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Timing of tectonic evolution of the East Kunlun Orogen, Northern Tibet Plateau

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The East Kunlun Orogen, located at the northern Tibet Plateau, represents the western segment of the Central China Orogenic Belt which was formed by amalgamation of the North China blocks and South China blocks. It is a key to understanding the formation of Eastern Asian continent as well as the evolution of the Pangea supercontinent. Based on detailed geological mapping, geochemical and geochronological investigations, the orogen is divided into three main tectonic belts, from north to south, including the Northern Qimantagh, Central Kunlun and Southern Kunlun Belts by the Qimantagh suture, Central Kunlun suture and South Kunlun fault.

The Qimantagh suture is marked by the Early Paleozoic ophiolites outcropped in the Yangziquan, Wutumeiren, and Tatuo areas, which consist mainly of peridotites, gabbros, diabases and basalts. Besides, the ophiolite in the Wutumeiren is characterized by occurring anorthosite while the ophiolite in the Tatuo occurring chert. The basalts and diabases from both Yaziquan and Tatuo areas display depletion of Nb, Ta, P and Ti, and enrichment of LILE, suggesting a subduction related tectonic setting. LA-ICP-MS zircon U-Pb age of 421 Ma for the diabase represents the formation age of the Yaziquan ophiolite, while the U-Pb ages of 490 Ma and 505 Ma for gabbro and anorthosite, respectively, constrain the formation age of the Tatuo ophiolite. The basaltic rocks in the Wutumeiren area display flat distribution of HFSEs (such as Nb, Ta, K, La, Ce, Pr, Nd, Zr, Sm, Eu, Ti, Dy, Y, Yb and Lu) and slightly enrichment in LREEs, while the peridotites showing depletion in MREEs. The LA-ICP-MS zircon U-Pb age of 431 Ma for the gabbro represents the formation age of the Wutumeiren ophiolite. Together with regional geology, we suggest herewith a back-arc basin tectonic setting during ca. 505-421 Ma at least for the Qimantagh suture.

The Central Kunlun suture is represented by the ophiolite in the Wutuo area, which is characterized by depletion of Nb, Ta, P and Ti, and enrichment of LILEs, LREEs, K, Pb, Sr and Nd, accounting for a subduction relation setting. The gabbro yields a LA-ICP-MS zircon U-Pb age of 243 Ma, representing the formation age of the ophiolite. Taking into account of evidence from the Early Paleozoic ophiolites in the Buqinshan (Bian Qiantao et al., 2001, 2007; Li Zuochen et al., 2013; Li Ruibao et al., 2014; Liu Zhanqing et al., 2011) and the Derni areas (Chen Liang et al., 2001, 2003), the Central Kunlun ocean might be existed from Early Paleozoic to Middle Triassic time.

The Northern Qimantagh tectonic belt, to the north of the Qimantagh suture, exposes a large volume of Early Paleozoic granitic plutons and volcanic rocks. Geochemistry of the granites suggests an arc setting. LA-ICP-MS zircon U-Pb ages ranging from ca. 440 to 402 Ma constrain the time of the subduction and arc setting.

The Central Kunlun tectonic belt is characterized by occurring of Paleo-Proterozoic basement which was intruded by large amounts of Triassic granitoids. The basement represented by the Jinshuikou Group including gneisses, amphibolites and marbles, yields a protolith formation age of 2.2 Ga which was overprinted by Neoproterozoic tectono-thermal event. The plutonic intrusions display LA-ICP-MS zircon ages mainly of 260-200 Ma with minor ages of 470-400 Ma, revealing a long-lived subduction from Early Paleozoic to Late Triassic.

Taken into together all above evidence, trench-arc-back arc basin tectonics were suggested here accounting for the tectonic evolution of the East Kunlun Orogeny during Early Paleozoic to Triassic time.