

NATIONAL INSTITUTE OF POLAR RESEARCH

ANTARCTIC GEOLOGICAL MAP SERIES
SHEET 2 WEST ONGUL ISLAND

Explanatory Text of Geological Map
of
West Ongul Island, Antarctica

Keizo YANAI, Tatsuo TATSUMI and Toru KIKUCH

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Explanatory Text of Geological Map
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West Ongul Island

Keizo YANAI*, Tatsuo TATSUMI** and Toru KIKUCHI***

1. West Ongul Island

West Ongul Island, 3.4 km north-south and 3.6 km east-west, has the highest point of 47.6 m above sea level at the center of the island from which the low ridge runs in the north-south direction. The island is geomorphologically rather flat but is undulated with gentle slopes, shallow valleys and numerous ponds that resulted from the past glaciation. Some of the ponds have dried up, and others are diminishing their size. The island is surrounded by sea ice which scarcely melts or is seldom blown away even in summer. Therefore, the area of the island is inferred from the line of the tidal cracks around the island. One-third to the half of the island is ordinarily covered with snow throughout the year.

West Ongul Island is separated from East Ongul Island by a narrow channel called the Naka-no-seto Strait, from Teöya by the Minami-no-seto Strait, and from Ongul Kalven Island by the Nishi-no-seto Strait.

2. Geology of West Ongul Island

West Ongul Island is constructed by several kinds of gneiss and metabasite. Porphyroblastic gneiss and garnet-biotite gneiss occupy the ridge zone of the island. Pyroxene and hornblende gneisses widely cover both sides of the ridge. Metabasites are seen on the eastern side of the island. Minor rock facies such as garnet gneiss, garnet-bearing granitic gneiss and gneissose granite occur sporadically as thin beds or lenses. These rocks have distinct foliation which trends north-south in the northern part of the island and N 30° W in the south, but the foliation dips monoclinaly toward east.

Dikes of miclocline granite and pegmatite cut these rocks discordantly. The raised beach deposites of gravel and sand are found in the lower area along the coast.

Age determinations on the basement rocks have been carried out and are listed in Table 1.

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Table 1. Radiometric ages of rocks from West Ongul Island.

Lithology	Material	Method	Age (m.y.)	Ref.
A small biotite rich mass in a basic charnockite lens occurring in garnet gneiss	Bi	Rb-Sr	500±30	1
Sample number A-02	Bi	Rb-Sr	508	2
	Kf	Rb-Sr	726	
Sample number A-05	Bi	Rb-Sr	465	2
Biotite microcline granite	Bi	K-Ar	399	3
Hornblende gneiss	Bi	K-Ar	485	3
Biotite gneiss	Bi	K-Ar	560	3

1. NICOLAYSEN *et al.*, 1961.

2. MAEGOYA *et al.*, 1968.

3. YANAI and UEDA, 1974.

Bi=Biotite, Kf=K-feldspar, Hb=Hornblende.

2.1. Metabasite (Bm)

Concordant thin beds or lenses of metabasite are widely seen within the pyroxene gneiss near the Lake Ô-ike of the eastern coast. However, metabasite within the hornblende gneiss and garnet gneiss shows less continuity, occurring as scattered lenses or blocks. The rock has various facies such as hornblende eclogite (garnet, hornblende, clinopyroxene, orthopyroxene, phlogopite±, plagioclase An82-87), hornblendite (hornblende, phlogopite±, orthopyroxene±) and pyroxenite (orthopyroxene, clinopyroxene, hornblende±, biotite±, plagioclase).

2.2. Amphibolite (Am)

Amphibolite lenses occur within the pyroxene gneiss in the west of the Naka-no-seto Strait. The largest lens is approximately 200 m long and 50 m wide, and others range from several to several tens of meters. The lenses are concordant with the gneiss. The amphibolite is characterized by banded streaks of coarse-grained garnet crystals in the greyish white matrix, so that the foliation is more distinct than other gneisses. This rock may be defined as a variety of metabasite, in spite of its remarkably different characteristics from other metabasites. Its mineral assemblage is represented by hornblende, biotite, garnet, plagioclase (An74-79) and sometimes green spinel.

