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Title	Palaeomagnetism of Upper Carboniferous Rocks in Akiyoshi Province, S.W. Honshu, Japan
Author(s)	Fujiwara, Yoshiki
Citation	Journal of the Faculty of Science, Hokkaido University. Series 4, Geology and mineralogy, 13(4), 395-399
Issue Date	1967-04
Doc URL	https://hdl.handle.net/2115/35969
Type	departmental bulletin paper
File Information	13(4)_395-400.pdf



PALAEOMAGNETISM OF UPPER CARBONIFEROUS ROCKS IN AKIYOSHI PROVINCE, S. W. HONSHU, JAPAN

by

Yoshiki FUJIWARA

(with 4 Text-figures)

(Contributions from the Department of Geology and Mineralogy,
Faculty of Science, Hokkaido University. No. 1057)

Abstract

In this paper, a palaeomagnetic study of a reddish tuffaceous shale of Upper Carboniferous (s.l.) age developed in Akiyoshi Province, S.W. Honshu, Japan, will be briefly presented. The stability of rock magnetism was tested. The pole position determined by the present study is approximately 7°S Lat., 67°E Log., which is strikingly different from that previously determined from the Carboniferous rocks in the Kitakami Mountains in N.E. Japan, although the samples in the latter are of slightly older geologic age than those of the present study (MINATO and FUJIWARA, 1965).

Stratigraphic position of the sampled rocks

In 1963, fossils were found in reddish tuffaceous shales at a locality near Ohkubo in Akiyoshi Province by HASEGAWA (1963). The fossils include corals,

Table 1. Sequence of Palaeozoic formations developed in Akiyoshi Province
after HASEGAWA, 1963; MINATO and KATO, 1963

European and Russian Standard		Akiyoshi Province
Westfalian	Moscovian	Limestones of the <i>Fusulina-Fusulinella</i> zones
Upper Namurian	Bashkirian	Limestone of the <i>Profusulinella</i> zone
Lower Namurian	?	Limestone of the <i>Nagatophyllum</i> zone Greenish purplish basaltic tuffs Reddish tuffaceous shales with fossils*
Upper Viséan		Onimaru Series, unexposed

* sampled rocks

bryozoans, brachiopods and pelecypods which were described by MINATO and KATO (1963). According to them, the age of the fossils may be early Namurian, or at least slightly younger than the Upper Viséan Onimaru Series of the Kitakami Mountains.

The unusual lithology and fossiliferous of this reddish tuffaceous shale makes it unique among Japanese Palaeozoic deposits. A palaeomagnetic study under the direction of Prof. MINATO was therefore undertaken by the present author.

Measurements

The specimens were measured by means of an astatic magnetometer at the palaeomagnetic laboratory, Department of Geology and Mineralogy, Hokkaido University. The result is tabulated in table 2. The virtual pole position of the age represented by the sampled rocks was determined to be at 7°S , 67°E .

This location is quite different from what the author expected prior to measurement, inasmuch as a pole position of 71°N Lat., 63°W Long., previously been determined from Tournasian rocks in the Kitakami Mountains. Further, the observed declination at these two localities varies by over 100 degrees.

The author therefore became suspicious of the stability of the remanent magnetization in the Akiyoshi specimens. Whereas the Kitakami specimens are composed of basaltic volcanic rocks, the present specimens are andesitic tuffs and might be presumed to be comparatively unstable with respect to magnetization. Some of the specimens therefore were placed in storage for the purpose of subsequent

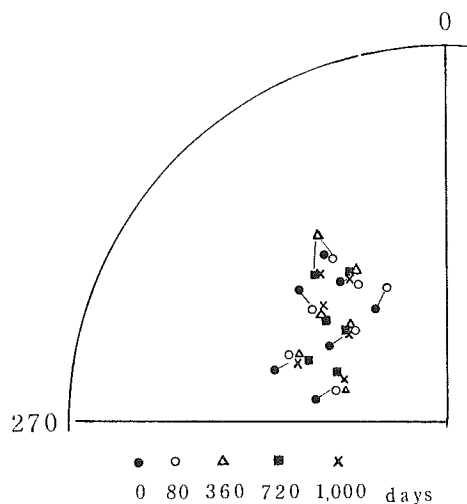


Fig. 1

Change in the direction of remanent magnetization during storage.

checks on possible changes in the direction of remanent magnetization.

As a result, the direction of magnetization was found to have shifted to some extent during 4 years (Feb. 1963–Jan. 1967).

Nevertheless, as is shown in fig. 1, this seems not to have been affected by the prevailing direction of the geomagnetic field. The remanent magnetization of the samples tested thus can be concluded to be fairly stable.

