Syenites and related intrusive rocks are important to understand the process of collision zone magmatism in Dronning Maud Land (DML), East Antarctica, because DML is situated within the continental collision orogen between the West and East Gondwana (Mikhalsky et al., 2006). The Sør Rondane Mountains is located in the eastern part of DML. According to the previous results, the timing of continental collision is regarded as the late Proterozoic (650 to 600 Ma) in the Sør Rondane Mountains (Shiraishi et al., 2008, Baba et al., 2013, Hokada et al., 2013, Osanai et al., 2013). Undeformed (post-kinematic) granite stocks, a syenite complex and lamprophryres intrude during the extensional stages in the Sør Rondane Mountains (Toyoshima et al., 2013). In this paper, we address the geochronological and geochemical studies of the syenite complex and lamprophryres, and then discuss the timing of intrusion and the origin of syenite magma.

The syenite complex occurring in the Lunckeryggen, the central part of the Sør Rondane Mountains, consists of a layered syenite, melanosyenite dikes and quartz syenite dikes. The syenite complex and the Lunckeryggen granite that is K-feldspar-rich alkaline granite are coeval intrusive rocks. The boundary between them is not clear and shows mingling structure. The lamprophyre locally intrudes the granite as a syn-plutonic dike. The U-Pb zircon dating used for the SHRIMP-II installed at NIPR gives ages of 559.4 ± 1.6 Ma, 550.0 ± 1.7 Ma, 548.8 ± 3.4 Ma for the layered syenite, the granite and the melanosyenite dike, respectively. The recalculated Pb-Pb age of the lamprophyre (M09010802A, published in Owada et al., 2013) shows 557.5 ± 4.8 Ma. Considering the field relationships and the zircon SHRIMP dating, the syenite complex, granite and lamprophyre would, therefore, intrude into this suture zone during the same magmatic stage.

The layered syenite has basically similar mineral assemblages in each layer but shows different modal abundances. The mineral assemblages are of K-feldspar, clinopyroxene, amphibole, biotite, epidote, titanite, ilmenite and apatite with small amounts of fluorite, calcite and zircon. The lamprophyre possesses mineral assemblages similar to the melanocratic layer of the layered syenite but poor in clinopyroxene. Bulk chemical compositions of the syenite complex form monotonous trends on the variation diagrams. SiO₂ contents of the syenite complex show a wide range (44-62 wt%) and total alkaline (Na₂O+K₂O) contents are as high as 4-15 wt%. The syenite complex and the lamprophyre have significant character with high-K (K₂O/Na₂O≥3), high-LREE/HREE ratios and relatively enriched Sr-Nd isotopic compositions. The chondrite-normalized REE patterns of clinopyroxenes from the melanocratic part of layered syenite and lamprophyre show the concaved upward between LREE and MREE with HREE depletion. Considering petrography, mineralogy and geochemistry, the syenite complex has been derived from the lamprophyre magma, and fractional crystallization and accumulation played an important role of formation of the layered structure. Therefore, the syenite complex corresponds to the plutonic facies of the lamprophyre magma.

The lamprophyre possessing primitive compositions includes phenocrysts of Mg- and Cr-rich phlogopite. The P-T conditions of the lamprophyre magma are estimated by the biotite-liquid equilibrium relations (Righter and Carmichael, 1996). The calculated P-T conditions for the formation of lamprophyre magma are up to 1150 °C and 1.6 GPa that is equivalent to 60 km depth. The geochemical studies including Sr-Nd isotopic compositions reveal that the lamprophyre magma is derived from
ゴンドワナ超大陸は西ゴンドワナ大陸と東ゴンドワナ大陸の衝突によって原生代末～古生代初頭にかけて成立し、東南極シール・ロンケリッゲン山地を含む東南極ドロンイングモードランドに広く分布している。山地中央部には岩脈としてのランプロファイアープリフィアが分布するほか、ランプロファイアーブラックマグマが散発的に広く産する。本研究は岩脈とランプロファイアープリフィアのジルコニウム年代を対象として、衝突帯における岩脈の貫入時期とマグマの起源を議論する。

鳥取岩体は、複合岩体として高変成岩類を貫くストック状の層状岩体とそれを貫く優黒質閃長岩脈から構成される。岩体の南側には、黒雲母のマグマ流を観察した花崗岩が分布する。層状閃長岩と花崗岩のジルコニウム年代は、それぞれ559.4 ± 1.6 Maと550.0 ± 1.7 Maで、層状閃長岩を貫く優黒質閃長岩脈の年代は548.8 ± 3.4 Maを示す。また、ランプロファイアープリフィアのPb-Pb年代は557.5 ± 4.8 Maである。層状黒雲母の構成鉱物は、カリ長石、単斜輝石、角閃石、黑雲母、チタン石、火星鉱、緑簾石および腐灰石で、まれに鋳石、方解石、ジルコンを含む。ランプロファイアープリフィアの構成鉱物も基本的に優黒質閃長岩脈の組み合わせと類似する。層状黒雲母質岩脈は幅広いSiO2含有量（44-62%）、高Na2O+K2O含有量（4-15%）あるいはLREE/REE比を示す。優黒質閃長岩とランプロファイアープリフィアの単斜輝石は、同じREEパターンを示す。また、層状黒雲母の起源を検討し、ランプロファイアープリフィアはると同位体比の特徴を示す。この層状黒雲母質岩脈は、高Mg-, Cr-黒雲母斑晶が含まれる。この亜種巣リッゲン岩脈が地表60km付近のマントルから分離・上昇してきたと考えられる。また、Sr-Nd同位体比の特徴は、このランプロファイアープリフィアがやや肥沃なマントルに由来したことを示す。このようなマントルの変成は、衝突以前の島弧的な変成作用が加えられたことによると推察される。

References