Neoproterozoic mafic dikes and granitoids from Emeishan pluton on the western margin of the Yangtze Block, SW China, and their geological significance

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Voluminous mid-Neoproterozoic mantle plume activities-related volcano-sedimentary sequences and intrusions on the west-northern margin of the Yangtze Block, South China. The understanding the origin of the Emeishan granitoid intrusion and the spatially associated mafic dikes in the region is crucial for unravelling the tectonic evolution and continental crust growth processes in the Yangtze Block. SIMS zircon U–Pb dating suggests that the granitoids (ca. 818 ± 30 Ma) and mafic dikes (814 ± 43 Ma) are contemporaneous. The Emeishan granitoids have high SiO_2 (69.11–70.50 wt.%), $Na_2O + K_2O$ values of 3.52–4.13% and Al_2O_3 assays of 14.16–14.47%, and low assays of CaO (1.78–2.03%), MgO (0.72–0.91%). They show LREE-enriched REE patterns (La/Yb_N = 7.2–12.3) with negative Eu anomalies. The mafic dikes have low SiO_2 (48.09-48.65 wt.%), K_2O (1.94-2.12 wt.%) and Na_2O (1.64-1.75 wt.%), Mg# value of 61.67-62.26, and are characterized by enrichment in large ion lithophile elements (LILEs) and depletion in high-field strength elements (HFSEs), suggesting that their source was devired from mantle materials. The primitive-mantle-normalized incompatible element distributions between the Neoproterozoic Emeishan mafic dikes and the Hawaiian alkali basalts (Feigenson et al., 1996) are similar. Both the mafic dikes and granitoids share similar zircon εHf(t) values (0 to +9.1, -1.7 to +11, respectively), and zircon ^{18}O values (4.47‰ and 10.41‰, 4.24‰ and 12.05‰, respectively), and ten low-^{18}O zircon grains were discovered, suggesting that the granitoids might be generated by partial melting of juvenile basaltic crust and protolith affected by high-temperture water-rock interaction. Based on its plume-related geochemical affinity and contemporaneous plume-related magmatism, the Emeishan pluton is proposed to be generated in a mantle-plume setting during mid-Neoproterozoic.