Zircon U-Pb/Hf and Sr-Nd isotopic data of magmatic rocks from the Lohit Plutonic Complex, Eastern Himalayan Syntaxis: Implications for subduction of the Neotethyan slab along Southeast Asia

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The Transhimalayan batholiths exposed in the northern part of the Himalayan range were emplaced in the early Jurassic and Eocene, as a result of subduction of the Neotethyan oceanic lithosphere beneath Asia prior to the India-Asia collision. In-situ zircon U-Pb and Hf isotopic data in association with geochemical data of intrusives from the Lohit Plutonic Complex (LPC) of eastern Himalayan syntaxis were generated to constrain the petrogenesis and tectonic environment of the Transhimalayan batholiths of the Southeast Asia. The LPC is extensively exposed over large part of the Dibang and Lohit valleys of Arunachal Pradesh, India. It overlies the Indus Tsangpo suture zone tectonically on the Lohit Thrust and comprises diorite, gabbro and trondhjemite, garnet-sillimanite gneisses, marble and leucogranite. The zircon U-Pb ages of gabbro and diorite suggest two distinct stages of magmatic activity, i.e. ~145 and ~100-90 Ma, respectively. The $(^{176}Hf/^{177}Hf)_i$ data range from 0.2820 to 0.2832. Zircons in both gabbro and diorite samples show positive $\varepsilon_{Hf}(T)$ values between +11 and +20 and plot in and around the depleted mantle line in the $\varepsilon_{Hf}(T)$-t(Ma) diagram, suggesting crystallization from the juvenile crust or depleted mantle derived melts, as also constrained by the low initial $^{87}Sr/^{86}Sr$ ratios (0.7038 to 0.7045) and high positive $\varepsilon_{Nd}(t)$ values (+2.941 to +5.906). Geochemical data show both gabbro and diorite have calc-alkaline signature with metaluminous character containing low alumina saturation index values ranging from 0.61 to 0.90. The enrichment of large-ion lithophile elements relative to high field strength elements with highly depleted negative Nb anomaly suggests their origin in a subduction related environment. The isotopic and geochemical results of the LPC are similar to the I-type granitoids of Gangdese batholith in Tibet and significantly recommend that the intrusives of the LPC were emplaced during the Cretaceous due to the Neotethyan subduction along Southeast Asia.