

Cambrian mafic and felsic intrusions in the Mazar-Tianshuihai terrane, West Kunlun Orogen: Implications for the southward subduction of the Proto-Tethys Ocean

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The West Kunlun Orogen (WKO), recording key information for the evolution of the Proto-Tethys Ocean, is subdivided into the North Kunlun Terrane (NKT), the South Kunlun Terrane (SKT) and Mazar-Tianshuihai Terrane (MZ-TSHT). We report field observations, petrography, ages, elemental and Sr-Nd isotopic compositions of the newly identified doleritic/gabbroic and granitic intrusions in the MZ-TSHT, in attempt to better understanding of the early Paleozoic tectonic evolution of the WKO and to deciphering the process of the Tarim assemblage to Gondwana. Zircon U-Pb dating reveals that mafic and granitic rocks in Tianshuihai terrane (TSHT) emplaced at ca. ~530 Ma, while the mafic rock in the Mazar Terrane (MZT) emplaced in ca. 493 Ma. Whole-rock major and trace element geochemistry indicate a tholeiitic signature for both the Cambrian mafic rocks from MZT and TSHT. The variable concentrations of Cr (5.88-448 ppm), Ni (12.1-156 ppm) and total REE (41.46-255 ppm) and negative initial Nd isotopic compositions (-12.90 to -9.71) indicate that these Cambrian mafic rocks in the MZ-TSHT were derived from sub-lithospheric mantle source in an arc setting, with significantly upper crustal contamination and mafic minerals fractionation/cumulation. The granites in the TSHT are typical fractionated I-type granites and were generated by partial melting of Mesoproterozoic crustal sources as a result of underplating of mafic magma. The Cambrian mafic and granitic rocks in the MZ-TSHT reveal that the southward subduction of the Proto-Tethys Ocean initiated before ~530 Ma. The long-term southward subduction led to the formation of the massive early Paleozoic accretionary wedge in WKO and the final closure of the Proto-Tethys Ocean at ca. 440 Ma, which caused blocks, such as the Tarim, Qaidam and North Qilian, docking to the northern fringe of the Eastern Gondwana.