of about 1 km. If the mean heat production values persist even up to 15 km depth, then the heat flow for different plutons would range from about 80 to 110 mWm^{-2} without taking into account the contribution of "reduced heat flow". Similar values are also obtained if it is assumed that radioelement concentrations similar to the inferred parental magma composition (least differentiated) persist up to the base of the batholith. On the basis of above analysis, it has been possible to identify certain plutons that merit further investigations for geothermal resource studies.

Uranium deposits are not known to occur in the Main Range Batholith. Erosional loss of deposits is a possibility that needs a careful evaluation. For some plutons, however, the lack of uranium mineralization appears to be due to mineralogical control. The uranium mineralization potential should not, therefore, be evaluated mainly on the basis of whole-rock U contents.