Geological Surveys in the Vicinity of Lützow-Holm Bay and the Yamato Mountains, East Antarctica

— Report No. 1 of the Geology Section of the 10th Japanese Antarctic Research Expedition —

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リュツォ・ホルム湾沿岸付近およびやまと山脈の地質調査

—第10次南極地域観測隊地質部門報告(1)—

吉 田　勝*・安 藤 久 男**

要　旨

1969年1月～1970年2月の間に行なわれた第10次日本南極地域観測隊地質部門の地質調査結果を総括した．各地域の調査の程度とルートマップを表1，図2～6に示した．

リュツォ・ホルム湾沿岸地域全域にわたって，岩石種を以下のように設定した．

1. 片麻岩類
2. 片麻状花崗閃緑岩
3. 含ガーネット片麻状花崗岩
4. 桃色正長石片麻状花崗岩
5. 細粒黒雲母花崗岩

やまと山脈では，上記のうち2と3を欠くが，閃長岩が特徴的に分布している．

リュツォ・ホルム湾沿岸地域には，複雑な褶曲構造が発達している．スカーレンでは横臥褶曲構造と，その後の2度のゆるい褶曲構造が認められた．リュツォ・ホルム湾沿岸地域では，片麻状花崗閃緑岩に関係する早期の花崗岩化作用と，桃色正長石片麻状花崗岩に関係する後期の花崗岩化作用が認められる．これらの花崗岩化作用より以前に塩基性グラニュライトが形成されている．

1. Introduction

This is a report on part of the activities of the geology section of the 10th Japanese Antarctic Research Expedition. An outline of the geological surveys and preliminary petrological considerations is given.

The survey was carried out between January 1969 and February 1970. Ice free

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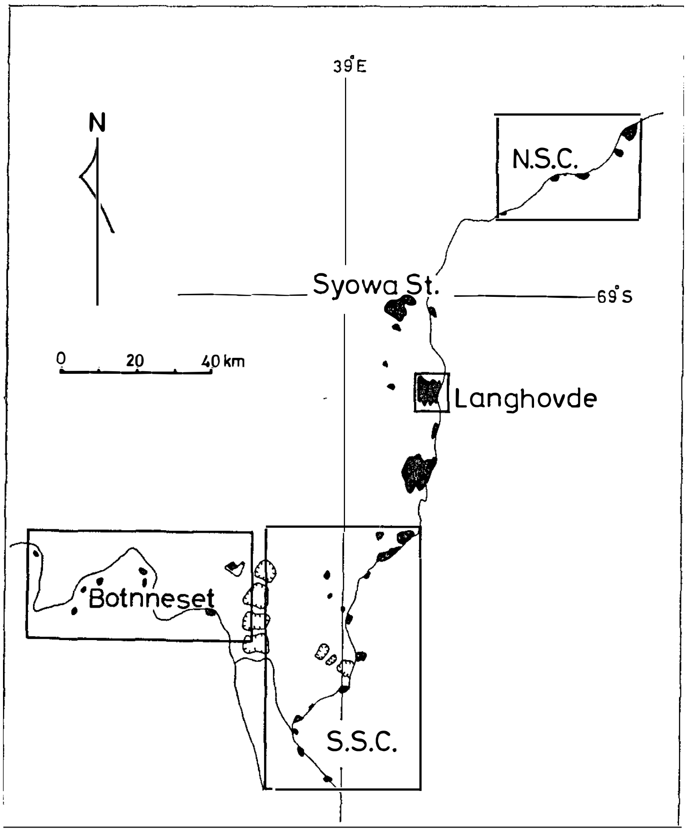

Fig. 1. Geological surveys of the vicinity of Lützow-Holm Bay.
N. S. C.: Northern region of the Sôya Coast.
S. S. C.: Southern region of the Sôya Coast.

areas in the vicinity of Lützow-Holm Bay (Fig. 1) and the Yamato Mountains were surveyed on scales of 1/100,000 and 1/2,000. A helicopter in the summer season and a snow vehicle in the other seasons, were used as the means of transportation for the surveys. The outline of the surveys is summarized in Table 1. The geologic sketches of the surveyed areas are shown in Figs. 2–6.

