GEODYNAMICS & TECTONOPHYSICS

PUBLISHED BY THE INSTITUTE OF THE EARTH'S CRUST
SIBERIAN BRANCH OF RUSSIAN ACADEMY OF SCIENCES

2017 VOLUME 8 ISSUE 3 PAGES 593–594 ISSN 2078-502X

https://doi.org/10.5800/GT-2017-8-3-0300

Proceedings of the Second Russia–China International Meeting on the Central Asian Orogenic Belt (September 6–12, 2017, Irkutsk, Russia)

COMPARISON OF DEEP CRUSTAL COMPOSITIONS BETWEEN THE QINLING-DABIE OROGEN (CHINA) AND CENTRAL ASIAN OROGENIC BELT AND IMPLICATIONS FOR UNDERSTANDING ACCRETIONARY AND COLLISIONAL OROGENIC PROCESSES

X. X. Wang[1], T. Wang[2], C. H. Ke[1], H. Huang[2], Y. Tong[2], Y. Yang[1], D. W. Hong[2]

[1] *Institute of Mineral Resources, Chinese Academy of Geological Sciences, Beijing 100037, China*
[2] *Institute of Geology, Chinese Academy of Geological Sciences, Beijing 100037, China*

For citation: *Wang X.X., Wang T., Ke C.H., Huang H., Tong Y., Yang Y., Hong D.W.*, 2017. Comparison of deep crustal compositions between the Qinling-Dabie orogen (China) and Central Asian Orogenic Belt and implications for understanding accretionary and collisional orogenic processes. *Geodynamics & Tectonophysics* 8 (3), 593–594. doi:10.5800/GT-2017-8-3-0300.

It is generally considered that there are different continental compositions between a subductional–collisional and an accretionary orogen, however, what are the differences and how to identify them has not been well understood. This study attempts to discuss this problem by comparing Nd isotopic compositions of granitoids in the Qinling-Dabie orogen, a typical subductional-collisional orogen, with those in southwestern segment of the Central Asian Orogenic Belt (CAOB), the world's largest phanerozoic accretionary orogenic belt.

The Qinling-Dabie orogen is one of the main orogenic belts in Asia and mainly consists of four distinct blocks. These are, from north to south, the North China craton (NCC), the North Qinling belt (NQB), the South Qinling belt (SQB) and the South China craton (SCC). Voluminous Paleozoic and Mesozoic granitoids in the Qinling Orogen have $\varepsilon_{Nd}(t)$ values from −21.9 to −10.9 in the southern margin of the NCC, from −14 to +5.4 in the NQB, from −10 to −1.8 in the SQB and from −6.5 to −3.2 in the northern margin of the SCC. Correspondingly, Nd model ages (T_{DM}) vary from 2.82 to 1.47 Ga, 2.38

to 0.73 Ga, 1.79 to 1.13 Ga and 1.52 to 1.25 Ga, respectively [*Wang et al., 2015*]. These results indicate the southern margin of the NCC with old basement rocks, the SQB and the northern margin of the SCC with slightly older basement rocks and the NQB with more complex basement rocks. Mesozoic granitoids in the Dabie orogen show $\varepsilon_{Nd}(t)$ values ranging from −22 to −8, corresponding T_{DM} from 1.8 to 2.0 Ga [*Hong et al., 2003*]. It suggests old basement rocks, being similar to those of the NCC, for the Dabie orogen.

The CAOB, bounded by the Siberian craton to the north and the Tarim-North China craton, is the most important site of Phanerozoic continental growth on the Earth (e.g. [*Şengör et al., 1993; Jahn et al., 2000; Kovalenko et al., 2004*]), even if the growth was probably overestimated [*Kröner et al., 2014*]. The southwestern CAOB, comprising from north to south the Altai orogen (or terrane), Junggar terrane, Tianshan and Beishan orogens, is a typical area for the CAOB. The Paleozoic and Mesozoic granitoids of the central Altai show εNd(t) = −5 to +2 with TDM=1.6–1.1 Ga, the Western Junggar εNd(t) = +3 to +9 with TDM=0.8 to 0.4 Ga, the Eastern Junggar εNd(t) = +2 to +8 with TDM=0.9 to 0.5 Ga and the Tianshan and Beishan with large ranges of εNd(t) values and TDM [*Wang et al., 2009*]. These data suggest that the central Altai has a remnant of a reworked (old) continental terrane, the Junggar terrane a juvenile accretionary complex (mélange), the Tianshan and Beishan orogens with both juvenile and old recycled crust.

