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Heavy mineral analysis and detrital U-Pb ages of the intracontinental Paleo-Yangzte basin, SE margin of Tibetan Plateau

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The Paleo-Yangtze Basin is hypothesized to have connected the Sichuan, Xichang and Chuxiong basins during the Late Mesozoic to Early Cenozoic. The Paleo-Yangtze Basin subsequently fragmented later in the Cenozoic, which makes it challenging to decipher its provenance shifts and the exhumation of the surrounding hinterland. Heavy mineral analyses combined with detrital apatite, rutile and zircon U-Pb dating were employed to elucidate the stratigraphic signatures and exhumation patterns along the eastern margin of the Tibetan Plateau during the Late Cretaceous to Paleogene. Two key horizons have been identified across these basins based on their detrital mineralogy: a garnet-rich horizon within the southern Sichuan Basin, and a garnet-poor horizon in the Xichang and Chuxiong basins. Furthermore, there is a distinct increase in (garnet-zircon) GZi and (apatite-tourmaline) ATi indices in the Upper Cretaceous Gaokan Formation in the Sichuan Basin, indicating increased sediment input from metamorphic and granitic sources as a result of enhanced uplift and exhumation during the Late Cretaceous. A subsequent decrease in these indices in the Sichuan Basin during the Early Paleogene is attributed to the tectonic quiescence of the western Yangtze region during the Early Cenozoic. It should be noted that a contemporaneous decrease in ATi and RZi indices in both the Xichang and Chuxiong basins sections is observed from the Upper Cretaceous to the Paleogene. Detrital apatite, rutile and zircon U-Pb ages from the Sichuan, Xichang and Chuxiong basins share similar characteristics, and the zircon U-Pb data are dominated by age peaks of ca. 2600-2200 Ma, ca. 1900-1700 Ma, ca. 900-600 Ma, ca. 500-380 Ma and ca. 260-200 Ma. These data indicate a dominant source from the northwestern and northern Yangtze areas and the region around the Kangdian rift, consistent with predominant southeast- and southwest-directed palaeocurrents in these basins. We thus argue that detritus derived from the northwestern and northern Yangtze areas and Kangdian rift region fed the basins located on the western Yangtze Block throughout Late Cretaceous to Early Paleogene times. The Lanping-Simao and Khorat basins on the Indo-China block were also fed by these sedimentary source regions, indicating a major transcontinental drainage system across the western Yangtze Block.