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Geochronology and Geochemistry of Middle Devonian Mafic Dykes in the East Kunlun Orogenic Belt, Northern Tibet Plateau: Implications for the Transition from Prototethys to Paleotethys orogeny

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The tectonic transition from Prototethys to Paleotethys orogeny in the East Kunlun orogenic belt is not completely clear and is a major unresolved geologic problem. Here, we present zircon chronology, whole-rock elemental and zircon Hf isotopic geochemistry for newly discovered mafic dykes from the northern part in the East Kunlun orogenic belt, to provide constraints on this issue. The studied mafic dykes are hornblende gabbros, consisting of hornblende (60~65 vol.%), plagioclase (15~25 vol.%) and augite and biotite (0~5 vol.%). LA-ICP-MS zircon U-Pb dating shows that these mafic dykes were emplaced at ca. 393 Ma. All the mafic dykes are characterized by high contents of CaO (8.82~11.48 wt.%), MgO (9.07~11.39 wt.%), V (275~336 ppm), Cr (370~467 ppm) and Ni (78.3~120 ppm), with high ratios of Mg# (63~67), flat REEs distribution and depleted $\epsilon_{\text{Hf}}(t)$ values (2.03~5.35), showing tholeiitic affinities and geochemical characteristics similar to those of mid-ocean ridge basalts. They were derived from low degree (ca. 5%~15%) partial

melting of a fertile spinel lherzolite source, which have been metasomatized by fluids introduced to the mantle by former subducted slab. The geologic-petrologic evidence suggests that the mafic dykes were emplaced in a shift tectonic setting, which related to continental rifting as a consequence of the extensional collapse related to the lithospheric thinning after the Prototethys orogeny. The delamination-induced thermal disturbance and extensional decompression triggered partial melting of the mantle and the emplacement of the mafic dykes. In conjunction with previous work, we propose that the Middle Devonian mafic dykes may be the early magmatism response to the transition from Prototethys to Paleotethys orogeny, which marking the end of Prototethys orogeny and the opening of the Paleotethys orogeny in the East Kunlun orogenic belt.

Key words: mafic dykes, geochronology, geochemistry, East Kunlun, Tethys orogeny

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