K-Ar ages of the Massifs A, B, C and the Minami-Yamato Nunataks, Yamato Mountains, East Antarctica

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The Yamato Mountains are located around 71º15'S - 72º05'S, and 34º45'E - 36º55'E in East Antarctica. The mountains extend for about 60 km north-south, and are made up of several small nunataks and Massifs A to G from south to north. The Minami-Yamato Nunataks are situated in the southernmost part of the Yamato Mountains, 40 km southwest of Massif A. The Yamato Mountains are composed of high-grade metamorphic rocks, syenitic rocks and granitic rocks. To understand the timing of the metamorphism and plutonism that built the Yamato Mountains, various types of geochronological studies (K-Ar, Rb-Sr, CHIME, SHRIMP U-Pb methods) have been performed on rocks of Massifs A, C and E. However, no geochronological study has been carried out on the rocks from the Massifs B, D, F, G and the Minami-Yamato Nunataks.

I measured the K-Ar mineral ages of rocks from Massif A (Mt. Nokogiri), Massif B (Akakabe Bluff), Massif C (Tsuitate rock and a small nunatak) and the Minami-Yamato Nunataks (Nunatak C in Kuwagata Mt.) in the Yamato Mountains. Dated samples were collected by 35th (Massifs B and C; Ishikawa and Funaki, 1998) and 41st (Massifs A, C and Minami-Yamato Nunataks) Japanese Antarctic Research Expeditions. Potassium content and the radiogenic ^{40}Ar abundance in the samples were measured at Yamagata University.

The results are as follows. (1) K-Ar ages of gneiss rocks ranged 450-490 Ma (Massifs A, B, C and Minami-Yamato Nunataks). (2) Syenites of Massifs A and C yielded younger K-Ar ages around 350 Ma than those of gneiss rocks from Massif A (470-480Ma, Shibata et al., 1985) and Massif C (~470Ma). These results will be useful to consider the genetic relationships of rocks from the Yamato Mountains.

References

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Geochemical conceptual model at an Underground Research Laboratory (URL) construction site, Mizunami, Japan.

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Introduction

JNC is developing methodologies to evaluate underground environments and their change by investigating the environment prior to, during and after the construction of URL with a depth scale of 1,000 m. The present paper describes results dealing specifically with the baseline condition of groundwater chemistry before URL construction around the URL site.

Results and discussion

Groundwater samples were collected from sedimentary rocks and basement granite at depths of up to approx. 175 m below ground level. The groundwaters investigated are divided into two types; Si-Na-Ca-SO4-HCO3 ions dominate water in the shallow part of the sedimentary rocks and Na-Cl ions dominate fresh water in the deeper part of the sedimentary sequence and in the basement granite. Chemical evolution processes are most likely weathering of silicate minerals, and dissolution of marine sulphide / sulphate and carbonate minerals in the shallow part, and mixing between high and low salinity Na-Cl dominate water in the deeper part of the sedimentary rocks and in the basement granite.

In the rocks containing water of Na-Cl type, the concentrations of chemical components are linearly correlated with chloride concentrations. Correlations among chloride and inorganic carbon concentrations, and isotopic compositions (13C/12C, 14C) indicate that there are possibly more than 3 different mixing components in groundwaters derived from the shallow sedimentary rocks, and the shallow and deep granite. In such a groundwater system, hydrochemical changes caused during and after URL construction can be evaluated by a numerical model that assumes mixing among multiple components of groundwater.

Conclusion

Hydrochemical baseline conditions at depths up to 175 m below ground level at the URL construction site were summarized a conceptual model. Numerical modelling based on chlorine concentration, in addition to new borehole investigations, will evaluate the hydrochemical conditions and their changes caused by URL construction in the deep granite.