ジルコンとモナザイトの U-Th-Pb 年代と希土類元素組成から制約される Rauer 諸島 Mather 半島における超高温変成作用のタイミング

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Timing of UHT metamorphism at Mather Peninsula in Rauer Islands: Zircon and monazite U-Th-Pb and rare earth elements chemistry constraints

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The Rauer Islands in Prydz Bay, East Antarctica, includes both Archaean and Mesoproterozoic crustal components last metamorphosed and deformed at ~500 Ma. A distinct suite of supracrustal rocks, the Mather Paragneiss, within the Rauer Islands preserves evidence for ultrahigh-temperature (UHT) metamorphism at 990-1030°C and 1.0-1.2 GPa followed by isothermal decompression (ITD) at >850-950°C (Harley, 1998). Zircon and monazite in ultrahigh temperature metamorphic rocks from the Rauer Islands were investigated in terms of U-Th-Pb and rare earth elements (REE) chemistry along with textural context. All four analyzed samples, two from the Mather Paragneiss UHT unit and two from the host orthogneiss unit yield c. 522-517 Ma concordant zircon ages, with older protolith/inherited zircon ages of c. 3268 Ma and c. 2800-2400 Ma along with highly discordant Neoproterozoic ages. Our data confirm the Archaean protolith age for the host orthogneiss surrounding the UHT Mather Paragneiss. The Archaean and Mesoproterzoic components of the Rauer Islands were not amalgamated in the Rauer Tectonic Event at c. 1030-990 Ma, and deposition of the Mather Paragneiss was considered at some time after the Rauer Tectonic Event. In contrast to the well-defined c. 520 Ma ages obtained from the zircons in the UHT rocks, monazite grains measured by electron microprobe show a distinct internal zonation, from c. 580-560 Ma dark-BEI cores to c. 550-520 Ma mid-BEI mantles and c. 510-500 Ma bright-BEI rims. From the chemical and textural evidence we infer that the MREE-HREE-rich c. 580-560 Ma monazite cores may have formed through the decomposition of garnet during decompression just after the UHT event, whereas the MREE-HREE-depleted c. 550-500 Ma monazite grains/rims formed or recrystallized in reactions associated with subsequent extensive hydration, which also caused marked recrystallization of zircon. The above data strongly support the interpretation that the UHT metamorphism occurred prior to c. 590-580 Ma.

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References

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