GEOLOGY OF HONNÖR OKU-IWA ROCK, EAST ANTARCTICA

Tamio NISHIDA,

Institute of Earth Science, Faculty of Education, Saga University, 1, Honjo-machi, Saga 840

Keizo YANAI

National Institute of Polar Research, 9–10, Kaga 1-chome, Itabashi-ku, Tokyo 173

and

Hideyasu KOJIMA

Institute of Mining Geology, Mining College, Akita University, 1–1, Tegatagakuen-cho, Akita 010

Abstract: Honnör Oku-iwa Rock is a small ice-free area located about 6 km southeast of Bôzu Peak of Byvågåsane of central Sôya Coast of Lützow-Holm Bay, East Antarctica, and has been named after the Honnör Glacier of which left margin contacts this rocky area. The result of geological survey of the area is reported in this paper.

The crystalline basement of the area comprises the following petrographic types of rock; hornblende gneiss, metabasite, garnet-biotite gneiss and charnockitic rock. A rather small amount of pegmatite intrudes these gneisses. The sequence is about 700 m in thickness and probably correlated with the Ongul Group.

As a whole the foliation of gneisses dips to the east with moderate to steep angles and the geologic structure is seemingly homoclinal. From the north to the south large sigmoidal configuration of gneisses seems to be caused by one set of synformal and antiformal folds of open type, of which axes both run east-west and slightly plunge to the east. Westerly prolongations of these folds probably can be connected with the open folds in the northern part of the Byvågåsane region.

The area was once entirely covered by continental ice, and glacial striae and grooves on basement rocks show the east-south-east to west-north-west direction of flow throughout the area.

1. Introduction

A small ice-free area located about 6 km southeast of Bôzu Peak of Byvågåsane of central Sôya Coast of Lützow-Holm Bay, East Antarctica, has been called Honnör Oku-iwa Rock by members of the Japanese Antarctic Research Expedition (JARE). It covers an area of approximately 2 km^2 and extends along

the Honnör Glacier, after which the rocky area was named (Fig. 1).

Honnör Oku-iwa Rock was first visited in the summer season of 1970 by some members of JARE-11 and Dr. G. A. MORGAN, an Australian exchange scientist to this party, by means of a helicopter. This is not officially recorded yet (KAWAGUCHI, 1972) but known from the "timecapsule" which was left in the northern part of the area by them. It was visited for the second time by a five-man party of JARE-20 including the present authors from 11 to 13 September, 1979 by an overland route. During this short stay geological, geodetic and bacteriological surveys were carried out. The present report deals with the outline of geology and geologic structure of Honnör Oku-iwa Rock. This area seems to be important for the geology around Lützow-Holm Bay because of its easternmost location.

As no detailed topographic map of this area has been published, field data are plotted on the conventional map on a scale of about 1:10000 compiled from the aerial photographs taken by JARE-6 in 1962 on a scale of 1:26000 (6AV-1-1, 47–50).

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2. Geology

Honnör Oku-iwa Rock is thoroughly surrounded by continental ice. The height above the sea level is over 300 m in the southeastern part of the area and below 150 m in the northwestern part. The area is covered by moraine in some

