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Ridge subduction and episodes of crustal growth in protracted accretionary processes: Evidence from Paleozoic magmatic rocks of the Central Asian Orogenic Belt

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Accretionary orogenic belts are important sites for the growth of continental crust. During the long-lived evolution of accretionary orogenic belts, the growth of continental crust is restricted to relatively short time periods, and is mainly linked to the extensional tectonics [1]. Taking the Central Asian Orogenic Belt (CAOB) as an example, it is one of the largest accretionary orogenic belts on Earth, and accompanied by voluminous juvenile crust formed in the Phanerozoic [2]. However, the mechanism of crustal growth remains controversial, as implied by a variety of proposed models ranging from contributions of mantle-derived basaltic underplating in a post-collisional extensional setting to subduction-related processes in an island arc setting [2-3]. Recent research suggested that ridge subduction events played an important role in crustal growth in the CAOB [4]. To evaluate the above model, we systematically carried out petrological, geochemical, whole-rock Sr-Nd isotope and zircon U-Pb and Hf isotope analyses of Paleozoic magmatic rocks from the northern Inner Mongolia region, southeastern CAOB. In view of the temporal and spatial distribution characteristics of magmatic rocks in this area, we infer that a ridge subduction event may have occurred in this region during Late Carboniferous to Early Permian. The new data of this study, combined with the systematic statistics of zircon U-Pb age, whole-rock Sr-Nd isotope and zircon Hf isotope data in the southeastern CAOB, suggest that ridge subduction played an important role in the rhythmic growth of juvenile crust in the CAOB during the Paleozoic [5-7]. Repeated cycles of punctuated, rapid growth of juvenile crust associated with long-lived subduction systems represent a pattern that may be generalized to other Phanerozoic accretionary belts on Earth.

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