

Age and genesis of Sabah ophiolite complexes in NE Borneo

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Previous studies suggest that Sabah ophiolites bear supra-subduction zone (SSZ) feature and formed during Late Triassic to Late Cretaceous, but their age and tectonic origin remain debated. This study presents bulk-rock geochemical data, zircon U-Pb dating and Hf isotope results of ophiolite complexes collected at Darvel Bay (DBO) in the southeastern Sabah and at Telupid (TPO) in the northwestern Sabah, NE Borneo, to examine their origins and tectonic implications. The crustal section of DBO is composed of gabbros, with whole rock rare earth elements (REE) display depleted light-REE (LREE) and nearly flat high-REE (HREE). In addition, their multi-element distribution patterns show depletion in large ion lithophile elements (LILE) without depleted high field strength elements (HFSE). The zircon U-Pb ages in the gabbros show values ranging from 231±5 to 210±6 Ma, and positive $\epsilon_{\text{Hf}}(\text{T})$ values from +18 to +13. This observation suggests that DBO was a fragment of Triassic ophiolite generated in Mid-Ocean Ridge (MOR) setting. On the other hand, the crustal section of TPO consists of basaltic andesites (SiO_2 up to 53 wt.%) and gabbros. Similar to DBO gabbros, both TPO basaltic andesites and gabbros show depleted LILE, LREE and nearly flat HREE without HFSE depletion, but zircon U-Pb ages in gabbros ranging from 47±2 to 42.5±0.3 Ma, and positive $\epsilon_{\text{Hf}}(\text{T})$ values from +22 to +16. The results indicate that TPO was a fragment of Eocene ophiolite generated in MOR setting. Our data suggest that not all Sabah ophiolites are Mesozoic and formed in SSZ setting as previous thought; Triassic and Eocene MOR-type ophiolites are both discovered in Sabah. Furthermore, DBO and TPO could have different origins, DBO could associate with Luk-Ulo and Meratus sutures which represent the closure of Meso-Tethys [1], whereas TPO might be related to Palawan ophiolite which is most likely to be a remnant of Proto South China Sea [2].

[1] Metcalfe (2011) *Gondwana Res.*, 19, 3-21. [2] Hall (2002) *JAES*, 20, 353-431.