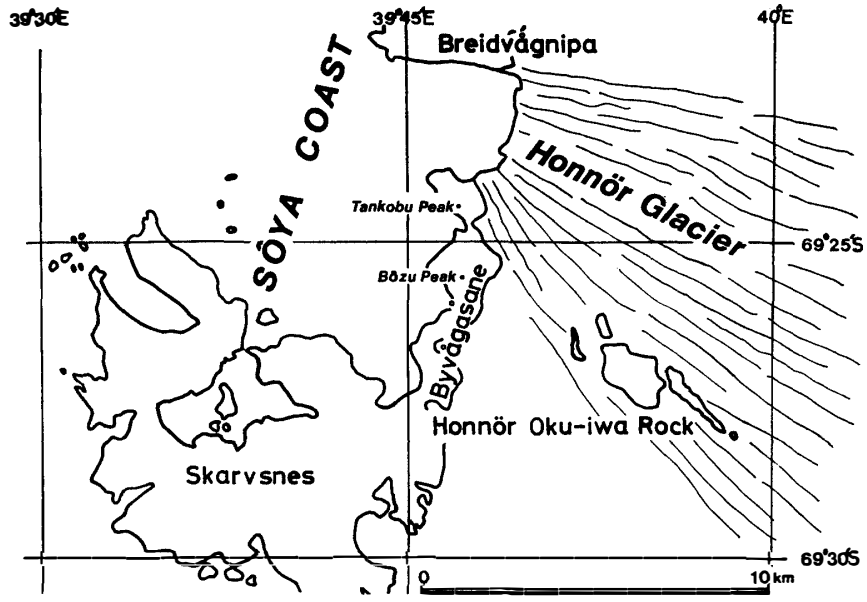

Fig. 1. Location map of Honnör Oku-iwa Rock.

