Zircon geochronology and geochemistry of syenites in the Yamato Mountains, East Antarctica

Kenji Horie[1, 2], Mami Takehara[1] and Tomokazu Hokada[1, 2]
[1]*National Institute of Polar Research*
[2]*The Graduate University for Advanced Studies, SOKENDAI*

The Yamato Mountains consist mainly of the granulite-facies and amphibolite-facies metamorphic rocks and intrusive syenitic rocks, and include seven massifs, called provisionally A, B, C, D, E, F and G from south to north, and associated nunataks. The syenite in the Yamato Mountains are not affected by deformation and recrystallization and then they are regarded as emplacing at the late stage of the regional metamorphism. Geochronological data for the Yamato Mountains are limited. Some K-Ar and Rb-Sr ages are reported for the syenites, granites, and metamorphic rocks (500-400 Ma, whole-rock; e.g., Yanai and Ueda, 1974, Kojima et al., 1982). Shibata et al. (1985, 1986) also obtained a Rb-Sr isochron age of 493.3 + 4.5 Ma (K-feldspar, plagioclase, biotite, and whole-rock), K-Ar ages of 480 Ma (biotite) and 502 Ma (hornblende) for the metamorphic rocks from the Yamato Mountains (Massif A). The zircon U-Pb dating of orthopyroxene biotite gneiss in Massif A shows high U overgrowth rims with 630-605 Ma (Shiraishi et al., 1994). Quartz monzonite of Massif A indicates the emplacement age of 532 ± 8 Ma (Shiraishi et al., 2003). Granitic gneiss of Massif B shows a weighted mean $^{206}Pb/^{238}U$ age of 539 ± 4 Ma with older cores of 630-570 Ma.

In this study, two syenites (73120307 and 92110701B) and biotite-pyroxene gneiss (92111401C) collected from Massif D were analyzed by a sensitive high-resolution ion microprobe (SHRIMP-IIe) at the National Institute of Polar Research, Japan. The weighted mean $^{206}Pb/^{238}U$ ages of 73120307 and 92110701B syenites are 537.9 ± 3.0 Ma (95% conf.) and 538.4 ± 3.0 Ma (95% conf.), respectively, which is consistent with the that of the quartz monzonite of Massif A. Chemical U-Pb dating of monazite in the 73120307 sample was carried out by an electron probe micro analyzer (JEOL JXA-8200) at National Institute of Polar Research. The monazite ages are scattered from 610 to 499 Ma and age peak center of a probability density is ca. 526 Ma. The zircon grains in the biotite-pyroxene gneiss show low response CL rim surrounding igneous (broad band to oscillatory) zoning core. The zircon cores suggest the igneous activity at 625.8 ± 4.3 Ma. The rim shows a weighted mean $^{206}Pb/^{238}U$ age of 548.5 ± 3.7 Ma, which indicates the timing of the regional metamorphism. Further information such as other trace element concentrations will be demonstrated.

References

Kojima, H., Nishida, T., and Yanai, K., Geology of the Belgica Mountains, Jap. Mem. Natl. Inst. Polar Res.; Spec. Issue 21, 32-64, 1982.

Shibata, K., Yanai, K., and Shiraishi, K., Rb-Sr mineral isochron ages of metamorphic rocks, East Antarctica, Jap. Mem. NatL Inst. Polar. Res.; Spec. Issue 37, 164-171, 1985.

Shibata, K., Yanai, K., and Shiraishi, K., Rb-Sr whole-rock ages of metamorphic rocks from eastern Queen Maud Land, East Antarctica, Jap. Mem. Natl. Inst. Polar. Res.; Spec. Issue 43, 133-148, 1986.

Shiraishi, K., Ellis, D. J., Hiroi, Y., Fanning, C. M., Motoyoshi, Y. and Nakai, Y., Cambrian orogenic belt in East Antarctica and Sri Lanka: implications for Gondwana assembly, The Journal of Geology, 102, 47-65, 1994.

Shiraishi, K., Hokada, T., Fanning, C.M., Misawa, K., and Motoyoshi, Y., Timing of thermal events in eastern Dronning Maud Land, east Antarctica, Polar Geosci., 16, 76-99, 2003.

Yanai, K., and Ueda, Y., Absolute ages and geological investigations on the rocks in the area around Syowa Station, East Antarctica, Nankyoku Shiryo (Antarct. Rec.) 48, 70-81 (in Japanese, with English abstract), 1974.