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2. Characteristics of the Rock Species

The vicinity of the Lützow-Holm Bay consists mainly of gneisses characterized by alternating basic and acid bands, gneissose granodiorite, garnet-bearing gneissose

Table 1. Geological surveys in the 10th JARE, 1969-1970.

Area surveyed	Period of the survey	Man-day of the survey (md) and pieces (ps) and weight (kg) of the samp es collected
Vicinity of Botnneset: Oposite shore of Nesholmen Is,. Authovde, West of Vesthovde, Northwesternmost outcrop of Fletta bay	Jan. 28-29, 1969	4 md 31 ps 60 kg
Southern region of Sôya Coast: Between Sudare Iwa and Oku-hyoga Iwa	Aug. 7-11, 1969	4 md 21 ps 50 kg
Skallen: Skallen, Skallevikhalsen, Hyartoy	Feb. 2-11, 1969 Oct. 12, 1969 Feb. 4- 7, 1970	15 md 113 ps 230 kg
Langhovdc	Jan. 25-26, 1969 Sept. 18-20, 1969 Feb. 7-10, 1970	12 md 60 ps 90 kg
Northern rcgion of Sôya Coast: Between Tcnsoku Iwa and Omega Misaki	Oct. 3-10, 1969	10 md 88 ps 120 kg
Yamato Mountains	Dec. 30, 1969-Jan. 12, 1970	15 md 166 ps 180 kg

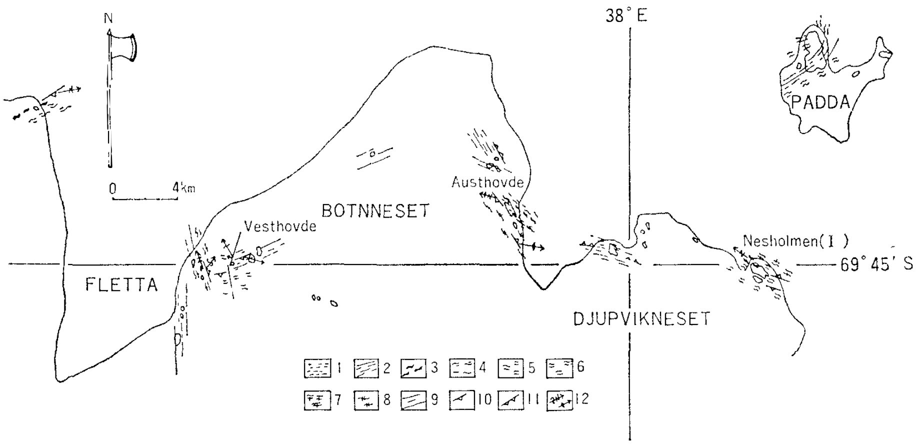

Fig. 2. Geologic sketch of the vicinity of Botnneset.

1. Siliceous gneiss. 2. Alternation of basic and acid gneisses distinguished in aerophotograph. 3. Basic granulite and amphibolite. 4. Granitic siliceous gneiss. 5. Gneissose granodiorite. 6. Gneissose granodioritic rock distinguished in aerophotograph. 7. Biotite gneissose granite and hornblende gneissose granite. 8. Pink potash feldspar gneissose granite. 9. Strike of rocks distinguished in aerophotograph. 10. Foliation. 11. Foliation distinguished in aerophotograph. 12. Lineation.

