東南極セール・ロンダーネ山地に分布する原生代後期の未成熟弧に形成した変トーナル岩とアダカイト質花崗岩

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Late Proterozoic juvenile arc metatonalite and adakitic granitoids in the Sør Rondane Mountains, East Antarctica

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Late Middle Proterozoic to early Late Proterozoic granitoids are scattered throughout the Dronning Maud Land, which lies between 20° W and 45° E in East Antarctica. Recently, the geochronological similarities between the granitoids in western and central Dronning Maud Land have been clarified, with age data being concentrated in the range 1200–1050 Ma (e.g., Grantham et al., 1995, 2011; Groenewald et al., 1995; Jacobs et al., 1996; Board et al., 2005). Moreover, on the basis of the data from Mikhalsky and Jacobs (2004) and Grantham et al. (2011), the rocks can be categorized primarily as high- to medium-K series calk-alkaline granitoids. However, these characteristics of granitoids may not continue into the eastern part because a huge granitic pluton, which composed of metatonalite, in the Sør Rondane Mountains at the eastern Dronning Maud Land exhibits a younger solidification age of 960–920 Ma (Takahashi et al., 1990; Shiraishi et al., 2008) and geochemical features similar to those of low-K Archean tonalite–trondhjemite–granodiorite (TTG) associations (Ikeda and Shiraishi, 1998). The existence of this granitic discontinuity has been postulated by a previous study (e.g., Jacobs et al., 2008); however, the cause of the discontinuity has not been clarified to date. In this study, we explore this discontinuity on the basis of a detailed examination of the metatonalite in the Sør Rondane Mountains.

We obtained significant data on lithological and geochemical investigations and some U–Pb SHRIMP zircon dating throughout the area of the metatonalite. Metatonalite is dominant over roughly 100 × 20 km^2 area in the southwestern end of the mountain range and is classified into five lithologies: gneissose Bt–Hbl metatonalite, weak gneissose Hbl–Bt metatonalite, Hbl metagabbro, Hbl–Bt tonalitic gneiss, and Bt metatonalite. The gneissose Bt–Hbl metatonalite is the main lithotype widely distributed over this area, which is geochemically categorized as low-K tholeiitic granitoid. Petrological studies suggest that the tholeiitic magma was derived from low-K basalt melting at the crustal depth, and the most plausible tectonic setting is a juvenile oceanic arc. The other four metaplutonic rocks are scattered as stocks or small intrusions in this area. They are geochemically regarded as calc-alkaline adakites related to oceanic slab melting. U–Pb SHRIMP zircon ages of the tholeiitic

metatonalite are concentrated at 998–995 Ma, whereas the calc-alkaline adakitic rocks are younger and divided between ages 945–920 Ma and 772 Ma. We believe that the tholeiitic metatonalite was formed first as a juvenile arc component between 998–995 Ma, followed by adakitic magmatism and oceanic slab melting at 945–920 Ma and 772 Ma. This Late Proterozoic tholeiitic granitoid is not distributed in the western to central Dronning Maud Land. Moreover, the exposure of an adakitic equivalent continues at the father eastern side of the Sør Rondane Mountains. This suggests that the tectonic framework of the Sør Rondane Mountains, eastern Dronning Maud Land, is different from the western to central Dronning Maud Land. Our results would provide a constraint on the geological history of Dronning Maud Land during the late Middle Proterozoic to early Late Proterozoic.

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