All these signatures indicate that the granitoids in the Qinling-Dabie orogen and CAOB have significant differences in Nd isotopic compositions, suggesting different deep crustal compositions for them. Compared with the CAOB the Qinling-Dabie orogen has much older compositions and less crustal growth (juvenile materials) during Phanerozoic time, and it is not an accretionary orogen, particularly in the Dabie, a typical collisional orogen. This comparision also implies that an accretionary orogen may be regarded as a "young" orogen and it can evolve into an "older" collisional orogen, such as the Qinling orogen, a composited orogen preserving voluminous juvenile subductional-accretionary compositions, while in the Dabie orogen, juvenile accretionary and oceanic crusts were subducted. This study reveals that isotopic compositions of magmatic rocks can trace deep compositions of orogens and provide significant information for understanding compositions and evolution stages (from juvenile accretionary, subductional to collisional) of orogens.

References

Hong D.W., Wang T., Tong Y., Wang X.X., 2003. Mesozoic granitoids from North China Block and Qinling-Dabie-Sulu Orogenic Belt and their deep dynamic process. *Earth Science Frontiers* 10 (3), 231–256.

Jahn B.M., Wu F.Y., Chen B., 2000. Granitoids of the Central Asian Orogenic Belt and Continental Growth in the Phanerozoic. *Transactions of the Royal Society of Edinburgh: Earth Sciences* 91 (1–2), 181–193. https://doi.org/10.1017/S0263593300007367.

Kovalenko V.I., Yarmolyuk V.V., Kovach V.P., Kotov A.B., Kozakov I.K., Sal'nikova E.B., Larin A.M., 2004. Isotope provinces, mechanisms of generation and sources of the continental crust in the Central Asian Mobile Belt: geological and isotopic evidence. *Journal of Asian Earth Sciences* 23 (5), 605–627. https://doi.org/10.1016/S1367-9120(03)00130-5.

Kröner A., Kovach V., Belousova E., Hegner E., Armstrong R., Dolgopolova A., Seltmann R., Alexeiev D.V., Hoffmann J.E., Wong J., Sun M., Cai K., Wang T., Tong Y., Wilde S.A., Degtyarev K.E., Rytsk E., 2014. Reassessment of continental growth during the accretionary history of the Central Asian Orogenic Belt. *Gondwana Research* 25 (1), 103–125. https://doi.org/10.1016/j.gr.2012.12.023.

Şengör A.M.C., Natal'in B.A., Burtman V.S., 1993. Evolution of the Altaid tectonic collage and Palaeozoic crustal growth in Eurasia. *Nature* 364 (6435), 299–307. https://doi.org/10.1038/364299a0.

Wang T., Jahn B.M., Kovach V.P., Tong Y., Hong D.W., Han B.F., 2009. Nd–Sr isotopic mapping of the Chinese Altai and implications for continental growth in the Central Asian Orogenic Belt. *Lithos* 110 (1–4), 359–372. https://doi.org/10.1016/j.lithos.2009.02.001.

Wang X.X., Wang T., Ke C.H., Yang Y., Li J.B., Li H.Y., Qi Q.J., Lv X.Q., 2015. Nd-Hf isotopic mapping of Late Mesozoic granitoids in the East Qinling orogen, central China: Constraint on the basements of terranes and distribution of Mo mineralization. *Journal of Asian Earth Sciences* 103, 169–183. https://doi.org/10.1016/j.jseaes.2014.07.002.