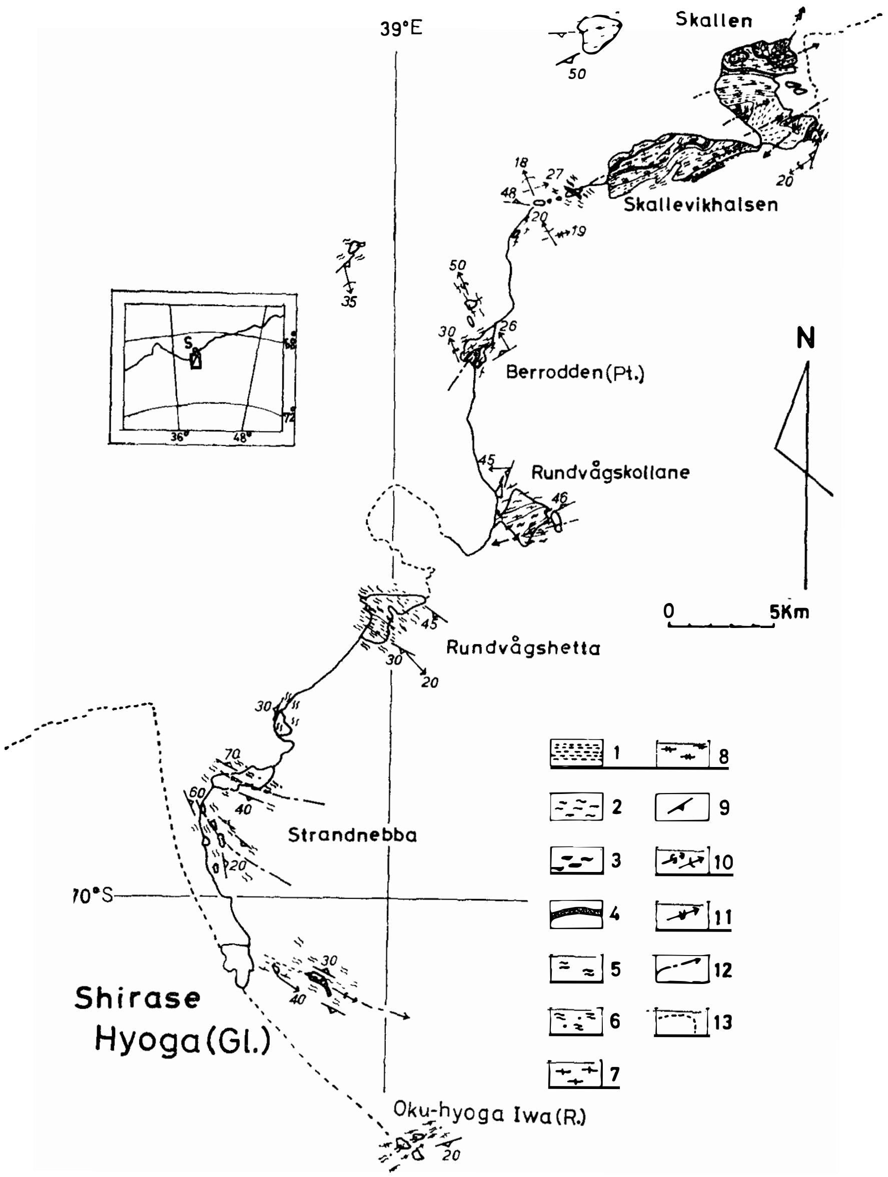

Fig. 3. Geologic sketch of the southern region of the Sôya Coast.
1. Siliceous gneiss with intercalations of basic gneiss. 2. Biotite gneiss. 3. Basic granulite and amphibolite. 4. Marble bed. 5. Gneissose granodiorite. 6. Hypersthene-bearing gneissose granodiorite. 7. Garnet-bearing gneissose granite. 8. Pink potash feldspar gneissose granite. 9. Folaiation. 10. Microfold lineation. 11. Crenulation lineation. 12. Folding axis. 13. Fringe of ice shelf or glacier.

