アカスタ片麻岩体における最古岩石の分布

The distribution of the oldest rocks at the Acasta gneiss complex

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The Hadean from birth of the Earth to 4.03 Ga is the earliest period of the history of the Earth, and defined by no preservation of rock records in the Earth. The oldest rock, which defines the Hadean era, is present in the Acasta Gneiss Complex (AGC). The AGC, located in the western part of the Slave Province, Canada, is one of the Early Archean terranes, and mainly consists of 3.6-4.0 Ga felsic and layered gneiss suites with minor mafic rocks. Based on a zircon U-Pb geochronology, Bowring et al. (1999) reported 4.03 Ga granodioritic gneiss, which is, so far, considered as the oldest terrestrial rock. Recent studies try to more quantitatively elucidate the emplacement ages of the Acasta gneisses by combining the zircon U-Pb geochronology with whole rock and mineral (zircon) geochemistry. Mojzsis et al. (2014) classified an orthogneiss sample into some components based on cross-cutting relationship, and reported U–Pb geochronology and trace element compositions (REE, Ti) of zircons from the components and compositions of the components themselves. The apparent calculated partition coefficients for REEs between the components and zircons separated from the components were compared with the theoretical partition coefficients. They concluded that all AGC zircons older than 4.0 Ga were inherited and AGC emplacement age was 3.92 Ga because the apparent calculated partition coefficients for the >4.0 Ga zircons are inconsistent with the theoretical values. On the other hand, Reimink et al. (2014) discovered well-preserved 4.02-billion-year-old tonalitic gneiss in the northern part of the AGC and named “Idiwhaa Tonalitic Gneiss (ITG)”. The ITG is garnet-biotite-hornblende tonalitic gneiss, and has intermediate major element compositions. It contains abundant igneous zircons with a U-Pb crystallization age of 4.02 Ga and their REE compositions are consistent with the host whole rock compositions. Notably, the ITG is characterized by their high total iron, low Mg-numbers, flatter REE patterns and negative Eu anomalies, and is distinct from the typical Archean TTGs. They concluded that the oldest tonalite was formed in a plume-related tectonic setting. However, Reimink et al. (2014) identified the ITG unit only in the northern part of the East Acasta Gneiss Complex. In order to more comprehensively obtain the distribution of ITG unit over the AGC, we carried out geological survey in the Acasta gneiss complex, and conducted major and trace element analysis of the orthogneisses and U-Pb dating of zircons. Preliminary results indicated the orthogneiss, which shares some geochemical features of the ITG, is also present in the southern part of the AGC, implying that the ITG unit is extensively distributed over the AGC.

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