ZHANG Li, YANG Jingsui, LIAN Dongyang, LIU Fei, ZHAO Hui, HUANG Jian andYANG Yan, 2015. Gongzhucuo Massif: An Ever Slightly Depleted Peridotite in the Western Yarlung Zangbo Ophiolitic Belt of Southern Tibet. *Acta Geologica Sinica* (English Edition), 89(supp. 2): 117-119.

Gongzhucuo Massif: An Ever Slightly Depleted Peridotite in the Western Yarlung Zangbo Ophiolitic Belt of Southern Tibet

ZHANG Li[1, 2], YANG Jingsui[1, 2,3, *], LIAN Dongyang[2, 3], LIU Fei[2], ZHAO Hui[1], HUANG Jian[1] and YANG Yan[1]

1 School of Earth Sciences and Resources, China University of Geosciences, Beijing 100083, China
2 CARMA, State Key Laboratory forContinental Tectonics and Dynamics, Institute of Geology, Chinese Academy of Geological Sciences, Beijing 100037, China
3 Faculty of Earth Sciences, China University of Geosciences, Wuhan 430074, China

The Gongzhucuo ophiolite, located near Lake Gongzhu in SW Tibet, occurs in the southern ophiolite sub-belt along the western YarlungZangbo suture zone. It is is mainly composed of harzburgitic and lherzolitic upper mantle peridotites, intruded by mafic dikes. The mantle peridotites consist of olivine (Fo_{89-91}) and orthopyroxene (En_{85-90}) with minor clinopyroxene (En_{44-51}) and spinel (spinel in harzburgites $Cr^{\#}$=17–20；spinel in lherzolites $Cr^{\#}$=13–20). Compared to primitive mantle, the Gongzhucuo peridotites have relatively high MgO (in harzburgites average: 43.13wt%; in lherzolites average: 41.40wt%), and relatively low Al_2O_3 (in harzburgites average: 1.64 wt%; in lherzolites average: 2.16wt%), CaO (in harzburgites average: 1.60wt%; in lherzolites average: 2.29wt%), and TiO_2 (in harzburgites average: 0.03wt%; in lherzolites average: 0.04wt%). Their mineral chemistry and whole rock geochemistry show an affinity to abyssal peridotites, and their total rare-earth element (REE) contents (in harzburgites ΣREE=0.662–1.096 ppm, average: 0.923; in lherzolites ΣREE=0.904–3.784 ppm, average: 1.912) are significantly lower than those of the primitive and depleted mantles. Chondrite-normalized REE patterns of the Gongzhucuo mantle peridotites display a slight enrichment in LREE, suggesting late-stage modification. Primitive mantle–normalized spider diagrams exhibit large positive U anomalies, small positive Nd anomalies, large negative anomalies of Zr, and both positive and negative anomalies of Sr. Their platinum group element (PGE) contents (in harzburgites 15.26.26–25.23 ppb，average: 20.06; in lherzolites 18.81–26.86 ppb ppm，average: 22.98) are homogeneous. Chondrite–normalized diagram shows a generally flat pattern with narrow range of IPGE as compared to PPGE, characteristic of partial melting residues. However, most samples have Pd/Ir, Pd/Pt and Rh/Ir ratios that are higher than primitive mantle- and C1 chondrite, indicating that they may not simply represent partial melting residues. Results of our modeling of partial melting suggests that the Gongzhucuoperidoties represent the residues after 3–11% near-fractional partial melting (using the REE model after Krishnakanta, 2013 shown in Fig. 1) or 9%–16% batch partial melting (using the partial melting model based on the PGEs and Cu versus Al_2O_3 after Marchesi, 2013 shown in Fig. 2) in the spinel stability field. Compared to the Purang and Xiugugabu ophiolites, the Gongzhucuo ophiolite probably formed in a different tectonic setting and underwent lower degrees of partial melting. The Gongzhucuo mantle peridotites represent the residues after low-degrees of partial melting in the spinel stability field beneath a mid-ocean ridge environment, however, the U-shaped chondrite-normalized REE patterns suggest some minor late-state modification.