granite, pink potash feldspar gneissose granite, and micro biotite granite. In the Yamato Mountains, syenites are well developed while the gneissose granodiorite is absent. Petrographic features of these rock species are briefly described in the following:

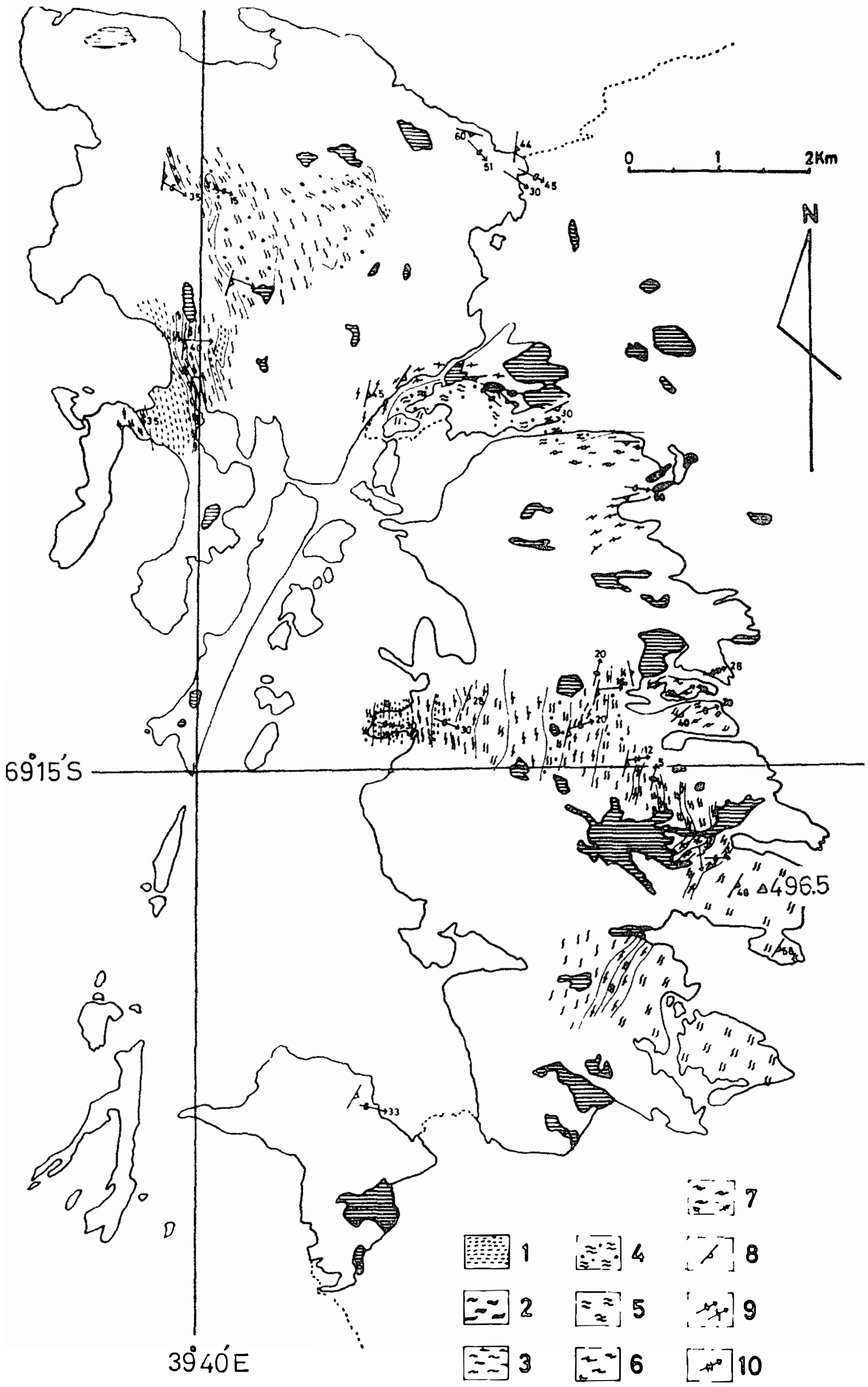

Fig. 4. Geologic sketch of Langhovde.

