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Two Contrasting Ophiolites in One Suture Zone: a Case Study from East Kunlun Orogenic Belt, North Tibetan Plateau

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Ophiolites are fragments of upper mantle and oceanic crust (Dewey and Bird, 1971; Coleman, 1977; Nicolas, 1989) that were consisting of mantle peridotites and a suite of magmatic rocks. Importantly, ophiolite suite is the key sign for the boundary between two terranes, and could be produced in varied settings, such as continent-continent or arc-continent collisions (Dilek and Flower, 2003), ridge-trench interactions (Cloos, 1993; Lagabrielle et al., 2000), and subduction-accretion orogen (Cawood et al., 2009). The typical ophiolites are formed in a single environment during a single ocean-continent conversion cycle, however, there is a special case in the North Tibetan Plateau, which is characterized by two ophiolites with different chemical affinities and ages located in one same suture zone.

The southern marginal suture of East Kunlun orogen, North Tibetan Plateau, contains numerous ophiolites including A'nyemaqen and Kuhai-Saishitang ophiolites. These ophiolites are consisting of two different ages, i.e., 555~516 Ma and 333~308 Ma (Liu,2011; Bian,2004 ; Yang, 2004; Li,2007), respectively. Large-scale island-arc- , OIB- and MORB-type basalts coexist in the earlier one, characterized by MORB-type Majixueshan gabbro (535±10 Ma), OIB-type Kuhai gabbro (555±9 Ma) and Yari volcanic arc-type gabbro (502.9±3.8 Ma). Recently, we have identified a suit of mafic dyke swarms in Kuhai area, getting the zircon age of 629.8±3.4 Ma. These dykes show high Ti contents, and geochemical similar to continental rift related basalts, which maybe the response to the breakup of Rodinia Supercontinent.

These different types of mafic rocks coexisted in one same ophiolite indicate a complex ocean opening and subduction history, maybe reflect a heterogeneous mantle source and emplacement process during the formation of ophiolites. As same time as the Main Brasiliano block separated from the south Rodinia Supercontinent during the Late Neoproterozoic, the East Kunlun terrane may drift to north alone and represent the initial opening of the Proto-tethys ocean. During the Early Cambian, the oceanic basin between East Kunlun Terrane and Laurasia became mature, with the formation of numerous oceanic island- and mid-oceanic ridge-basalts. Since the Late Cambian, the subduction of the Proto-tethys ocean Initiated, and closed no later than the Early Devonian. Different types of mafic rocks coexisted in one same ophiolite demonstrate it is confusing to classify an ophiolite only based on their geochemistry simply. It is possible that what we investigating are continually evolved fragments of oceanic crust and upper mantle, which are formed in varied geodynamic settings and emplaced at different positions. Therefore, identifying the different types mafic rocks in one ophiolite, reconstructing their primary emplaced positions, and establishing the temporal-spatial evolution framework are vital to discriminate the types of one complex ophiolite.

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