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Petrogenesis of Oceanic Island Basalt from A'nyemaqen Ophiolite Mélange, North Qinghai-Tibet Plateau, China

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The A'nyemaqen ophiolite mélange is located in the East Kunlun southern marginal suture zone in the northern part of the Qinghai-Tibet Plateau (Fig. 1. Yang et al., 1996). The belt intersects the Kunlun–Altyn ophiolite belt knot in the west and links with the Mianlue ophiolite belt in the east, and is sandwiched between the Kunlun–Qilian–Qinling suture system in the north and the Paleotethyan suture system in the south (Bian et al., 2004). Determination of the age and tectonic setting of the East

Kunlun southern marginal ophiolite belt is important for understanding the tectonic framework and the evolution of the Qinghai-Tibet Plateau. However, the tectonic evolution of this belt has long been debated due to inadequate research.

The belt is 10–20 km wide and more than 400 km long, starts west of Buqingshan and extends eastward through Huashixia, Xiadawu and Majixueshan, to the east of Maging. The WNW-trending ophiolite mélangé consists

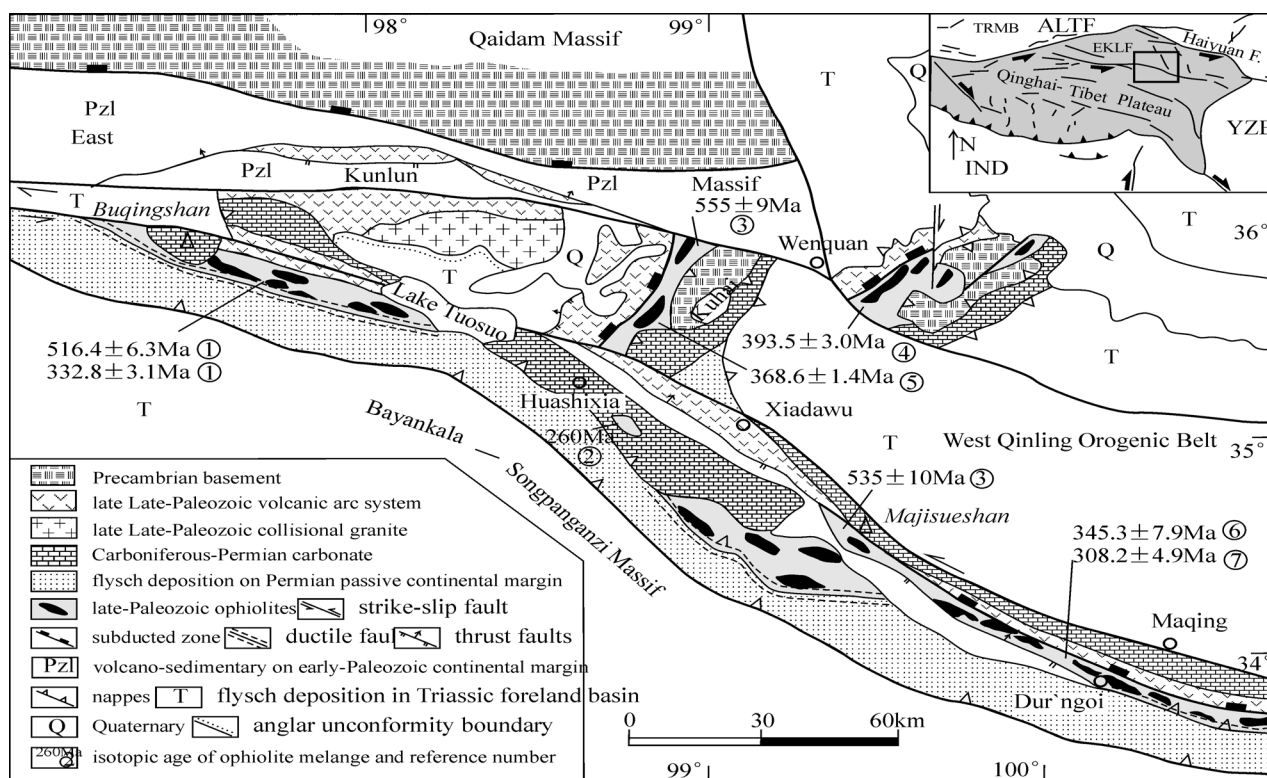


Fig.1 Geological sketch map of the A'nyemaqen ophiolite belt and the ages of ophiolitic mélange in the region (Modified after Guo et al. 2007; Yang et al., 2009)

Samples are as follows: QDM, Qaidam basin; TRMB, Tarim basin; ALTf, Altyn Tagh fault; EKLf, East Kunlun fault; IND, Indian plate; YZB, Yangtze block.
References in number: ① Liu et al., 2011; ② Jiang et al., 1992; ③ Li, 2008; ④ Sun et al., 2004; ⑤ Wang et al., 2000; ⑥ Chen et al., 2001; ⑦ Yang et al., 2004

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of metaperidotite, gabbro, diabase, pillow basalt, massive basalt and pelagic sedimentary rocks including radiolarian chert. The ophiolitic sequence is tectonically juxtaposed against each other, thus, the original internal architecture of the ophiolite is tectonically disrupted during its emplacement.

Several ophiolitic slices with ages ranging from 555 ± 9 Ma (Li, 2008) to 260 Ma (Jiang et al., 1992) have been reported in this area, demonstrating a complex accretionary history starting from Neoproterozoic (Fig. 1). In the long process of geologic evolution of the A'nyemaqen ophiolite mélange belt, some basalts in the mélange bear the signature of ocean island basalt (OIB) except mid oceanic ridge basalt (MORB) and are characterized by alkaline composition with high concentrations of $\text{Na}_2\text{O} + \text{K}_2\text{O}$ (2.2–5.5 wt.%) and TiO_2 (0.8–3.2 wt.%), enrichment in light rare earth element (LREE) and depletion in heavy rare earth element (HREE) and right-dip REE patterns on the chondrite-normalized REE distribution diagram (Guo et al., 2007). They have $(\text{La}/\text{Sm})_{\text{N}} = 3.3$, $(\text{La}/\text{Yb})_{\text{N}} = 5\text{--}10$, and high ΣREE , identical to the OIB REE pattern of Sun and McDonough (1989), and thus, possess OIB property.

Compared with the contemporaneous OIB in the Sanjiang region (Hou et al., 1996), they have the similar pattern. They also display strong geochemical similarities with the Xigaze seamount basalts suggestive of their intra-oceanic setting (Xia et al., 2008). The primitive-mantle-normalized concentration patterns of incompatible elements for the basaltic samples exhibit enrichment in incompatible elements, and no obvious Nb, Ta and Ti negative anomalies, identical to the typical OIB. We propose that these basaltic rocks were derived from a mantle plume-related magmatism associated with the evolution of the Paleotethyan Oceanic system. Subduction of the oceanic lithosphere commenced during Paleotethyan evolution stage, with the eventual accretion of the seamounts with the OIB in the fore-arc together with oceanic fragments forming the A'nyemaqen ophiolitic mélange.

Key words: ophiolite, oceanic island basalt, petrogenesis, tectonic setting, A'nyemaqen, Tibet Plateau

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