Acknowledgements

Thanks for advisement and revise of professor Paul T. Robinson, Y. Dilek, and Julian A. Pearce. This research was jointly by grants from the Ministry of Science and Technology of China (2014DFR21270), China Geological Survey (12120115026801, 12120115027201, 201511022) and the Fund from the State Key Laboratory of Continental Tectonics and Dynamics (Z1301-a20).

References

Krishnakanta, A.S., 2013. Petrology and geochemistry of Abyssal Peridotites from the Manipur Ophiolite Complex,

* Corresponding author. E-mail: yangjsui@163.com

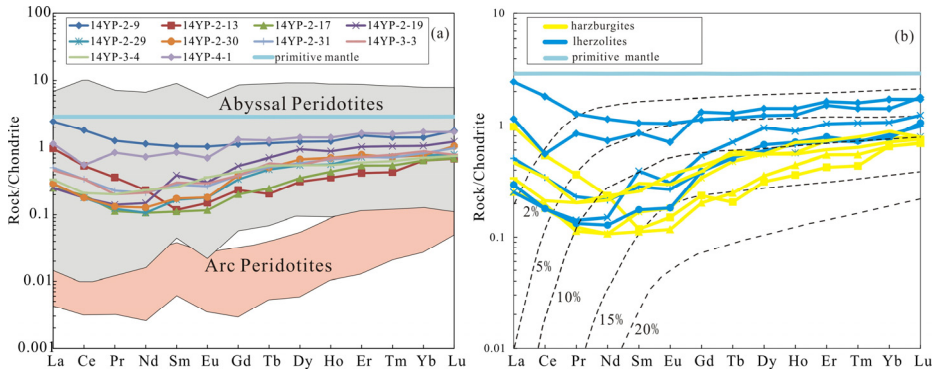

Fig. 1. Chondrite−normalized REE patterns for the mantle peridotites from Gongzhucuo ophiolite (chondrite value after Sun, 1989). (a), the gray region represents compositional variations of abyssal peridotites (after Niu (2004))；the pink region represents compositional variations for arc peridotites from Izu−Bonin−Mariana (after Parkinson and Pearce (1992)); (b), Dash lines are the range of model residual mantle compositions calculated using the modelling of near-fractional melting for different amounts of melt extraction (2%–20%)melting within the spinel stability field（after Krishnakanta , 2013).