1. Siliceous gneiss. 2. Basic granulite and amphibolite. 3. Biotite gneiss. 4. Hypersthene-bearing gneissose granodiorite. 5. Gneissose granodiorite. 6. Garnet-bearing gneissose granite. 7. Pink potash feldspar gneissose granite. 8. Foliation. 9. Microfold lineation. 10. Crenulation lineation.

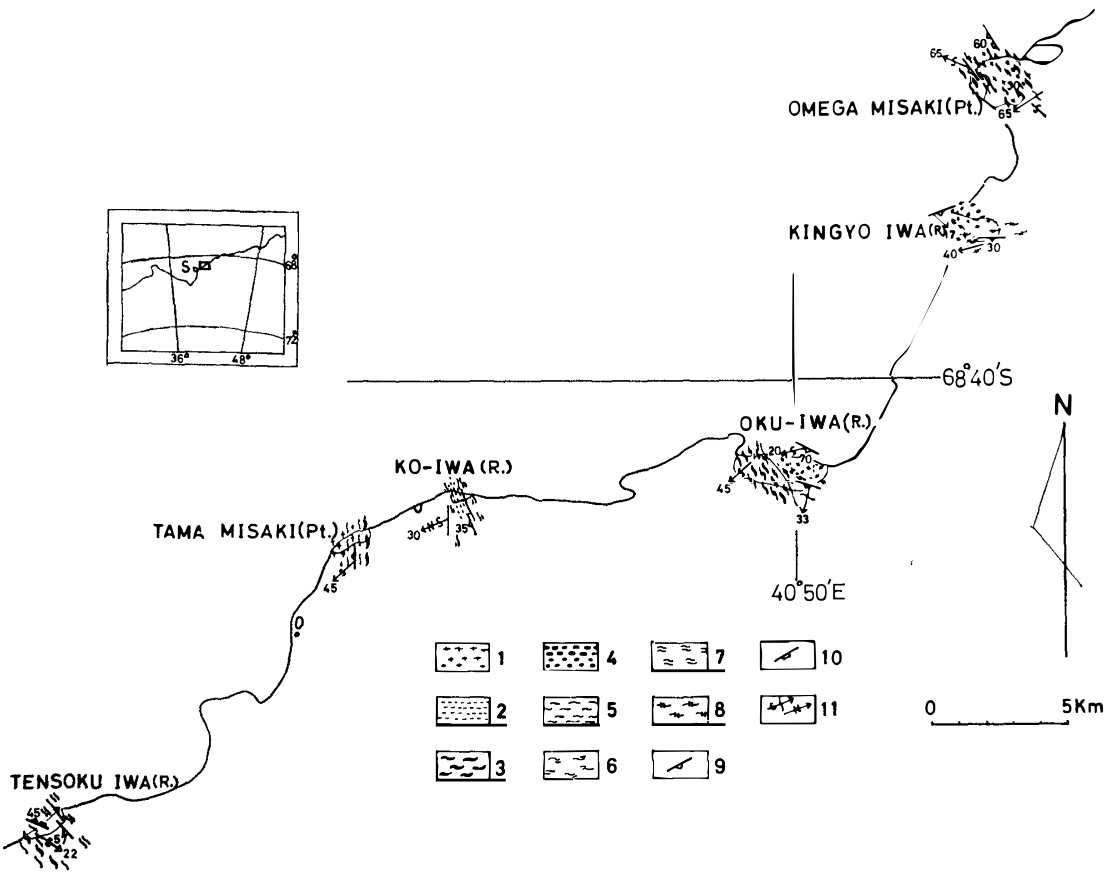

Fig. 5. Geologic sketch of the northern region of the Sôya Coast.

