

HAN Lei, ZHANG Lifei, ZHANG Guibin, 2013. The Subducted Oceanic Crust with Two Periods of Eclogite Metamorphic Age in Yematan UHPM Terrane, North Qaidam, NW China: Evidence from Petrology, Geochemistry and Geochronology. *Acta Geologica Sinica* (English Edition), 87(supp.): 468-469.

The Subducted Oceanic Crust with Two Periods of Eclogite Metamorphic Age in Yematan UHPM Terrane, North Qaidam, NW China: Evidence from Petrology, Geochemistry and Geochronology

HAN Lei*, ZHANG Lifei, ZHANG Guibin

MOE Key Laboratory of Orogenic Belt and Crustal Evolution, School of Earth and Space Sciences,
Peking University, Beijing 100871, China

The Yematan UHP terrane is located at the eastern most of the North Qaidam UHP belt. The Yematan eclogite and peridotite occur as blocks, boudins or layers in the host para- and orthogneiss, and the discovery of coesite inclusions in zircon from the host paragneiss indicates that both the mafic/ultramafic rocks and the felsic host gneiss should be subjected to UHP metamorphism (Song et al., 2001a, 2001b, 2003b, 2006; Yang et al., 2001). Moreover, there is a very typical field cross section in Yematan area which contains four kinds of eclogite (Bimineralic eclogite; Phengite-Epidote eclogite; Phengite eclogite and Epidote eclogite), serpentized peridotite (some peridotite even contain garnet (Mattinson et al., 2007)), garnet-bearing pyroxenite (Song et al., 2003a) and the host para- and orthogneiss.

Song et al. (2003a, 2003b) report peak P-T conditions for eclogites are 29 to 32 kbar and 631 to 687°C. SHRIMP U-Pb dating of zircon from four eclogites in this area yields weighted mean ages of 449 to 422 Ma (Mattinson et al., 2006), and they suggest that the 25 m.y. age range reflects the duration of eclogite-facies conditions, whereas there is another opinion that eclogite with metamorphic age of 457 Ma and coesite-bearing zircon grains in pelitic gneisses with peak metamorphic age of 423 Ma represent the evolution from 457 Ma oceanic subduction (to continental Collision with peak metamorphic age of 423 Ma (Song et al., 2006). Therefore, whether there is an evolution from oceanic subduction to continental Collision or it just a duration of eclogite-facies conditions is a hot topic question. Here, we report the two periods of eclogite facies metamorphism to represent oceanic and continental subduction individually based on the studies of petrology, geochemistry and geochronology from the Yematan UHP terrane.

Zircon U-Pb LA-ICP-MS dating shows that the eclogites have a protolith age of 496 ± 11 Ma and two periods of eclogite-facies metamorphic ages of 440.3 ± 3.9 Ma and 418.3 ± 5 Ma respectively. The two periods of eclogite-facies metamorphic ages from one eclogite sample should represent the age of oceanic subduction and continental subduction respectively. Sr-Nd isotope data indicate that the protoliths of eclogites ($[^{87}\text{Sr}/^{86}\text{Sr}]_i \sim 0.704-0.723$; $\epsilon_{\text{Nd}}(T) \sim -3.4 - 7.6$) are of mantle origin (e.g., ocean crust and OIB signatures). The presence of quartz exsolution in omphacite and Phase equilibrium calculations suggest that the Yematan eclogites have undergone ultrahigh pressure metamorphism (2.6-2.8 GPa, 600-650°C of oceanic subduction and 2.7-2.9 GPa, 750-800°C of continental subduction). These data indicate the Yematan eclogites may be the relics of subducted oceanic crust follow by the continental subduction during Ordovician-Silurian times and ultimate continent collision, therefore, the Yematan UHPM terrane should record a complete evolution history from oceanic subduction to continental subduction.

Key words: North Qaidam, Yematan Eclogite, UHP metamorphism, Oceanic subduction, Continental subduction

References

- Mattinson C G, Menold C A, Zang J X, Bird D K, 2007. High- and ultrahigh-pressure metamorphism in the North Qaidam and South Altyn Terranes, western China. *International Geology Review*, 49: 969-995.
- Mattinson C G, Wooden J L, Liou J G, et al., 2006. Age and duration of eclogite-facies metamorphism, north Qaidam HP/UHP terrane, western China. *American Journal of Science*, 306: 683-711.
- Song S G, Yang J, Katayama I, et al., 2001a. Zircons and their inclusions from various rocks in the Dulan UHP metamorphic

* Corresponding author. E-mail: 15201471025@126.com

- terrane, the North Qaidam, NW China, UHPM workshop 2001: Fluid/slab/mantle interactions and ultrahigh-P minerals: Tokyo, Japan, Waseda University, 116–120.
- Song S G, Yang J S, Liou J G, et al., 2003a. Petrology, geochemistry and isotopic ages of eclogites from the Dulan UHPM terrane, the North Qaidam, NW China. *Lithos*, 70: 195–211.
- Song S G, Yang J, Wu C, Liou J G, et al., 2001b. Petrology, geochemistry, and isotopic ages of eclogites in the Dulan UHPM terrane, the North Qaidam, NW China, Sixth International Eclogite Conference: Niihama, Japan, 150.
- Song S G, Yang J S, Xu Z Q, et al., 2003b. Metamorphic evolution of the coesite-bearing ultrahigh-pressure terrane in the North Qaidam, northern Tibet, NW China. *Journal of Metamorphic Geology*, 21: 631–644.
- Song S G, Zhang L F, Niu Y L, et al., 2006. Evolution from oceanic subduction to continental collision: a case study of the Northern Tibetan Plateau inferred from geochemical and geochronological data. *Journal of Petrology*, 47 (3): 435–455.
- Sun, S.S, McDonough, W.F., 1989. Chemical and isotopic systematics of oceanic basalt: implications for mantle composition and processes. In: Saunders, A.D., Norry, M.J. (Eds.), *Magmatism in the Ocean Basins*. Special Publication, vol. 42. Geological Society, London, 313–345.
- Yang J S, Xu Z Q, Song S G, et al., 2001. Discovery of coesite in the North Qaidam Early Paleozoic ultrahigh pressure metamorphic belt, NW China. *Sciences De La Terre Et Des Planets*, 333: 719–724.