Petrology, geochemistry, and zircon U-Pb-Hf isotopes of the Quxu gabbro-granite complex in the southern Lhasa subterrane, Tibet: Evidence for magma mixing during the early Eocene break-off of the Neo-Tethyan slab

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Gabbro-granite complexes that form in active continental margins commonly document magma mixing processes and provide insights into regional magmatism and tectonics. Here, we present an integrated study including petrography, mineral chemistry, whole-rock geochemistry, Sr-Nd and zircon U-Pb-Hf isotopes for the Quxu intrusive complex in southern Tibet, with the aim of constraining the origin of the complex and gaining insights into the early Eocene magmatism and geodynamics of the southern Lhasa subterrane. The Quxu intrusive complex consists predominantly of tonalites, and minor gabbronorites and quartz diorites. Zircon LA-ICP-MS U-Pb dating yields crystallization ages of ~51 Ma for all lithologies in this complex. Geochemically, the gabbroic rocks, dioritic rocks, and granitoids exhibit continuous variations in most of their major- and trace-element compositions. All the lithologies in the Quxu complex have homogeneous and depleted isotopic compositions, with whole-rock initial $^{87}Sr/^{86}Sr$ ratios (I_{Sr}) of 0.7038–0.7041, $\varepsilon_{Nd}(t)$ values of +5.5 to +6.3, and zircon $\varepsilon_{Hf}(t)$ values of +8.5 to +12.9. The combined geological and geochemical data indicate that the Quxu intrusive complex originated from magma mixing between mafic and felsic end-members in varying proportions. Our results also indicate that break-off of the Neo-Tethyan oceanic slab was responsible for the generation of the Quxu complex and, more generally, for the early Eocene magmatism in the southern Lhasa subterrane.