Geochemical Features of the Caledonian Granites in the Beihuaiyang Structural Belt, Eastern Dabie Mt

WU Weiping*, PENG Zhi, JIANG Laili and DONG Xiaoping

Anhui Institute of Geology, Hefei, Anhui, China

Along the north margin of the Dabie Mt, the Beihuaiyang structural belt extends from the Nanxiang Basin in the west to the Tancheng-Lujiang Fault in the east, but is separated from the Dabie Orogen in the south by the Tongcheng-Tongbai Fault and from the North China Landmass in the north by the Minggang-Feizhong Fault. Based on structural difference itself, the Dabie Orogen has long been divided into two parts by the Shangcheng-Macheng Fault, to the west of which the Beihuaiyang structural belt hosts the Caledonian and Hercynian granites, but so far there has not been any a definite report of occurrences of Paleozoic magmatic rocks to the east. Now, the question is raised: Does the Beihuaiyang structural belt of the eastern Dabie Mt contain similar Paleozoic arc granite as found in Mafan, Guangshan, western Dabie Mt.? This is very important to locating the suture of the eastern Dabie Mt. and understanding its structural framework. A dating of 467.5±7.5Ma was obtained from gneissic granite in the Luzhenguan complex in the Beilou area in the Beihuaiyang structural belt, eastern Dabie Mt., indicating the existence of the Caledonian granite there indeed.

The proposed Paleozoic magmatic arc is of great importance to determination of the location of suture and structural framework of eastern Dabie Mt.

1 Geological setting and field evidence

The gneissic granite lies in the Beilou area, northern Beihuaiyai, Dabie Mt., to the south of the Guishan-Meishan Fault. It has been found in Beilou, Gaoshuitian and Zaohe in Tiechong Township, Jinzhai County, extending EW and outcropped in an area of 3km2. Granitic gneiss intruded into greenschist and quartzite of the Luzhenguan complex in the Beilou area in the Beihuaiyang structural belt, eastern Dabie Mt., indicating the existence of the Caledonian granite there indeed.

The proposed Paleozoic magmatic arc is of great importance to determination of the location of suture and structural framework of eastern Dabie Mt.

2 Petrological and petrographic features

Monzonitic granite is dominant, grey-greyish white in color, grained and crystalloblastic in texture, and weakly gneissic-massive in structure. It consists of Paleozoic magmatic rocks to the east. Now, the question is raised: Does the Beihuaiyang structural belt of the eastern Dabie Mt contain similar Paleozoic arc granite as found in Mafan, Guangshan, western Dabie Mt.? This is very important to locating the suture of the eastern Dabie Mt. and understanding its structural framework. A dating of 467.5±7.5Ma was obtained from gneissic granite in the Luzhenguan complex in the Beilou area in the Beihuaiyang structural belt, eastern Dabie Mt., indicating the existence of the Caledonian granite there indeed.

The proposed Paleozoic magmatic arc is of great importance to determination of the location of suture and structural framework of eastern Dabie Mt.

3 Petrogeochemical features

Petrochemically, the Beilou granite falls into the area of monzonitic granite on the CIPW’s Q-A-P chart, with high content of SiO2 in a range of 73.91%-76.02%, an average of 74.72%, of acid rocks. It has high total alkali, with Na2O+K2O being 6.59 in average, Na2O/K2O 1.2-1.75, 1.33 in average, belonging to sodium series. It falls into the sub-alkaline area on the total alkali-silica diagram, with ACNK being 0.85-1.13, 1.0 in average, showing an evolving trend from metaluminous to peraluminous. The composite index of 1.1-1.6 indicates a calc-alkaline series, projected into the area of calc-alkaline rock series on the SiO2-K2O diagram. Differentiation index (DI) is 84.21-91.38, 86.16 in average, implying higher degree of evolution of the magma.

In terms of REE, all rocks show strong depletion of Nb,
Ti and P, characterizing igneous rocks of zone of subduction or continental crust-source rocks. Large ion lithophile elements such as Rb, Ba and Th are enriched, with Rb being 53.4 ppm in average, Ba 911.67 ppm in average. Sr is relatively low, 227.83 ppm in average, usually showing negative anomaly on spider diagram of leading elements, with Rb/Sr being 0.08-0.44, higher than that of usual plagioclase granite and similar to that of arc rock. Sr/Y ratio, changing within 9.09-22.03, is low in general.

Total REE in the rock, 54.1 ppm-128.33 ppm, 96.74 ppm in average, is relatively low, with LaN/YbN being 5.48-9.45, an indication of moderate REE fractionation. Eu anomaly is evident with δEu being 0.54-0.78, 0.68 in average, showing a right-dipping "seal gull" on REE normalized ratio diagram. In a few cases, HREE shows depletion, suggesting that the rocks may have been subjected to a crystallization differentiation with hornblende and plagioclase as major phases of separation.

4 Tectonic setting and implications

On tectonic setting trace element discrimination diagram, all samples fall into the area of magma arc granites, indicating that the Beilou granite probably formed in arc environment.