HAN Qingsen, PENG Songbai, Ali POLAT and Timothy KUSKY, 2016. A Paleoproterozoic (Orosirian) Ophiolitic Mélange, North Yangzte Craton. *Acta Geologica Sinica* (English Edition), 90(supp. 1): 215-216.

A Paleoproterozoic (Orosirian) Ophiolitic Mélange, North Yangzte Craton

HAN Qingsen[1,2], PENG Songbai[1,2,*], Ali POLAT[3,4] and Timothy KUSKY[1,2,3]

1 School of Earth Sciences, China University of Geosciences, Wuhan 430074, China
2 Center for Global Tectonics, School of Earth Sciences, China University of Geosciences,
3 Wuhan 430074, China3.State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan 430074, China
4 Department of Earth and Environmental Sciences, University of Windsor, Windsor, ON N9B3P4, Canada

Ophiolites represent fragments of ancient oceanic lithosphere, tectonically incorporated into continental margins during plate subduction or remained in the subduction–collisional orogenic belt. They provide important information on the operating time, the mechanism of the tectonic plates, global tectonic evolution as well as the reconstruction of the supercontinent. As the only area exposed representative Archean continental crust, Huangling dome is an important window to study the early crustal evolution of the Yangtze craton. Recent research on Huangling dome provides important records of the high-grade metamorphism and post-collisional magma related to paleoproterozoic collisional orogeny.

In this contribution, we report for the first time a suite of Paleoproterozoic (Orosirian) ophiolitic mélange belt (named Shuiyuesi Ophiolitic Mélange) exposed in the Archean–Paleoproterozoic Kongling Complex from the northern Huangling Dome. The mélange belt is 3-12km wide, and contains a structurally complex tectonic mixture of garnet gneiss, mica-graphite schist, marble, quartzite, banded iron formation (BIFs), and tectonic blocks of metamafic-ultramafic blocks/slices and TTG gneisses. Metamafic-ultramafic rocks commonly occur as lenses, boudins and layers within the metamorphic supracrustal rocks are composed mainly of serpentinized harzburgite, meta-olivine pyroxenite, metapyroxenite and amphibolite (metadiabase, metagabbro and metabasalt). Geochemical characteristics show that serpentinized harzburgite are LREE-enriched metasomatic abyssal residual mantle peridotite, the meta-olivine pyroxenites, metapyroxenites are cumulates at supra-subduction zone influenced by subduction fluid. The amphibolites are tholeiitic rocks, and characterized by flat to light enriched LREE patterns, enriched LILE patterns (e.g. K, Rb, Ba, Th, Cs), and negative anomalies of HFSE (e.g., Nb, Ti) suggesting a supra-subduction zone (SSZ) environment. The amphibolites have formation age of ca. 2150Ma and eHf (t) values range from +5.35 to +10.26 (average=+7.2) and TDM1=2.24 Ga. All units in the mélange have suffered paleoproterozoic (2.0–1.95Ga) amphibolite-granulite facies metamorphism and strong deformation. In addition, the formation age of quartz monzonitic dyke crosscutting the serpentinized harzburgite is 1999 Ma, giving minimum emplacement age for the mafic–ultramafic complex. The field relationships suggest that the metamafic-ultramafic blocks are possible oceanic crust fragments incorporated into the suture zone during the accretionary-collisional process. So, we inferred a southeast-dipping subduction system (present orientation) in north Huangling Dome at middle paleoproterozoic (~2.15–2.0Ga) which is end up with collision between the eastern and western microcontinents mainlmy consistant of Archean TTG gneiss.

The metamafic–ultramafic complex and meta-supracrustal rocks combined into an ophiolitic mélange suffered paleoproterozoic (2.0–1.95 Ga) amphibolite-granulite facies metamorphism related to subduction-collision orogeny. The supra-subduction zone affinity indicate a subduction–collision orogenic event during the Paleoproterozoic in the Yangtze Craton, and it has experienced a complex tectonothermal evolution involving accretion of a number of continental blocks. In this case, the Shuiyuesi mélange belt may represent a relict suture zone between micro-continents that constitute the Yangtze Craton. And it provides important geological evidence for the Paleoproterozoic accretion-collision orogenic events associated with the amalgamation of the global Columbia supercontinent.

* Corresponding author: E-mail: psongbai@aliyun.com

Acknowledgements

This study was supported by the fundings (No. 41272242) from National Natural Science Foundation of China.