2.3. Pyroxene gneiss (Gp)

Pyroxene gneiss occupies the eastern half and the western margin of the island. The rock is brown to blue-grey due to the presence of colored quartz and feldspars. Pyroxenes are always present. It is usually medium-grained and the foliation is not very distinct, although the banded structure that resulted from the concentration of mafic minerals is partly observed. The rock is composed of clinopyroxene, orthopyroxene, hornblende±, plagioclase (An35-40), potash feldspar and quartz, with minor amounts of garnet and biotite.

2.4. Hornblende gneiss (Gh)

Hornblende gneiss is distributed around the Lake Ô-ike as well as on the west side of the central ridge. It also occurs as thin beds within the pyroxene gneiss concordantly throughout the island. Furthermore, the rock is found in the marginal area, 5 cm to several tens of meters wide, of the pink microcline dikes which cut through the pyroxene gneiss.

The rock is generally medium-grained and brownish grey, bluish grey or reddish grey. The foliation is distinct but partly obscured in massive portions where the rock becomes coarser-grained and pinkish grey. The rock is composed of green hornblende, biotite, potash feldspar, plagioclase (An₃₀) and quartz, free from garnet. Most of the gneiss was probably derived from the pyroxene gneiss as the result of granitization.

2.5. Garnet-biotite gneiss (Ggb)

Thin beds of garnet-biotite gneiss are found within the porphyroblastic gneiss as well as within the pyroxene gneiss. The rock is fine- to medium-grained, with similar mineral assemblage as that of the porphyroblastic gneiss, but is characteristically reddish brown in color due to the presence of abundant garnet and biotite. It shows marked gneissose structure.

2.6. Porphyroblastic gneiss (Gpo)

The central portion of the island is occupied by porphyroblastic gneiss which is also seen in Mame-zima Island. The gneiss is characterized by the potash feldspar porphyroblasts of approximately 4 cm, and coarse-grained with distinct gneissose structure. The mineral assemblage is represented by quartz, plagioclase (An₂₆₋₃₀), potash feldspar and minor amounts of garnet and biotite.

2.7. Garnet gneiss (Gg)

A narrow belt of garnet gneiss is seen along the boundary between pyroxene gneiss and hornblende gneiss in the neighborhood of the Lake Ô-ike. The rock occurs also as lenses in the south of the Naka-no-seto Strait. The rock is fine- to medium-grained, showing spotted garnet crystals of reddish brown color in grey matrix. The foliation is not conspicuous. The constituent minerals are quartz and garnet, with minor potash feldspar and plagioclase. Mafic minerals are scarce and completely altered where they are present.

2.8. Feldspathic gneiss (Gf)

The feldspathic gneiss seen in the west of the Naka-no-seto Strait, is coarse-grained, greyish-white in color, and rather massive in appearance. The principal constituent mineral is plagioclase (An₃₅₋₅₇), associated with hornblende, biotite and a minor amount of muscovite.

2.9. Garnet-bearing granitic gneiss (Ggg)

The gneiss distributed in rather wide area of the western half of the island,

Table 2. Chemical composition of rocks from West Ongul Island.

