



## **Contrasting deep crustal compositions between the Altai and East Junggar orogens, SW Central Asian Orogenic Belt: Evidence from zircon Hf isotopic mapping**

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There are long-standing uncertainties over the deep crustal composition and basement nature of the Chinese Altai and Junggar orogens of the southwestern Central Asian Orogenic Belt (CAOB). Zircon Lu–Hf isotopic tracer techniques applied to granitoids are helpful in distinguishing old from young deep crustal compositions. This study aims to characterize the basement nature (ancient & juvenile) of the Chinese Altai and East Junggar orogens using Hf isotopic mapping of granitoids (510–200 Ma). Zircon Hf isotopic data (18 new and 98 published samples) indicate that the study area can be divided into six Hf isotopic provinces on the basis of TDMC ages: Province I, >1.4 Ga; II, 1.4–1.2 Ga; III, 1.2–1.0 Ga; IV, 1.0–0.8 Ga; V, 0.8–0.6 Ga; and VI, 0.6–0.4 Ga. Provinces I, II, and III occur mainly in the central (units 2 and 3) and southern (unit 4) Altai orogen, and have slightly positive zircon  $\varepsilon\text{Hf}(t)$  values of +0.5 to +9.1 with slightly old TDMC ages of 1.53–0.81 Ga. Provinces IV and V are mainly distributed in the northern (unit 1) and southernmost (unit 5) Altai orogen, with zircon  $\varepsilon\text{Hf}(t)$  values of +7.5 to +11.1 and young TDMC ages of 0.84–0.60 Ga. In contrast, Province VI (East Junggar orogen) has zircon  $\varepsilon\text{Hf}(t)$  values of +11.6 to +14.9, with much younger TDMC ages of 0.59–0.35 Ga, except for the small Taheir area with a negative  $\varepsilon\text{Hf}(t)$  value of –2.5 and an older TDMC age of 2.5 Ga. There is a sharp contrast between the deep crustal compositions of the Altai and Junggar orogens, which are ancient in central Altai and relatively juvenile in East Junggar. This confirms that significant Neoproterozoic–Phanerozoic continental crustal growth occurred in the southern Altai and Junggar orogens, with juvenile crust occupying ~78% of the study area, and that the CAOB is a site of significant Phanerozoic continental growth. The distribution of juvenile and ancient crust in the Altai and East Junggar orogens provides new evidence for the tectonic division of the two orogens by the Erqis fault zone, and explains the heterogeneity of crustal growth in the southwestern CAOB.