References

Dewey, J. F., 1977. Suture zone complexities: A review. Tectonophysics, 1977, 40(1): 53-67.

de Wit, M. J., Hart, R.A. and Hart, R.J., 1987. The Jamestown Ophiolite Complex, Barberton mountain belt: a section through 3.5 Ga oceanic crust. Journal of African Earth Sciences, 6(5): 681-730.

de Wit M. J., 2004. Archean greenstone belts do contain fragments of ophiolites. Developments in Precambrian Geology, 13: 599-614.

Dilek, Y. and Furnes, H., 2011. Ophiolite genesis and global tectonics: Geochemical and tectonic fingerprinting of ancient oceanic lithosphere. Geological Society of America Bulletin, 123(3-4): 387-411.

Dong, S.W., Zhang, Y.Q., Gao, R., Su, J.B., Liu, M. and Li, J.H., 2015. A possible buried Paleoproterozoic collisional orogen beneath central South China: Evidence from seismic-reflection profiling. Precambrian Research, 264: 1-10.

Evans, D.A.D., Mitchell, R.N., 2011. Assembly and breakup of the core of Paleoproterozoic–Mesoproterozoic supercontinent Nuna. Geology, 39(5): 443-446.

Furnes, H., Dilek, Y. and de Wit, M., 2015. Precambrian greenstone sequences represent different ophiolite types. Gondwana Research, 27(2): 649-685.

Han, Q.S., Peng, S.B., Cen, Y.,Jiang, X.F. 2015. Discovery and Tectonic Significance of Paleoproterozoic Ophiolite from North Huangling Dome, Yangtze Craton. Acta Geologica Sinica (English Edition), 89(s2): 25-25.

Kusky, T.M., 2004. Precambrian ophiolites and related rocks, 13. Elsevier, xiii, 748 pp.

Kusky, T.M., Polat, A., 1999. Growth of granite–greenstone terranes at convergent margins, and stabilization of Archean cratons. Tectonophysics, 305(1): 43-73.

Kusky, T.M., Windley, B.F., Safonova, I., Wakita, K., Wakabayashi, J., Polat, A., Santosh, M., 2013. Recognition of plate stratigraphy in accretionary orogens through Earth history: A record of 3.8 billion years of sea floor spreading, subduction, and accretion. Gondwana Research 24, 501-547.

Meert, J.G., 2012. What's in a name? The Columbia (Paleopangaea/Nuna) supercontinent. Gondwana Research, 21 (4): 987-993.

Moores, E.M., 2002. Pre–1 Ga (pre-Rodinian) ophiolites: Their tectonic and environmental implications. Geological Society of America Bulletin, 114(1): 80-95.

Nance, R.D., Murphy J.B., Santosh M., 2014. The supercontinent cycle: a retrospective essay. Gondwana Research, 25(1): 4-29.

Nicolas, A., 1989. Structures of ophiolites and dynamics of oceanic lithosphere, 4. Kluwer Academic Publishers, xiii, 367 pp.

Pearce, J.A., 2008. Geochemical fingerprinting of oceanic basalts with applications to ophiolite classification and the search for Archean oceanic crust. Lithos, 100(1-4): 14-48.

Polat, A., Wang. L., Appel. P. W. U., 2015. A review of structural patterns and melting processes in the Archean craton of West Greenland: Evidence for crustal growth at convergent plate margins as opposed to non-uniformitarian models. Tectonophysics, 662: 67-94.

Rogers, J.J.W. and Santosh, M., 2002. Configuration of Columbia, a Mesoproterozoic Supercontinent. Gondwana Research, 5(1): 5-22.

Rogers J.J.W., Santosh M., 2003. Supercontinents in Earth history. Gondwana Research, 6(3): 357-368.

Wakabayashi, J., Dilek Y., 2011. Introduction: characteristics and tectonic settings of mélanges, and their significance for societal and engineering problems. Geological Society of America Special Papers, 480: v-x.

Yin, C.Q., Lin, S.F., Davis, D.W., Zhao, G.C., Xiao, W.J., Li, L.M. and He, Y.H., 2013. 2.1-1.85 Ga tectonic events in the Yangtze Block, South China: Petrological and geochronological evidence from the Kongling Complex and implications for the reconstruction of supercontinent Columbia. Lithos, 182: 200-210.

Zhao, G.C., Cawood, P.A., Wilde, S.A. and Sun, M., 2002. Review of Global 2.1–1.8 Ga Orogens: Implications for a pre-Rodinia Supercontinent. Earth-Science Reviews, 59(1): 125-162.

Zhao, G.C., Sun, M., Wilde, S.A. and Li, S.Z., 2004. A Paleo-Mesoproterozoic supercontinent: assembly, growth and breakup. Earth Science Reviews, 67(1): 91 - 123.