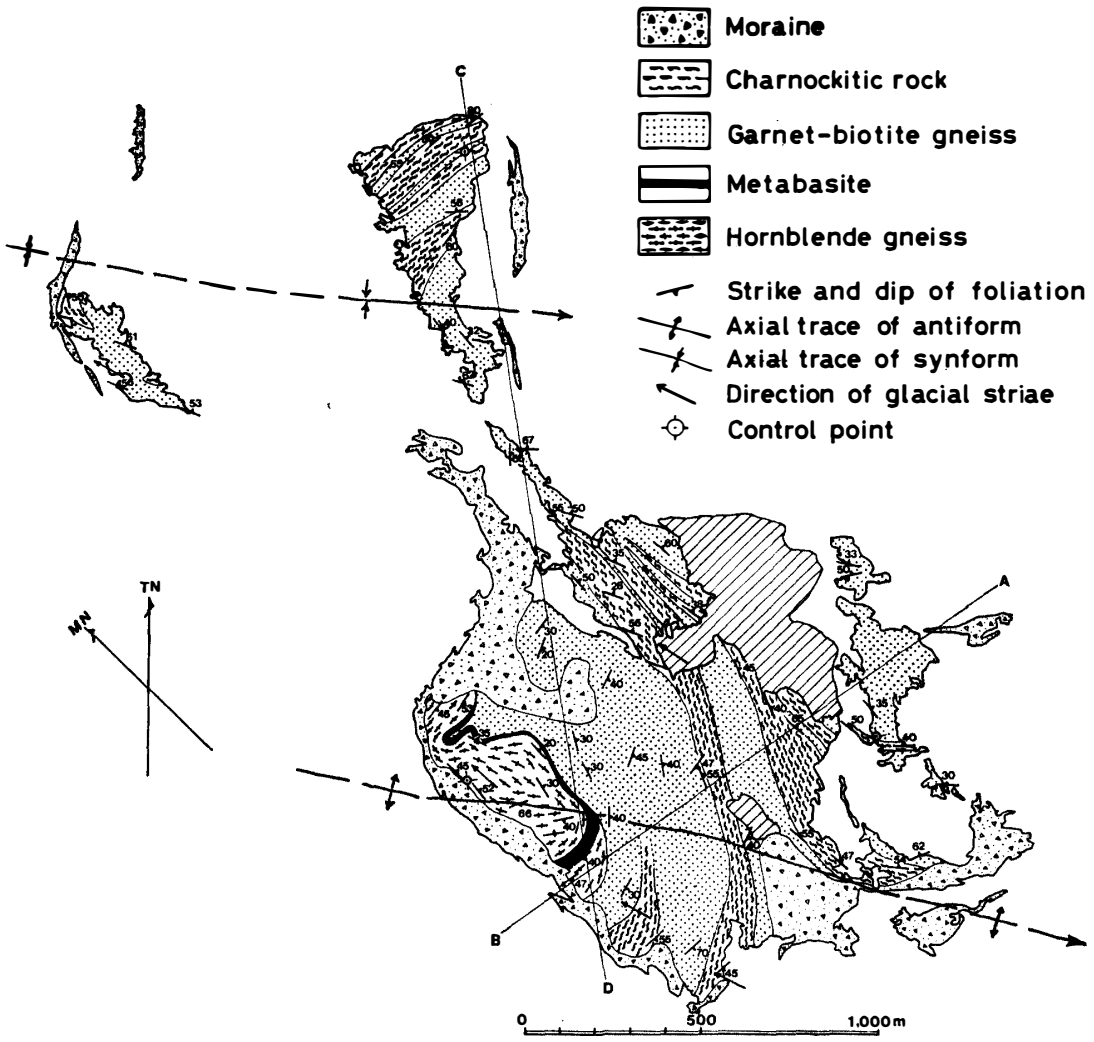

Fig. 2. Geologic map of Honnör Oku-iwa Rock.

places, especially widely covered in the southeastern part and was once entirely covered by continental ice sheet, judging from the glacial polished surfaces which are found at and near the highest peak. The directions of glacial striae and grooves on the basement rocks show a general trend of about N60°W–S60°E throughout the area, being nearly parallel to the extension of the area and also to the direction of flow of the Honnör Glacier.

The crystalline basement rocks consist mainly of hornblende gneiss, metabasite, garnet-biotite gneiss and charnockitic rock. A rather small amount of pegmatite intrudes these gneisses. The distribution of these rocks and the profiles of the sequence are shown in Figs. 2 and 3 respectively. The sequence of gneissic rocks is about 700 m in thickness and most probably correlated with the Ongul Group

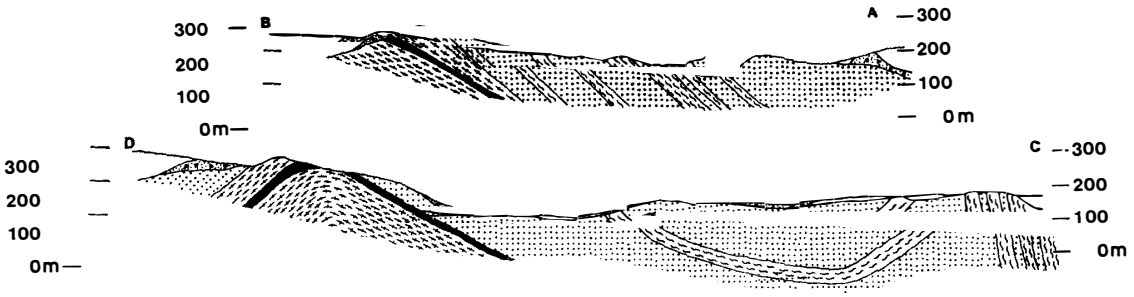

Fig. 3. Geologic profiles of Honnör Oku-iwa Rock. For legend see Fig. 2.

of YOSHIDA (1978) judging merely from the close similarity in rock association and structure. All kinds of gneisses in this area are known to occur in the adjacent Skarvsnes region which is the widest ice-free area around Lützow-Holm Bay (ISHIKAWA *et al.*, 1977; MATSUMOTO *et al.*, 1979; MATSUMOTO, 1979).

2.1. Hornblende gneiss

The rock occurs in the southwestern part and is more than 100 m in thickness, apparently occupying the lowermost portion of the sequence of the area. It is generally brown-colored due to slight weathering and rather gray-colored in fresh specimen. This rock is medium-grained and shows a somewhat granular texture. It is characterized by the presence of hornblende and by the absence of pyroxenes and garnet. The gray color is due to abundance of plagioclase. Biotite, potassium feldspar and quartz are other main constituent minerals. Potassium feldspar is mostly perthitic. Zircon and apatite are often observed as accessories. Thin layers and small irregular-shaped bodies of orthopyroxene-bearing rock sporadically occurring within hornblende gneiss seem to be relic of charnockitic rock as first mentioned by KIZAKI (1964) in East Ongul Island in Lützow-Holm Bay and later have been widely recognized in other places around Lützow-Holm Bay.