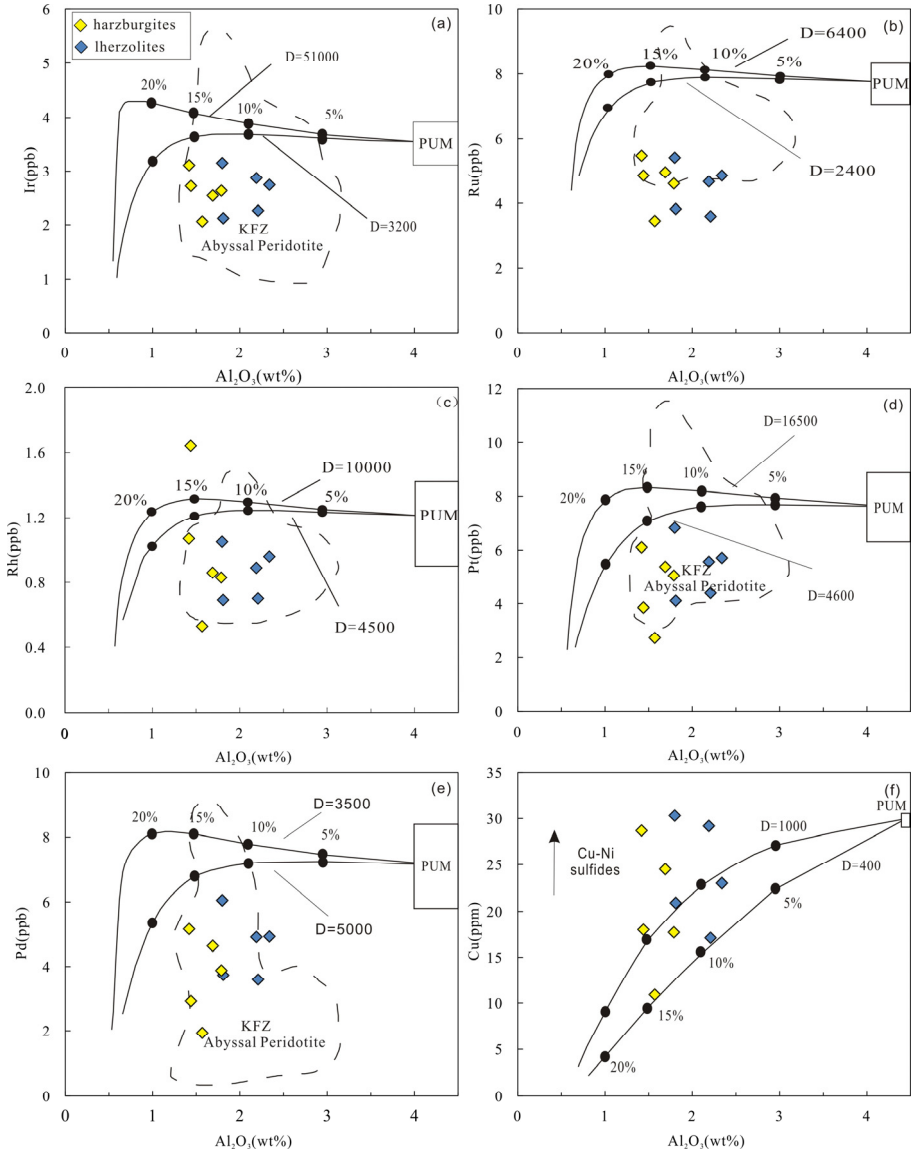

Fig. 2. Plots of PGEs and Cu versus Al_2O_3 for mantle peridotites from Gongzhucuo ophiolite (after Marchesi, 2013). (a), Ir-Al2O3; (b), Ru-Al2O3; (c), Rh-Al2O3; (d), Pt-Al2O3; (e), Pd-Al2O3; (f),Cu-Al2O3. KFZ abyssal peridotite, abyssal peridotite from the Kane Fracture Zone (after Luguet (2003)); PUM, primitive upper mantle (after Mcdonough, 1995).

Indo-Myanmar Orogenic Belt, Northeast India: Implication for melt generation in mid-oceanic ridge environment. *Journal of Asian Earth Sciences*, 66: 258–276.

Luguet, A., Lorand, J., and Seyler, M., 2003. Sulfide petrology and highly siderophile element geochemistry of abyssal peridotites: A coupled study of samples from the Kane Fracture Zone (45 W 23 20N, MARK Area, Atlantic Ocean). *Geochimica et Cosmochimica Acta*. 67(8): 1553–1570.

Marchesi, C., Garrido, C.J. and Harvey, J., 2013. Platinum-group elements, S, Se and Cu in highly depleted abyssal peridotites from the Mid-Atlantic Ocean Ridge (ODP Hole 1274A): Influence of hydrothermal and magmatic processes. *Contributions to Mineralogy and Petrology*, 166(5): 1521–1538.

Mcdonough, W.F., and Sun, S., 1995. The composition of the Earth. *Chemical geology*, 120(3): 223–253.

Niu Yaoling, 2004. Bulk-rock major and trace element compositions of abyssal peridotites: implications for mantle melting, melt extraction and post-melting processes beneath mid-ocean ridges. *Journal of Petrology*, 45(12): 2423–2458.

Parkinson, I.J, Pearce, J.A., and Thirlwall, M.E.A., 1992. Trace element geochemistry of peridotites from the Izu-Bonin-Mariana forearc. *Leg*, 125: 487–506.

Sun Xianshu and Mcdonough, W.F., 1989. *Chemical and isotopic systematics of oceanic basalts: implications for mantle composition and processes*. Geological Society, London, Special Publications, 42(1): 313–345.