To further test the stability of samples, alternating magnetic field demagnetization, thermo-demagnetization, thermo-magnetic analysis and X-ray analysis of the rock specimen was applied.

The Curie temperature of the ferromagnetic components of the present material ranges from 580°C to 600°C. The ferromagnetic mineral was determined by X-ray analysis to be γ -Fe₂O₃.

As a result of these stability tests, the remanent magnetization of the samples was to be sufficiently stable for reliable palaeomagnetic determinations (Fig. 2–4).

Table 2.

Mean direction and intensity of magnetization				Pole position	
Declination	Inclination	α	e. m. u./gr.		δ_p δ_m
S65°W	27°	15°	2.5×10^{-4}	7°S, 67°E	10° 16°

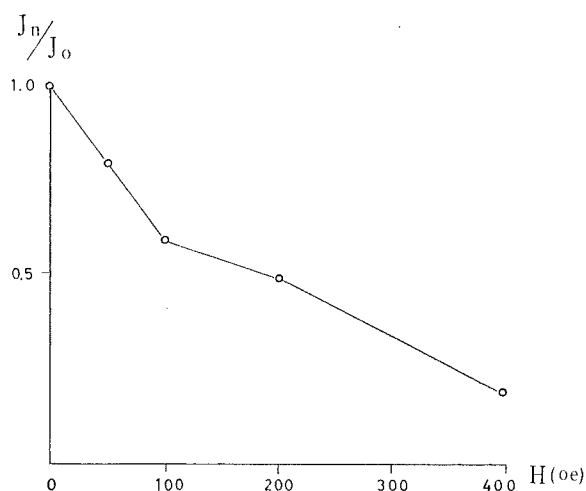
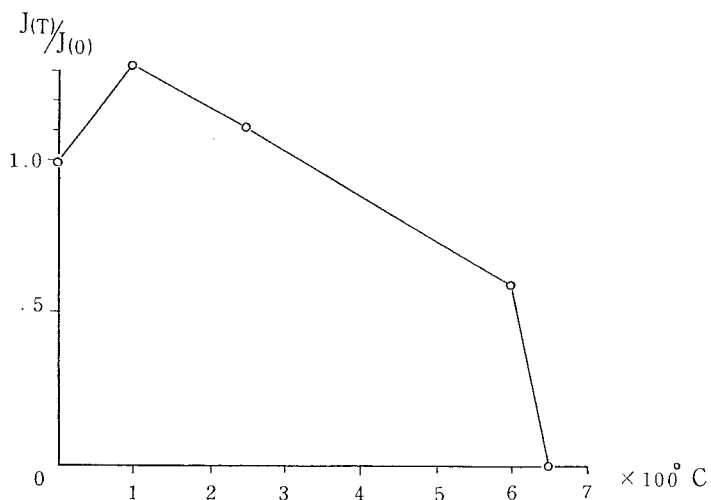
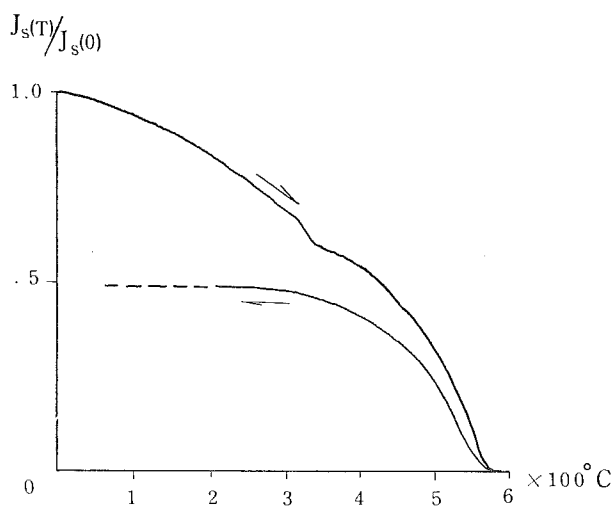


Fig. 2

Value of relative intensity of N. R. M. after A-C demagnetization. $H(oe)$; intensity of A-C magnetic field J_n/J_0 ; relative intensity of N. R. M.

**Fig. 3**

Value of relative intensity of magnetization after thermo-demagnetization.

**Fig. 4**

Thermo-magnetic curve of reddish tuffaceous shale. $H_{\text{ex}} = 3,300$ Oe

Acknowledgments

The author wishes to offer his sincere thanks to Prof. M. MINATO, who suggested this study and kindly read the manuscript. He is also much indebted to

Drs. S. UOZUMI, M. KATO and Y. HASEGAWA who assisted him in various ways during the course of the study. Thanks are also due to Dr. S. HONJO for his discussions of the experiment.

The manuscript was kindly read and corrected linguistically by Dr. C. L. ROWETT, for which the author also wishes to express cordial thanks.

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