

## **Discovery of Middle Triassic ophiolitic mafic-ultramafic rocks in the Nan area, northern Thailand: Geochronological, geochemical and Sr-Nd isotopic constraints on the timing of the Sukhothai Arc-Indochina Block collision**

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The mafic-ultramafic rocks in the Nan area, northern Thailand, are mainly composed of serpentinized peridotite, olivine pyroxenite and hornblende gabbro. LA ICPMS U-Pb analyses on zircons from the hornblende gabbros yield crystallization ages of 256-228 Ma with a weighted mean age of  $238 \pm 4$  Ma ( $n=15$ , MSWD=0.9), indicating Middle Triassic emplacement. These rocks have 38.14-51.96 wt.% SiO<sub>2</sub>, 7.36-41.38 wt.% MgO, 6.52-10.75 wt.% FeO<sub>t</sub> with low TiO<sub>2</sub> (0.01-0.74 wt.%), P<sub>2</sub>O<sub>5</sub> (0.01-0.02 wt.%), K<sub>2</sub>O (0.03-0.42 wt.%) contents and high *mg*-numbers (0.66-0.89). They are sub-alkaline rocks (tholeiitic), showing decreasing Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, CaO and TiO<sub>2</sub> contents but increasing FeO<sub>t</sub>, Cr and Ni with increasing MgO. The suite displays N-MORB type REE patterns with (<sup>143</sup>Nd/<sup>144</sup>Nd)<sub>t</sub> being 0.512827~0.512948 and εNd(t) +4.0~+9.4, and are characterized by consistent depletions in LREEs, significant enrichments in LILE (K, Sr, Rb, Ba) and noticeable HFSE (Nb, Ta, Th, Zr and Hf) negative anomalies. These characteristics are indicative of Late Permian-Middle Triassic sea-floor spreading, suggesting a supra-subduction affinity (SSZ-type ophiolite) and a back-arc basin setting. Geochemically, the suite is similar to the Carboniferous-Permian ophiolitic mélange in the Nan-Uttaradit belt. Associated with widespread Jurassic-Cretaceous continental sediments, our data suggests that the Paleo-Tethys Nan-Uttaradit back-arc basin didn't close until Late Triassic when the Sukhothai Arc-Indochina Block collision occurred.