1. Siliceous microdioritic gneiss. 2. Siliceous gneiss. 3. Amphibolite. 4. Basic granulite. 5. Biotite gneiss. 6. Granitized biotite gneiss. 7. Gneissose granodiorite. 8. Pink potash feldspar gneissose granite. 9. Foliation. 10. Veins of leucocratic rocks. 11. Lineation.

Gneisses: Siliceous gneiss, siliceous biotite gneiss, garnet-bearing biotite gneiss are predominant. With the former two gneisses, garnet-bearing quartz feldspathic gneiss and basic granulite are associated and marble beds are sometimes intercalated. These rock types are equivalent to metabasite, quartzite, marble, and a part of garnet gneiss described by TATSUMI *et al.* (1963). The gneisses represent complex folding and are often affected with granitization in various degrees.

Syenite: This rock is mainly composed of potash feldspar and/or sodic plagioclase feldspar, pyroxene, hornblende, and biotite. The rock type is equivalent to the pyroxene syenites described by KIZAKI (1965). This rock is sometimes foliated and sometimes massive. The lithologic character varies from melanocratic to leucocratic. The leucocratic syenite cuts the other syenites, and sometimes grades into pink potash feldspar gneissose granite.

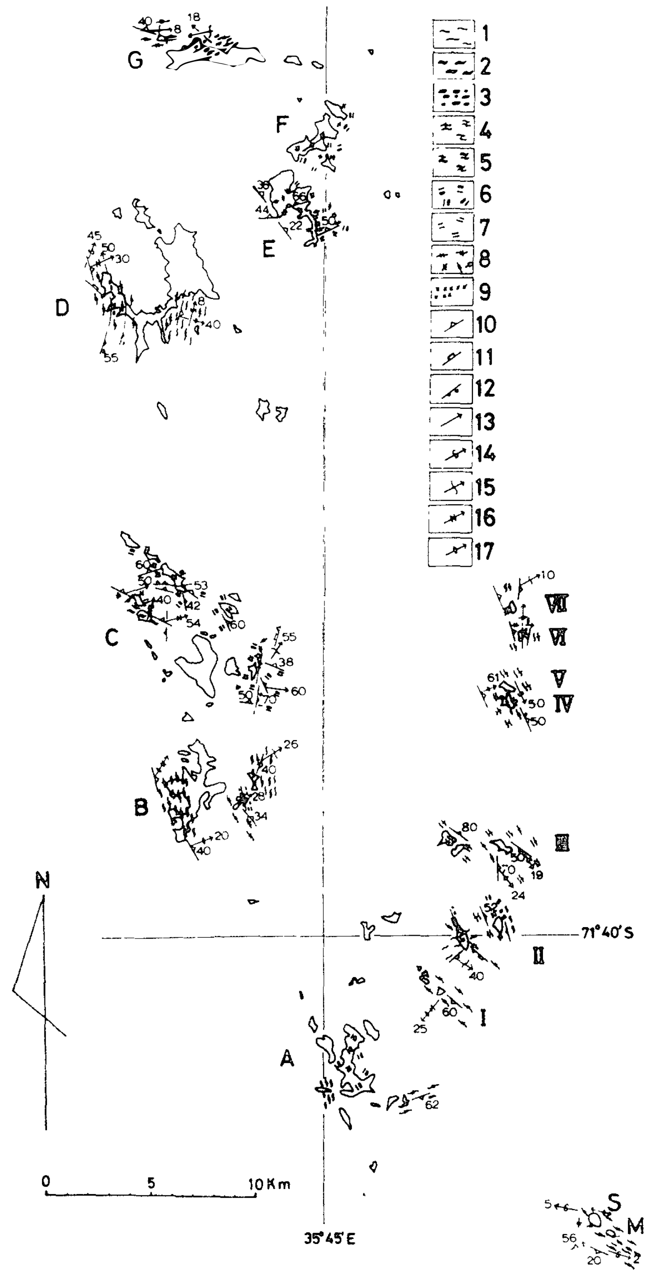

Fig. 6. Geologic sketch of Yamato Mountains.

