Vestigial signal of Gondwana to Pangaea transition: U-Pb and Hf isotopic studies on 500-200 Ma magmatic zircon from Peninsular Malaysia

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Earth's Phanerozoic orogenic system is separated into two contrasting types, internal and external, which reflect two global-scale mantle convection cells that power the supercontinent cycle. Although the idealized supercontinent model proposes a uniform pattern, the dispersion and re-amalgamation process has varied through time, especially during the younger supercontinents. As Peninsular Malaysia temporary associates with Gondwana dispersal and Pangaea formation, U-Pb and Hf-isotopic studies were performed on 500-200 Ma magmatic zircons from Peninsular Malaysia to study the vestigial signal left by the transition process. The difference in magmatic zircon Hf model ages uphold the previous rationale which separates Peninsular into two blocks; West Malaya block (part of Sibusima/Sibuma terrane) houses magmatic rocks of older zircons Hf model age, while East Malaya block (part of Chanthaburi-Sukhothai-Lincang arc terrane) host the opposite. During Early Paleozoic, West Malaya block endured a contraction ending ca.460 Ma, supposedly linked to Gondwana amalgamation. Juvenile crustal inputs during ca.345 Ma experienced by East Malaya block is perhaps related to the opening and subduction of Paleo-Tethys ocean. The shift of the zircon Hf array from external to internal orogenic system around ca.345 to ca.280 Ma presumably reflects the transition from Gondwana breakup (external subduction) to Pangaea assembly (internal orogen). During 230-218 Ma, coinciding with Indosinian collision, compiled zircon Hf-isotope evolution shows East Malaya block lower crust was substituted by West Malaya block in an internal orogenic system.