Lithospheric delamination in post-collisional setting: evidence from intrusive magmatism from the North Qilian orogen to southern margin of the Alxa block, NW China

LIQI ZHANG[1], HONGFEI ZHANG[1*]

[1] State Key Laboratory of Geological Processes and Mineral Resources and School of Earth Science,China University of Geosciences,Wuhan 430074,P.R. China
(correspondence: hfzhang@cug.edu.cn)

Post-collisional granitoids are widespread in the North Qilian and southern margin of the Alxa block and their petrogenesis can provide important insights into the lithospheric processes in a post-collisional setting. This paper carries out an integrated study of U-Pb zircon dating, geochemical and Sr-Nd-Hf isotopic compositions for five early Paleozoic intrusive plutons from the North Qilian to southern margin of the Alxa block. The geochronological and geochemical results show that their magmatism can be divided into three periods and also have different geochemical features. The early-period intrusive rocks (~440 Ma) include the Lianhuashan (LHS) and Mengjiadawan (MJDW) granodiorites. Both of them display high Sr/Y ratios (52-91), coupled with low Y and HREE contents, implying that they were derived from partial melting of thickened crust, with garnet in the residue. The middle-period intrusive rocks (~430 Ma), including the MJDW quartz diorites and Yangqiandashan (YQDS) granodiorites, are high-K calc-alkaline with low Sr/Y values. And they show similar I_{Sr} (0.7068-0.7073), $\varepsilon_{Nd}(t)$ (-3.1 to -2.3) and $\varepsilon_{Hf}(t)$ (-0.7 to +0.5) values, implying that they are generated from partial melting of lower crust without garnet in the residue. The late-period intrusive rocks (414-422 Ma), represented by the Shengrongsi (SRS) and Xinkaigou (XKG) plutons, are A-type or alkali-feldspar granites. The geochemical and isotopic data suggest that they are derived from partial melting of felsic crustal material under low pressure condition. Our data show decreasing magma crystallization ages from MJDW pluton in the north and LHS pluton in the south to the SRS and XKG plutons in the central part of the study area. We suggest that such spatial and temporal variations of magmatic suites were caused by lithospheric delamination after the collision of the Central Qilian and the Alxa block. A more plausible explanation is that the delamination propagated from the margin part of the thickened lithosphere to inward beneath the North Qilian and southern margin of the Alxa block.