No.	1	2	3	4	5	6	7	8	9	10	11	12
SiO ₂	72.40	76.11	68.83	68.68	65.32	63.56	61.85	54.26	44.20	33.85	40.15	69.98
TiO ₂	0.16	0.30	0.86	0.60	0.73	1.79	0.97	1.84	0.59	4.76	0.78	0.31
Al ₂ O ₃	14.45	13.01	13.18	14.74	14.46	14.64	15.43	17.44	26.26	20.11	16.85	15.74
Fe ₂ O ₃	0.98	0.67	2.26	0.75	2.16	0.58	1.22	1.74	0.77	3.22	1.35	0.81
FeO	1.10	0.87	4.52	3.46	3.16	6.46	5.45	7.33	6.58	13.08	17.06	1.48
MnO	0.02	tr	0.12	0.06	0.06	0.13	0.08	0.14	0.09	0.31	0.31	0.11
MgO	0.31	0.55	0.49	1.27	1.62	0.95	3.10	2.74	6.02	5.24	9.65	0.36
CaO	1.14	3.12	3.61	2.31	3.31	3.17	4.90	5.76	11.19	13.44	9.34	1.25
Na ₂ O	3.24	3.27	1.46	3.28	3.24	3.48	3.15	4.38	2.47	1.20	1.48	3.69
K ₂ O	5.75	1.36	3.89	4.52	4.20	3.94	2.60	2.61	0.63	1.75	0.87	4.87
H ₂ O ⁺	0.63	0.26	0.75	0.43	1.19	0.88	0.91	1.09	0.89	2.41	1.85	0.96
H ₂ O ⁻	0.10	0.12	0.12	0.10	0.12	0.14	0.24	0.12	0.08	0.21	0.12	0.12
P ₂ O ₅	0.06	0.02	0.12	0.07	0.07	0.07	0.08	0.05	0.17	0.21	0.14	0.10
Total	100.33	99.96	100.21	100.27	99.64	99.79	99.98	99.50	99.94	99.79	99.95	99.78

1. 68022014 Microcline granite. Analyst, K. YANAI.
2. 68022002 Biotite gneiss. Analyst, K. YANAI.
3. 68021514 Garnet gneiss. Analyst, K. YANAI.
4. 68032313 Garnet biotite gneiss. Analyst, K. YANAI.
5. 68022607 Hornblende gneiss. Analyst, K. YANAI.
6. 68032402 Pyroxene gneiss. Analyst, K. YANAI.
7. 68032310 Pyroxene gneiss. Analyst, K. YANAI.
8. 68030103 Pyroxene gneiss. Analyst, K. YANAI.
9. 68040105 Amphibolite. Analyst, K. YANAI.
10. 68022405 Garnet amphibolite. Analyst, K. YANAI.
11. 68021509 Hornblende eclogite. Analyst, K. YANAI.
12. JARE57120803 Granite (BANNO *et al.*, 1964b)

occurs as concordant sheets of ten to several tens of meters thick and several hundred meters long. The rock has various facies, such as white aplitic and reddish porphyroblastic, or the pink-colored facies of gneissose granite. Therefore, the mineral assemblage is also variable. The constituent minerals are potash feldspar, plagioclase and quartz, associated with biotite and/or garnet.

2.10. Hornblende-biotite gneissose granite (Grh)

Hornblende-biotite gneissose granite is a minor member occurring only in the central-north part of the island. The rock is fine- to medium-grained, and pink to reddish in color, and massive in appearance. The constituent minerals are plagioclase (An₂₃), potash feldspar and quartz, associated with biotite and green hornblende.

2.11. Microcline granite (Grm)

A dike of microcline granite of tens of meters thick cuts through the pyroxene gneiss discordantly. It is observed for a distance about 150 m and the both ends are covered by ice in the northeastern part of the island. The rock is reddish to pinkish, fine- to medium-grained, and shows marked foliation. The principal constituents are potash feldspar and quartz, associated with plagioclase and biotite which is altered to chlorite.

2.12. Pegmatite (Pg)

There are two kinds of pegmatite in the island, differing in the mode of occurrence. Pink microcline pegmatite occurs as dikes which contain pink perthite, quartz, biotite, and partly abundant magnetite. It is noteworthy that the pyroxene gneiss at the contact with the pegmatite dike is usually converted into hornblende gneiss for a width of several tens of centimeters.

Pegmatite of the other type occurs as irregular patches of white color. The rock is composed of perthite and quartz, associated with minor biotite.