1. Biotite gneiss. 2. Amphibolite. 3. Basic granulite. 4. Biotite gneissose granite. 5. Hornblende gneissose granite. 6. Syenite. 7. Leucocratic syenite. 8. Pink potash feldspar gneissose granite. 9. Micro biotite granite. 10. Foliation. 11. Veins of leucocratic rocks. 12. Shear-foliation. 13. Lineation. 14. Tight microfold lineation. 15. Open microfold lineation and kink band. 16. Crenulation lineation. 17. Mineral lineation.

I–VII, S, and M are provisional names of newly surveyed nunataks.

Gneissose granodiorite: This rock is composed mainly of potash feldspar, sodic plagioclase feldspar, and biotite. Small amounts of hornblende, garnet, and hypersthene are sometimes observed. The rock is dark-colored such as brownish or greenish because of the dark-colored nature of quartz and feldspars. This rock type is equivalent to the pyroxene gneiss described by TATSUMI *et al.* (1963). Nevertheless, it is different from the latter in that hypersthene is almost absent or is a remnant constituent. Sometimes the gneisses are altered by this rock, and in such cases thin layers of basic granulite are often altered to amphibolite.

Garnet-bearing gneissose granite: This rock is composed mainly of potash feldspar, quartz, and garnet. A small amount of biotite is also present. Potash feldspar often has a pinkish color. The rock is white and sometimes pinkish white in a hand specimen. This rock type is equivalent to a part of the garnet gneiss described by TATSUMI *et al.* (1963). This rock sometimes alternates with basic granulite. The most characteristic occurrence of the rock, however, is a parallel distribution with the gneissose granodiorite often in its outer margins. Remnants of strongly folded structure of the surrounding siliceous gneiss are sometimes observed in this rock type.

Pink potash feldspar gneissose granite: This rock is composed mainly of pink potash feldspar, quartz, and biotite. A small amount of garnet is sometimes observed. This rock type is equivalent to the gneissose granite and granite described by TATSUMI *et al.* (1963). The rock is generally gneissose, but sometimes massive and sometimes pegmatitic. This rock type cuts all the other rock types mentioned above. This type of rock is in a concordant or discordant intrusive relation to the surrounding rocks. Granitization of various degrees, results of which look rather mobile, is also often observed.

Micro biotite granite: This rock is composed of potash feldspar, quartz, and biotite. This is a massive, fine-grained and homogeneous rock with a mesocratic appearance in a hand specimen. The rock of this type cuts all the other rock types in the form of dikes.

3. Structural Characteristics and Metamorphic History

Recumbent fold superposed by two stages of gentle folding was discovered at Skallen. It is possible that such a kind of geologic structure is developed also in the vicinity of Lützow-Holm Bay.

At least two stages of granitization were discriminated in all the areas. The gneissose granodiorite is related to the earlier stage of granitization and the pink potash feldspar gneissose granite to the later stage. Prior to these granitizations, a high grade metamorphism related to the basic granulite affected the areas.

The petrographic characteristics of the rock species and their petrogenetic relationships, structures, and the metamorphic history revealed by the present survey will contribute to solve the geologic problems of the vicinity of Lützow-Holm Bay. Investigations are being continued and the results will be published in the future.

References

KIZAKI, K. (1965): Geology and petrography of the Yamato Sanmyaku, East Antarctica. JARE Sci. Rep., Ser. C, No. 3, 1–27.

TATSUMI, T., T. KIKUCHI and K. KIZAKI (1963): Geology of the region around Lützow-Holmbukta and the 'Yamato Mountains' (Dronning Fabiolafjella). Antarctic Geology; Proceedings of the 1st International Symposium on Antarctic Geology, 1963, North-Holland Publ., Amsterdam, 293–303.

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