Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.12006

U-Pb chronology, REE geochemistry, and Nd isotope ratios of detrital monazites from major North and South American rivers

KAZUMI YOSHIYA[1], KEITA ITANO[2] AND TSUYOSHI IIZUKA[1]

[1]The University of Tokyo

[2]Akita University

Presenting Author: k-yoshiya@eps.s.u-tokyo.ac.jp

We have determined U–Pb ages, trace element abundances, and Nd isotopic compositions of more than 500 detrital monazite grains from the major four rivers in north and south American continents: Mackenzie, Mississippi, Amazon and Parana Rivers. The U–Pb isotopic ages of monazite from the four rivers show prominent peaks at 2.7-2.55, 1.4, 0.65-0.75, 0.15 Ga and a broad peak around 2.1-1.65 Ga. Except for the 1.4 Ga peak, these peaks roughly correspond to the timing of supercontinent assembly.

Compared with U-Pb age distributions of detrital zircons from the same river sands ([1],[2],[3],[4],[5]), monazite ages show distinctive peaks and distribution, especially for the Mackenzie and Parana River samples. The U-Pb age distribution of detrital monazite from the Mackenzie River shows three sharp peaks at 0.15, 1.8-1.9, 2.6 Ga. Compared with U-Pb age distribution of detrital zircon from the Mackenzie River, most of the detrital zircon age peaks have corresponding ones except one broad peak from 1.4 to1.0 Ga. The U-Pb age peaks of zircons from the Parana river shows four peaks, whereas those of monazite shows a large peak at 0.65 Ga and a small peak at 2.05 Ga.

On the basis of source rock type estimated by trace element compositions, the monazite age distribution reflects both magmatic and metamorphic activities. The highly heavy rare earth element-depletion, suggesting a co-existing with garnet, was not observed in the monazite grains of older than 2.3 Ga.

Secular fluctuation in εNd(t) values would depict the dynamic evolution of continental curst. The oldest age population of 2.7–2.55 Ma shows a wide variation in εNd(t) and is characterized by a less radiogenic signature, suggesting the reworking of ancient crusts from the Archean eon. In contrast, the subsequent age peak of ~1.75 Ga shows a radiogenic signature (εNd(t) ranging from 0 to +3.8), suggesting the input of juvenile materials.

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