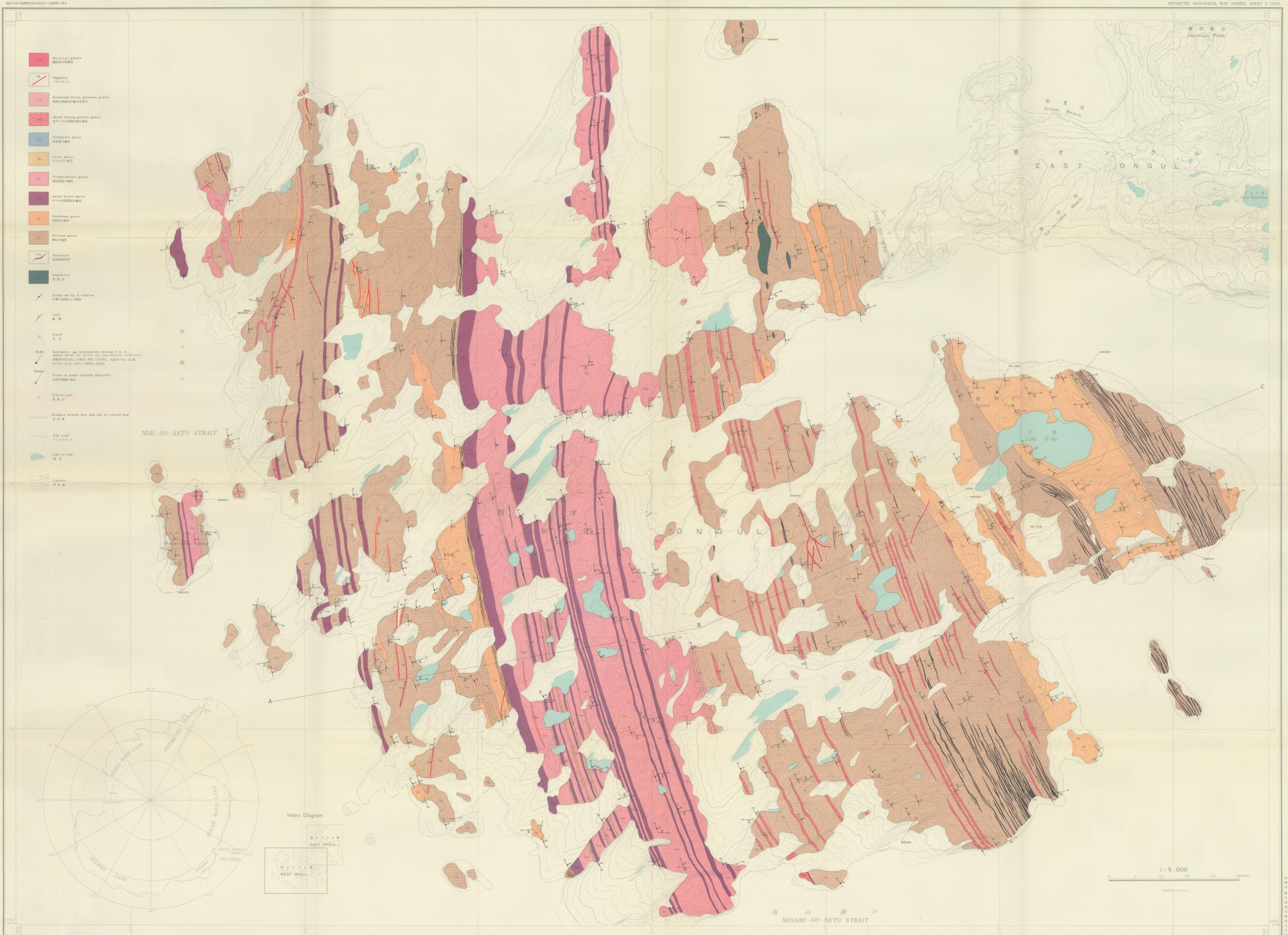
The chemical composition of these basement rocks are shown in Table 2.

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GEOLOGICAL MAP OF WEST ONGUL ISLAND
西オングル島地質図

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