東南極セール・ロンダーネ山地，原生代マグマ過程とテクトニクス

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Proterozoic magma processes and its tectonic setting in the Sør Rondane Mountains, East Antarctica

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The Sør Rondane Mountains is situated within the continental collision zone during the formaiton of the Gondwana supercontinent and the time of collition is regarded as the late Proterozoic (650 to 600 Ma) (Shiraishi et al., 2008). The mountains consist of greenschist- to granulite-facies metamorphic rocks and various kinds of intrusive rocks. Metamorphosed tonalite (meta-tonalite) is exposed in the southern part of the mountain. The meta-tonalite was formed at the subduction related tectonic setting priore to the collision event (Ikeda and Shiraishi, 1998), and frequently contains mafic rocks with basalt or andesite in compositions. The magma processes of the meta-tonalite provide us useful information of the formation of Gondwana supercontinent. Here, we report the geochemical features of the meta-tonalite and associated mafic rocks and discuss the tectonic setting prior to the collision event.

The mafic rocks occur together with the meta-tonalite as inclusions and discontinuous dikes. The size and shape of the mafic inclusions are varies; from few centimeters to tenth of meters in size and from roundness to angular in shape, locally showing tabular shapes. These mafic inclusions and dikes have dark colored and fine-grained rims, and locally contain huge feldspar crystals probably derived from the host tonalite. In some places, the mafic inclusions contain the tonalite as inclusions. Considering the field occurrence, the mafic rocks and the host tonalite were coeval intrusive rocks at the magmatic stage.

The meta-tonalite generally has pervasive foliations, and is composed mainly of plagioclase, quartz, biotite and hornblende with trace amounts of K-feldspar, garnet and epidote. The most of these minerals was crystallized during metamorphism. The mineral assemblages reveal that the metamorphic grade of the meta-tonalite corresponds to epidote-amphibolite facies. The mafic rocks consist mainly of plagioclase, hornblende, epidote with traces biotite and quartz. Opaque minerals are included as accessory minerals. Huge plagioclase phenocrysts are completely replaced by epidote. According to mineral assemblages, the mafic rocks underwent epidote-amphibolite facies metamorphism together with the host tonalite. The zircon grains in the meta-tonalite give an age of ca. 920 Ma by U-Pb SHRIMP dating (Shiraishi et al., 2008). This age indicates the time of intrusion for the tonalitic magma. Therefore, the time of intrusion for the mafic rocks (inclusions) would be the same as that of the meta-tonalite at the Mesoproterozoic.

The meta-tonalite and the mafic rocks possess 60 to 70 wt% and 45 to 60 wt% in SiO_2, respectively. Both rocks are characterized by low concentration of K_2O within the field of the low-K magmatic series. The meta-tonalite belongs to calcalkaline or tholeiite series, whereas the mafic rocks are plotted within the field of tholeiite series in some discrimination diagrams. The mafic rocks possess the low Zr/Y contents similar to island arc basalts. The trace elements abundances normalized to primitive mantle show HFS depression with negative Nb anomalies relative to MORB. Initial Sr isotopic compositions for the meta-tonalite corrected with 920 Ma show less than 0.7030 (recalculated from original date, Takahashi et al., 1990). On the other hand, some of the mafic rocks possess the chemical compositions similar to E-MORB. One of the E-MORB type mafic rocks shows SrI=0.7027 (corrected with 920Ma). Taking constituent rock assemblage; i.e., calcalkaline tonalite and tholeiitic basalt, and geochemical signature into account, the Proterozoic magma processes proceeded at the subduction related setting probably island arc rather than continental arc. In addition, some basaltic magmatism having MORB signature intruded into the tonalitic magma probably due to ridge subduction in the island arc setting,

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