The growth history of continents delineated by compilation of detrital zircon ages

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The current understanding on the growth history of continents needs a major revision in view of granitoid recycling into the mantle. At present, Archean continental crusts occupy less than 20 % in area of the modern continents; on the other hand, various previous studies on geochemistry and thermal evolution suggest active production of the continental crust since the Hadean. Production of the continental crust and the growth of the continents in large-term should be differentiated. In order to reconstruct the secular change in continental growth from ca. 3 Ga (Meso-Archean) to the present, we conducted global compilation of detrital zircon U-Pb ages from sandstones of various depositional age in the world. Using this database, the growth patterns of continents, at the timing of ca. 2.9, 2.6, 2.3, 1,0 and 0.6 Ga, are estimated for each continent first, then overall picture was reconstructed, as follows. Before ca. 2.3 Ga (Archean and Paleoproterozoic), the production and recycling of the continental crust were likely relatively short-cycled, and the net continental growth was probably slow. The short cycle was likely driven by the numerous formation of small-sized embryonic continents, much smaller than modern ones, and by the more ubiquitous subduction. From ca. 2.3 Ga to 1.0 Ga, the average size of continent became larger, comparable to the modern ones. Especially after ca. 1.8 Ga formation of the continent Nuna, more efficient continental growth started by the accretion of island arcs to continental margins. Since ca. 1.0 Ga, the breakup of the supercontinent Rodinia, the total volume of the continental crust likely has decreased according to the more effective recycling of relatively young continental crust.

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