5.5.34

Petrology and origin of the Sewariya granite, Northwestern India

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The Sewariya granite is the largest of the Erinpura granitoid intrusions in the Middle-Late Proterozoic South Delhi fold belt of Northwestern India. It occurs between the Banded Gneissic Complex-Ras Marble Formation on the northwest and supracrustals of the South Delhi fold belt on the southeast. Two main phases of the granite are represented by the biotite granite and younger tourmaline-bearing leucogranite. The bulk of the batholith is represented by biotite granite, which is a coarse grained porphyritic rock showing evidence of deformation. It contains up to 25% alkali megacrysts in a medium to coarse grained groundmass composed of alkali feldspar, quartz, plagioclase, biotite and muscovite, with a range of accessory minerals. The younger leucogranite phase is a non-foliated medium to fine grained muscovite-rich granite consisting of quartz, sodic plagioclase, K-feldspar, muscovite and tourmaline, with minor apatite, garnet and fluorite. A number of tungsten-mineralized quartz veins and zoned pegmatite veins with rare lithium phosphate minerals are found intruding the Sewariya granite.

Geochemically the Sewariya granite is characterized by high silica, moderate alumina, higher P_2O_5, Rb, Li and F with higher K_2O/Na_2O, Rb/Sr ratios and lower TiO_2, MgO, Zr, Sr and K/Rb ratios. The peraluminous nature of the granitoid is evident by the normative corundum, higher A/CNK ratios and biotite composition. In terms of mineralogy and major element characteristics, the Sewaria granite shows S-type granite affinity. The leucogranite has a higher Nb/Zr, Rb/Y and Rb/Sr ratios in comparison to the earlier phase. The Sewariya granite is LREE-enriched, with average Ce_N/Yb_N of 2.8. A large negative Eu anomaly is evident.

The peraluminous mineralogy and volatile-rich composition indicate that the Sewariya granite is derived by melting of sedimentary source rocks. The trace element data show affinity with the orogenic and within plate granite.

5.5.41

Post-collisional granitoids in the Dabie orogen of China: Zircon U-Pb age, element and oxygen isotope geochemistry

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While evidence of recycling of subducted oceanic crusts is well known from oceanic island basalts, it is less known whether recycling of subducted continental crusts took place in continental collision belts. The Dabie-Sulu orogenic belt in east-central China is characterized by not only the largest distribution of Triassic UHP metamorphic rocks in the world, but also the most profound occurrence of post-collisional magmatism. The post-collisional igneous rocks are composed of voluminous, coeval granitoids and minor mafic-ultramafics of Early Cretaceous age. The granitoids consist of hornblende-bearing intermediate rocks and hornblende-free granites. Zircon SHRIMP U-Pb dating, major and trace elements of whole-rock, oxygen isotope composition of mineral separates were determined in this study for some of post-collisional granitoids in the Dabie orogen.

Our results show that these granitoids are characterized by strong LREE enrichment and negative HFSE anomalies (Nb, Ti and P). Zircon U-Pb dating yields ages of 121 to 135Ma for magma crystallization and 113 to 119Ma for post-magmatic hydrothertmal overgrowth. Inherited cores are observed by CL images and SHRIMP dating in some zircon grains, which yield older ages of 693 to 785Ma in agreement with protolith ages of UHP metaigneous rocks in the this orogen. There is a large variation in oxygen isotope ratios of minerals and their host rocks (whole rock: 0.07‰ to 7.13‰, quartz: 5.13 to 8.66‰, orthoclase: 0.55 to 7.71‰, plagioclase: -4.88 to 6.96‰, zircon: 4.14 to 6.11‰). Most of the zircons have $\delta^{18}O$ values similar to the normal mantle zircon (5.3±0.3‰).

A comparison of the post-collisional granitoids with the metamorphic complex in North Dabie shows that they have many element and isotope features in common, and thus a genetic relationship between them. The metaigneous rocks of intermediate composition would originally be located in middle to lower crustal levels that are similar to the TTG orthogneisses in North Dabie, the latter may serve as a source for the hornblende-free granites. The hornblende-bearing intermediate rocks are probably generated by amphibole-dehydration melting of garnet- and amphibole-bearing metabasalts in the lower crust. Therefore, the subducted crust of the Yangtze plate became thickened during the Triassic collision, and partially melted in the Early Cretaceous due to mantle superwelling.