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Age and geochemistry of the Neoproterozoic granitoids in the the Songnen–Zhangguangcai Range Massif, NE China: Petrogenesis and tectonic implications

LUAN Jinpeng, XU Wenliang*, WANG Feng, WANG Zhiwei and GUO Peng

College of Earth Sciences, Jilin University, Changchun 130061, China

Abstract

The Songnen–Zhangguangcai Range Massif (SZRM) is located in the eastern Central Asian Orogenic Belt and crops out over an extensive part of NE China. The massif was originally thought to contain numerous Precambrian terranes (e.g., Xingdong, Dongfengshan, Yimianpo and Zhangguangcailing groups). However, more recent zircon U–Pb dating indicates that the majority of these so-called Precambrian sedimentary and igneous rocks actually formed during either the Paleozoic or Mesozoic and contain only minor Precambrian components (Wang et al., 2014). The presence of Neoproterozoic and Paleoproterozoic detrital zircons with magmatic origins from and Paleozoic units of the SZRM indicating that this area occurs Proterozoic magmatism (Wang et al., 2014), whereas no Proterozoic magmastism has been found. Recently, Pei et al. (2007) reported the ca. 1800 Ma magmastism, as evidenced by the data of exploration drillholes in the southern Songliao basin. However, an alternative view is that the basement within the SZRM is predominantly Phanerozoic, as evidenced by the presence of Paleozoic fossils and comparatively rare geochronological data (Guo and Liu, 1985; Wu et al., 2011), meaning that the ca. 1800 Ma rocks in this area may be a tectonically emplaced slice of the North China Craton (Zhang et al., 2005). All of this means that the age and nature of the SZRM basement, and whether this area records Neoproterozoic magmatism, remain unclear.

This study presents new geochronological, whole-rock geochemical, and zircon Hf isotopic data for early Proterozoic granitoids within the eastern margin of the SZRM of NE China. These data provide insights into the Neoproterozoic tectonic setting of the SZRM and the links between this magmatism and the evolution of the Rodinia supercontinent.

The zircon U–Pb dating indicates that the Neoproterozoic magmatism within the SZRM can be subdivided into two stages: (1) a ~917–911 Ma suite of syenogranites and monzogranites, and (2) an ~841 Ma suite of granodiorites. The 917–911 Ma granitoids contain high concentrations of SiO_2 (67.89–71.18 wt.%), K_2O (4.24–6.91 wt.%), and Al_2O_3 (14.89–16.14 wt.%), and low concentrations of TFe_2O_3 (1.63–3.70 wt.%) and MgO (0.53–0.88 wt.%). They are enriched in the light rare earth elements (LREE) and the light ion lithophile elements (LILE), are depleted in the heavy REE (HREE) and the heavy field strength elements (HFSE; e.g., Nb, Ta, and Ti), and have slightly positive Eu anomalies, indicating they are geochemically similar to high-K adakitic rocks. They have zircon ε_{Hf}(t) values and T_{DM2} ages from –4.4 to +1.5 and from 1915 Ma to 1592 Ma, respectively, suggesting they were derived from a primary magma generated by the partial melting of ancient thickened lower crustal material. In comparison, the 841 Ma granodiorites contain relatively low concentrations of Al_2O_3 (14.50–14.58 wt.%) and K_2O (3.27–3.29 wt.%), relatively high concentrations of TFe_2O_3 (3.78–3.81 wt.%) and the HREE, have negative Eu anomalies, and have zircon ε_{Hf} (t) values and T_{DM2} ages from –4.7 to +1.0 and from 1875 to 1559 Ma, respectively. These granodiorites formed from a primary magma generated by the partial melting of ancient crustal material. The ~917–911 Ma magmatism within the SZRM is inferred to have formed in an orogenic setting, whereas the ~841 Ma magmatism formed in an anorogenic setting related to either a post-orogenic tectonic event or the onset of Neoproterozoic continental rifting. It is proposed that the microcontinental massifs within the SZRM formed during or following the final stage of assembly of Rodinia before rifting away from the Tarim Craton in response to Rodinia breakup.

* Corresponding author. E-mail: xuwl@jlu.edu.cn

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References

Guo, C.K., Liu, J., 1985. *Basement and cover features of Songliao Basin.* In: Contributions to Structural Geology, Editional Board of Contributions to Structural Geology, vol. 4 (in Chinese). Geological Publishing House, Beijing, pp. 133–139.

Pei, F.P., Xu, W.L., Yang, D.B., Zhao, Q.G., Liu, X.M., Hu, Z.C., 2007. *Zircon U–Pb geochronology of basement metamorphic rocks in the Songliao Basin*. Chinese Science Bulletin 52, 942–948.

Wang, F., Xu, W.L., Gao, F.H., Zhang, H.H., Pei, F.P., Zhao, L., Yang, Y., 2014. *Precambrian terrane within the Songnen–Zhangguangcai Range Massif, NE China: Evidence from U–Pb ages of detrital zircons from the Dongfengshan and Tadong groups.* Gondwana Research 26, 402–413.

Wu, F.Y., Sun, D.Y., Ge, W.C., Zhang, Y.B., Grant, M.L., Wilde, S.A., Jahn, B.M., 2011. *Geochronology of the Phanerozoic granitoids in northeastern China*. J. Asian Earth Sciences 41, 1–30.

Zhang, Y.B., Wu, F.Y., Zhai, M.G., Lu, X.P., 2005. *Tectonic Setting of the Helong Block: implications for the northern boundary of the eastern North China Craton*. Science in China (D) 48, 1599–1612.