

Searching Hadean zircon based on growth history of the continental crust

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The granitic continental crust characterizes the Earth as water-rocky planet, and growth of it is significant for the history of the Earth and life. Especially, Hadean crust had lost from the surface of the Earth except tiny amount of zircon grains. Purpose of this study are, 1) estimating the history of the continental crustal growth and searching Hadean zircon grains by detrital zircon chronology focused on global unconformities, and 2) narrowing down the potential locality of the Hadean zircon by plotting the chronological data of detrital zircon on the paleogeographic maps which are restored based on age and shape of orogenic belts.

"Global unconformity" is major unconformity between basement units and sedimentary units which was formed by sedimentation on rift belt or passive margin, or sea-level change due to climate change after ca. 3 Ga. Sedimentary units on the global unconformity were supplied clastics from relatively large hinterland and detrital zircon grains in them represent the age frequency distribution of the hinterland at the depositional age. Therefore, focusing on the global unconformities is a key to find the lost Hadean crust effectively, and also suitable to estimate the age at the past.

In this study, we analyzed detrital zircon grains from total over 10 localities in Zimbabwe, Kaapvaal, Pilbara, and Laurentia by LA-ICP-MS, and estimated age frequency distribution of continental crust at 2.9, 2.6 2.3 1.0 and 0.6 Ga by compilation of detrital zircon chronological data with reported data of previous studies. The result show that average life span of continental crust in the initial stage of the Earth history is about 1 billion years which is one third as short as that of the present (Rino et al., 2008). Based on this result, Hadean zircon is likely found in the sedimentary rocks older than at least 3 Ga.

In addition to global information like above, paleogeography of the Archean and early Proterozoic is key to select potential units which contain ancient crustal materials. Before 3 Ga, almost continental crust was narrow shape like intra-oceanic arcs, and the amount of sediment was quite small and hinterland of them is limited. Thus, we should expand localities of searching Hadean zircon to highly metamorphosed sedimentary units like paragneiss.

Keywords: Hadean, Archean, continental crust, zircon, global unconformity