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Role of fractional crystallization in the petrogenesis of the Nyemo Igneous Complex in the Gangdese arc, South Tibet

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The continental crust is generally produced at magmatic arcs. The processes leading to the production of granitoids in continental arcs are key to understand the growth and evolution of the continental crust. In this study, we present an integrated study of field geology, petrography, geochronology, and geochemistry for the Nyemo Igneous Complex (NIC) in the Gangdese arc, South Tibet. The NIC comprises gabbros, monzogabbros, monzonites, monzodiorites, and monzogranites from deep to shallow. The full sequence of the NIC samples have zircon U-Pb ages of ~90 Ma and consistent Sr-Nd-Hf isotopic compositions. The field and petrographic observations and geochemical data reveal that the NIC record a fractional crystallization sequence composed of olivine + Fe-Ti oxides + pyroxene + plagioclase +biotite + K-feldspar. Based on the early crystallization of biotite and absence of amphibole, we conclude that the intermediate-felsic rocks in NIC were formed by crystallization differentiation of a damp (low H_2O), non-primitive basalt at middle crust. The intermediate-felsic rocks display high Sr/Y (33-116) and $(La/Yb)_N$ (10-21) ratios. Petrographic observation and positive correlation between Sr/Nd and Eu/Eu* indicate that the high Sr/Y rocks are cumulates formed by plagioclase + K-feldspar + biotite and interstitial melt. Our data do not support widespread fractionation of garnet/amphibole nor partial melting of juvenile lower crust in the petrogenesis of these melts.