Phanerozoic Continental Growth in Asia and The "Cimmerian Orogeny" in Tethys: A "CIA" (Caucasus/Iran/Anatolia) Perspective
亞洲的顯生宙大陸增生與特提斯的"基梅里"造山作用

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Asia that comprises numerous ancient cratonic blocks and young mobile belts is the largest composite continent on Earth. It was enlarged by successive accretion of dispersed terranes that, associated with opening and closure of the Paleo-Asian and Tethys oceans, had produced a vast amount of juvenile continental crust. The Central Asian orogenic belt (CAOB), for instance, is celebrated for its accretionary tectonics and production of massive juvenile crust in the Phanerozoic or, most significantly, in the Paleozoic. The Tethyan domain consisted of two major oceans, i.e., Paleo-Tethys in north and Neo-Tethys in south, separated by a strip of continents/terrains called the Cimmerian Continent (Sengor, 1984), most of which had begun splitting from the northern margin of Gondwanaland during Triassic time. Elimination of the Tethyan oceans by collisions of the Cimmerian Continent and subsequent Gondwana-derived terrains with Eurasia resulted in a double, largely over-printed orogenic system, i.e., the Alpine-Himalayan orogenic belt.

Here we synthesize zircon U-Pb and Hf isotope data of magmatic rocks from West and South Asia, in particular from "CIA" (Caucasus/Iran/Anatolia) and Tibet, along the eastern Tethyan orogenic belt (ETOB) or eastern part of the typically collisional Alpine-Himalayan system. The data suggest that, before collisions started, the entire region was characterized not only by Tethyan subductions but also by accretionary orogenic processes that led to the formation of a vast amount of juvenile crust from the Jurassic to Eocene or, in places, to Oligocene. Taking together, both the CAOB and ETOB appear to have evolved through time from an accretionary into a collisional system. Zircon Hf isotope data further reveal that, in contrast to generating massive juvenile crust in the earlier, accretionary stages of orogenic development, crustal recycling plays a more substantial role in the subsequent, collisional stages. The latter involves addition of older continental crust into the mantle, which in turn melted and caused compositional transformation of the juvenile crust formed in the accretionary stages. Similar features are observed in young volcanic rocks from eastern Taiwan, i.e., the northern Luzon arc and part of the complex subduction system in Southeast Asia, which may evolve one day to resemble the CAOB or ETOB by collision with the advancing Australian continent.