2.2. Metabasite

A rather thick metabasite is intercalated nearly concordantly with other gneisses in the uppermost portion of the hornblende gneiss in the southwestern part of the area. Maximum thickness of it reaches more than 25 m. This rock is composed mainly of hornblende, clinopyroxene, orthopyroxene, biotite, plagioclase and quartz. Hornblende occupies more than one-third of the constituents and is euhedral to subhedral and shows green to yellowish brown pleochroism. It may belong to amphibolite. Thin layers and schlieric bands of metabasite of less than 1 m in thickness are often found in other gneisses, though omitted in the geological map.

2.3. Garnet-biotite gneiss

The rock occupies a larger part of the sequence. It is a medium-grained and

rather strongly foliated, being composed mainly of plagioclase, quartz, biotite, garnet and potassium feldspar. Small amounts of opaque mineral, apatite and zircon are associated. With increase of relatively large phenocrystic crystals of potassium feldspar the rock grades into potassium feldspar porphyroblastic gneiss. The distribution of this rock is too small to be represented in the geological map.

2.4. Charnockitic rock

The rock occurs as alternating layers with garnet-biotite gneiss or as small bodies within hornblende gneiss. It is composed mainly of quartz, plagioclase, hornblende, orthopyroxene, clinopyroxene and biotite and a very small amount of potassium feldspar. A weak foliation of it is due to parallel orientation of mafic minerals. So far as eight samples of this rock examined under microscope are concerned, the quantity of hornblende predominates over that of pyroxenes. Conversion from orthopyroxene and clinopyroxene to hornblende is often observed. Orthopyroxene is pleochroic with pale green to pinkish-color. Garnet very rarely occurs as porphyroblastic crystals where the rock contacts garnet-biotite gneiss.

2.5. Garnet gneiss

This rock occurs as thin layers or very elongated bodies of less than 2 m in thickness within garnet-biotite gneiss. It is leucocratic and somewhat massive. Its distinct appearance is a useful key for structural analysis. Main constituent minerals of the rock are quartz, potassium feldspar, plagioclase and garnet. Quartz predominates over other minerals in quantity.

2.6. Pegmatite

Pegmatite is rarely observed in places as sheet-like bodies or dykes in gneissic rocks. It is less than 1 m in width and may be divided into two rock-types; gray-colored biotite granitic pegmatite and pinkish microcline granitic pegmatite.

3. Geologic Structure

As shown in Fig. 1, hornblende gneiss, metabasite and alternation of garnet-biotite gneiss and charnockitic rock are successively distributed from the southwest to the northeast in the area. As a whole, the foliation dips to the east and the geologic structure is seemingly homoclinal in the area. Tentative estimation of the sequence reaches 700 m in thickness. Small-scale isoclinal folds of which wavelength is less than several meters are often observable at many outcrops of alternation of garnet-biotite gneiss and charnockitic rock in the northeastern part and at some outcrops of garnet gneiss intercalated within garnet-biotite gneiss in the southeastern part. From north to south configuration of these gneisses shows a large sigmoidal shape. The axes of minor isoclinal folds run nearly parallel to this sigmoid. Besides, in the northern part a major synform is assumed to run east-

west and in the southern part a major antiform is also assumed to run in nearly parallel with the synform. Both folds seem to be of open type and their axes plunge to the east. The large sigmoidal configuration may have been caused by the folds. Therefore, the folds postdate the isoclinal folds. Although the westerly prolongations of the folds are masked by vast ice sheet, they probably can be connected with the open folds that were discriminated in the northern part of Byvågåsane by ISHIKAWA *et al.* (1977), MATSUMOTO *et al.* (1979) and MATSUMOTO (1979).

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