Palaeomagnetic Studies on Rocks on the Coast of Lützow-Holm Bay

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リュッォツ・ホルム湾東岸の岩石に関する古地磁気学的研究

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要旨

さきに永田，清水によるオングル島片麻岩による古地磁気学的研究の結果を報告した（南極資料第10号）．第3次隊越冬期間に，ルュッツオホルム湾東岸及び南岸の露岩中から多数の試料が採集された．この試料を全部調べた結果，この地域の岩石の生成されたカムブリア紀（4.7×10^8 年前）の磁極は赤道上西経約 100° 附近にあったという前報告の結果が再確認された．又付図は，我々の結果をもふくめて東南極大陸に関する古地磁気学的研究の成果を集めたものである．

In the previous paper[1], results of palaeomagnetic studies on Cambrian gneiss of the Ongul Islands were reported. The result shows that average direction of the stable remanent magnetization of the rocks *in situ* is given by $-23°$ in declination and $+51°$ in inclination. This magnetic orientation corresponds to the position of the North pole of the earth's magnetic dipole at 19°N in latitude and 163°W in longitude. However, the gneissosity planes in the concerned area are remarkably inclined, their dip and strike being ranged from 51° to 54° and from N20°W to N01°W respectively.

If it is assumed that the gneissosity planes were horizontal when thermal metamorphism of this area took place and consequently when thermo-remanent magnetization of these rocks was produced, the pole position must be reduced to

$$\text{Lat.} = 3°\text{N}, \qquad \text{Long.} = 107°\text{W}.$$

During the wintering period of JARE III, namely from February 1959 to January 1960, a large number of rock samples for the purpose of palaeomagnetic study were collected by T. OGUTI at various places where rocks were exposed along the coast of Lützow-Holm Bay as well as at East and West Ongul Islands. All these rocks are also dioritic gneiss having clean gneissosity planes which are about 50° in dip and N10°W in strike, being the same as those of the Ongul Islands rocks. Age of these rocks has been determined by N. SAITO *et al.* to be about 4.7×10^8 years. Therefore they are rocks of Cambrian age.

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Observed data of natural remanent magnetization of these rock samples newly collected can be distinctly classified into two groups, namely, normal magnetization (having upward magnetization) and reverse magnetization (having downward magnetization). Average value of declination and dip of the remanent magnetization of these two groups for the samples collected at the Ongul Islands and for those collected at the other places along the East Coast of Lützow-Holm Bay are summarized in the following Table.

A. The Ongul Islands.

	Nr. of specimen	Direction of magnetization		Position of South Pole (uncorrected)	
		D	I	Lat.	Long.
Normal sample	8	−21°	−69°	71°N	6°W
Reverse sample	5	−10°	49°	9°S	32°E

B. Coast of Lützow-Holm Bay.

	Nr. of specimen	Direction of magnetization		Position of South Pole (uncorrected)	
		D	I	Lat.	Long.
Normal sample	19	−39°	−83°	76°N	100°W
Reverse sample	7	−19°	60°	21°S	24°E

As the direction of the geomagnetic field at the locality concerned here is about −43° in D and about −66° in I, it may be said that the mean direction of magnetization of the normal samples is in rough agreement with that of the present geomagnetic field. Actually, those normal samples are magnetically weak and rather unstable according to the result of alternating field demagnetization test[2]. Thus, it may be reasonable to conclude that remanent magnetization of the normal samples is due to accumulation of isothermal remanent magnetization caused by the recent and present geomagnetic field, and consequently that these samples must be eliminated for the present purpose of palaeomagnetic studies of Cambrian geomagnetic field.

Compared with the normal samples, remanent magnetization of the reverse samples is much more intense and stable against A. C. demagnetization, just as so in the previous examination of magnetic properties of gneiss of the Ongul Islands. It seems

Locality	Nr. of specimen	Direction of magnetization		Position of N-pole (uncorrected)	
		D	I	Lat.	Long.
East Ongul Is. (1957–58)	18	−23°	51°	19°N	163°W
East & West Ongul Is. (1959–60)	5	−10°	49°	9°N	148°W
East coast of Lützow-Holm Bay	7	−19°	60°	21°N	156°W

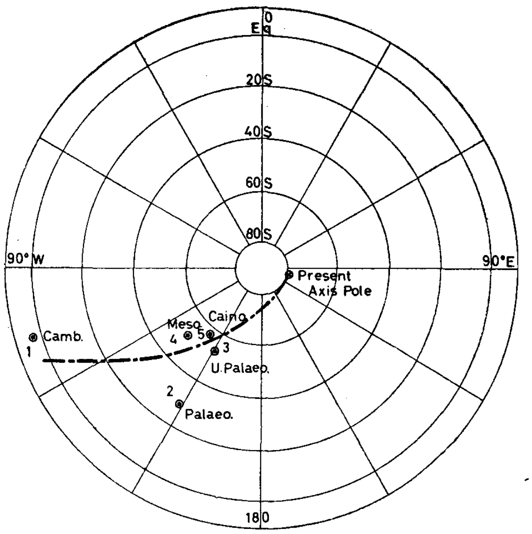
therefore that these reverse samples can be used for the palaeomagnetic purpose.

Magnetic orientation and the corresponding North pole positions thus obtained in the previous and present studies are reproduced in the foregoing Table.

As will be seen in the above results, the three independent sets of sample collections at different localities and magnetic measurements have given nearly the same results. This will be a confirmation of the conclusion obtained in the previous report.

Now, on the other hand, remanent magnetization of Palaeozoic, Mesozoic and Cainozoic rocks in the East Antarctic area have also been palaeomagnetically studied by IRVING, BULL[3], and TURNBULL[4]. Results of these studies are summarized in the following together with the present one.

Auther	Locality	Rocks	Geologic period	Pole position	
				Lat.	Long.
Nagata, Shimizu & Yama-ai	Lützow-Holm Bay	Gneiss	Cambrian (4.7×10^8 y)	3°N	107°W
Bull & Irving	Wright Valley	Basic dykes	Palaeozoic	29° S	149°W
Bull & Irving	Wright Valley	Dolerite sills	Mesozoic	51° S	132°W
Turnbull		Beacon sandstone	Early Mesozoic	53° S	151°W
Turnbull	Cape Hallet	Volcanics	Cainozoic	58° S	142°W



1. Syowa (69°.0S, 35°.5E)
2. Wright valley (77°.5S, 161°.5E)
3. Beacon sandstone
4. Wright Valley (Dolerite)
5. Cape Hallet (81°S, 94°E)

Fig. 1. Palaeomagnetism in East Antarctica.

The pole positions are plotted together with the present geomagnetic pole in Fig. 1, where it will be seen that the pole has shifted rather systematically from the equator in Cambrian toward the present pole in Antarctica.

References

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