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The nature and influence of magmatism during transcurrent tectonics: geochemical perspectives on geophysical constraints in Western Yunnan

REN-ZHI ZHU

Department of Geology, Northwest University

Presenting Author: rzzhunwu@163.com

The widespread leucogranite magmatism in southern Tibet is closely linked to the uplift of Tibet and the Himalaya and the southeastward extrusion of the Tibet Plateau, but there remains a lack of geochemical data from such magmas beneath SE Tibet since Miocene. New high-precision SIMS zircon U-Pb data reveal a continuum of magma activity in the eastern margin of Eastern Himalayan Syntaxis (EHS) over 2 Ma (16.5–14.5 Ma). These leucogranites have high SiO_2 (70.8-74.3 wt.%) and moderate Rb/Sr (~0.85) and Sr/Y (~12.3) ratios, rather distinct from those high Sr/Y crustal melts. Variable $\varepsilon_{Hf}(t)$ (-14.6 to -4.6) values and $\delta^{18}O$ (+4.88 to +11.1‰) in zircons suggest that they are heterogeneous metasedimentary melts. High $^{87}Sr/^{86}Sr_{(i)}$ (0.7122 to 0.7125 for bulk, 0.7102 to 0.7133 for plagioclase) and $\varepsilon_{Nd}(t)$ (-9.6 to -11.1), combined with P-T calculated results from biotite and zircon, suggest an anatexis of the mid to lower crust condition (~750-841℃, 0.5-0.9 GPa). The north-south-trending outcrop location of coeval leucogranites and potassic rocks in southern Tibet coincides with the east-west extensional structures active since early Miocene. This data couples well with geophysical observations that argue that the occurrence of high-temperature melts in the mid-lower crustal depth could facilitate crustal flow within a “jelly sandwich” mid-lower crustal model, and also suggests that the widespread mid-lower crustal melting can decrease the rigid crust to a viscous one, which is conducive to the change in deformation style from escape to ooze, and from fast- to slow-rotation of the SE plateau around the EHS.