

Arc-trench System of the Paleo-Tethys Ocean: Inferred from Ophiolite in the Southern Lancangjiang Belt, SW China



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Abstract: The Paleo-Tethys Ocean is usually interpreted as a Paleozoic ocean basin located between the Gondwana and Laurasia supercontinents. The Paleo-Tethyan orogenic record is well preserved in the Sanjiang area of SW China. However, ophiolites are commonly dismembered in orogenic belt, and complete ophiolite sequences are rare in the Sanjiang area. The southern Lancangjiang belt is the most complicated tectonic complex of the Sanjiang Paleo-Tethyan orogen, SW China, and is key to understanding the evolution of the orogen. In this study, we focused on mafic-ultramafic rocks in the Yakou and Banpo areas of the southern Lancangjiang belt, of which newly discovered Yakou rocks show a complete ophiolite sequence. These rocks are composed of serpentinized peridotite, isotropic and cumulate gabbros, massive and pillow basalts, and plagiogranite. Whole-rock geochemical data indicate that these rocks were formed in an oceanic ridge setting, and they show depletions in Nb, Ta and Ti, and enrichment in Pb, suggesting a supra-subduction zone affinity of a back-arc setting. Furthermore, positive $\epsilon_{\text{Nd}}(t)$ (+4.5 to +6.7) and zircon $\epsilon_{\text{Hf}}(t)$ values (+12.4 to +14.3), as well as mantle-like $\delta^{18}\text{O}$ values ($\sim 5.5\%$), suggest that these rocks were derived from a long-term depleted mantle source. All of these features suggest that the Yakou mafic-ultramafic complex represents an ophiolite suite, making it the first complete ophiolite sequence to be discovered in the southern Lancangjiang orogenic belt. The Banpo complex gabbroic rocks have similar whole-rock geochemical and Sr-Nd isotopic, and zircon O-Hf isotopic compositions to those of the Yakou complex, suggesting an N-MORB affinity. Thus, mafic-ultramafic rocks from the Banpo and Jinghong areas are most

likely dismembered ophiolite suites. Considering these various characteristics, we consider that the Yakou, Banpo, and Jinghong mafic-ultramafic complexes represent an ophiolite belt but not a magmatic arc belt. SHRIMP zircon U-Pb dating yield weighted mean ages of 305 ± 3 Ma, 310 ± 2 Ma, and 313 ± 6 Ma. Therefore, we suggest that the Banpo-Jinghong mafic-ultramafic complex represents a Late Carboniferous (313–305 Ma) ophiolite belt in the Sanjiang Paleo-Tethyan orogen of SW China. Finally, we propose that an arc-trench system could have developed in the Sanjiang Paleo-Tethyan orogenic belt of SW China during the Late Carboniferous.

Key words: ophiolite, zircon U-Pb dating, arc-trench system, southern Lancangjiang belt, Paleo-Tethys

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