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=====
=          DEEP SEA DRILLING PROJECT          =
=          PALEOMAGNETICS MEASUREMENTS        =
=          IGNEOUS AND METAMORPHIC ROCKS DATA FILE      =
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## I. INTRODUCTION

### A. BACKGROUND

The file contains paleomagnetic and rock magnetic measurements of igneous and metamorphic rocks and a few sedimentary rocks composed of volcanic material. Data were encoded primarily from the "Initial Reports of the Deep Sea Drilling Project". The shipboard "Hole Summary Book" and the DSDP data archives also were sources. The file contains both shipboard measurements and measurements made at onshore laboratories. Magnetic properties measured on the ship include magnetic intensity, declination, inclination, and initial susceptibility. Shipboard paleomagnetic apparatus included a Digico balanced fluxgate spinner magnetometer, a Schonstedt alternating field GSD-1 demagnetizer and a Bison magnetic susceptibility meter. Shipboard measurements of magnetic properties of igneous and metamorphic rocks were made during DSDP Legs 34, 37, 45-46, 49, 51-55, 58-66, 68-73, 75-78, 81-85, 89, and 92.

### B. METHODS

Magnetic properties recorded in the file include natural remanent magnetization (NRM) intensity, declination, inclination, initial susceptibility, stable declination, stable inclination, mean demagnetizing field, Curie temperature, saturation intensity, saturation remanence, coercive force, and remanent coercive force. The Koenigsberger ratio (Q) when calculated also is included. In a few instances the paleomagnetist has indicated the quality of orientation and a field is available for this information. There is also a field for the grain-size or the grain-size range.

Each record includes an identifying code for the analyst's or first author's name. See Table 1 for the index to analysts' codes.

Most records contain a code for data source (Table 3). The codes indicate whether the source was the "Initial Reports of the Deep Sea Drilling Project", the Hole Summary Book, or the prime data archives. Each record has a code indicating

whether the rock is igneous, sedimentary, or metamorphic. Rock type can be further specified by the codes for tuff (sedimentary), volcanic breccia (igneous), and brecciated (igneous). See Table 2 for rock type codes.

Codes indicate whether the measurements were done on board ship or at a shore laboratory.

A blank field means not determined.

NRM intensities and initial susceptibilities are expressed in scientific notation. The symbol @ is used to represent  $10^6$ .

Units for the magnetic parameters follow:

a) Magnetic intensity	emu/cm <sup>3</sup>
b) Mean demagnetizing field	oersteds
c) Initial susceptibility	gauss/oersteds
d) Saturation intensity	emu/cm <sup>3</sup>
e) Saturation remanence	emu/cm <sup>3</sup>
f) Coercive force	oersteds
g) Remanent coercive force	oersteds

In a few later DSDP reports data were expressed in SI units. The DSDP encoders converted SI units to CGS units. The following conversions were used:

$$\begin{aligned} (\text{A/m}) / 79.6 &= \text{oersteds} \\ (\text{A/m}) \times 10^{-3} &= \text{emu/cm}^3 \\ \text{mT} \times 10^{-1} &= \text{oersteds} \end{aligned}$$

As many as five comment records are present for information about the analysis and the sample. Lithological information about the rock sample, including the rock name and a visual estimate of the degree of alteration, is taken from the Visual Core Description for Igneous Rocks forms, which are completed by the shipboard scientists soon after core recovery.

Each paleomagnetic measurements set includes a lead record followed by one routine measurements record (R), and by one comment record (C). Since some comments are lengthy, additional comment records may be employed as necessary. An optional extra measurements (X) record may follow the routine measurements record. The X record contains several magnetic properties, including Curie temperature. Several temperatures may have been read from the thermomagnetic curve. The X record does not allow for repeating fields. Therefore, additional X records to contain all the Curie temperatures may be employed as necessary.

#### C. LEGS IN DATA SET

The data set contains data from Legs 14-16, 19, 23, 25-29, 32-34, 37-38, 41-43, 45-46, 49, 51-55, 58-66, 68-73, 75-78, 81-85, 89, 91-92.

D. BIBLIOGRAPHY

Partial references to analytical methods for shipboard measurements

Ade-Hall, J. M. and H. P. Johnson, 1976. Paleomagnetism of Basalts, Leg 34. In Yeats, R. S., Hart, S. R., et al., Initial Reports of the Deep Sea Drilling Project, Volume 34: Washington (U.S. Government Printing Office), pp. 513-532.

Hall, J. M. and P. J. C. Ryall, 1977. Paleomagnetism of Basement Rocks, Leg 37. In Aumento, F., Melson, W. G. et al., Initial Reports of the Deep Sea Drilling Project, Volume 37: Washington (U.S. Government Printing Office), pp. 425-448.

For methods used in a shore-based study, consult the paper in the the Initial Reports. The results and analytical information of shipboard analyses similarly are published in the Initial Reports. See Table 1 for the index to analysts' codes.

II. FORMAT, FIELD DESCRIPTIONS, AND CODES

A. RECORD FORMATS

=====  
 = LEAD RECORD =  
 =====

Record length = 51 characters  
 (originally 60, blank fields removed by NGDC)

COLUMN	FIELD	FORMAT
=====	=====	=====
1-2	LEG	A2
3-5	SITE	A3
6	HOLE	A1
7-9	CORE	A3
10-11	SECTION	A2
12-15	TOP INTERVAL DEPTH (centimeters)	F4.1
16-19	BOTTOM INTERVAL DEPTH (centimeters)	F4.1
20-27	TOP OF CORE DEPTH (meters)	F8.2
28-35	SAMPLE MIDPOINT DEPTH (meters)	F8.2
36-39	ANALYST CODE	A4
40-43	PIECE NUMBER	A4
44	unused	
45-46	NUMBER OF PHYSICAL RECORDS	I2
47	unused	
48	LITHOLOGY CODE	A1
49	SHIPBOARD OR ONSHORE MEASUREMENT CODE	A1
50	DATA SOURCE CODE	A1
51	PHYSICAL RECORD NUMBER	I1

=====  
 = ROUTINE MEASUREMENTS RECORD =  
 =====

Record length = 51 characters

COLUMN	FIELD	FORMAT
=====	=====	=====
1	ROUTINE MEASUREMENTS CODE "R"	A1
2-9	NRM INTENSITY	F8.0
10-14	NRM INCLINATION	F5.0
15-19	NRM DECLINATION	F5.0
20-24	STABLE INCLINATION	F5.0

25-29	STABLE DECLINATION	F5.0
30-31	QUALITY OF ORIENTATION	A2
32-36	MEAN DEMAGNETIZING FIELD	A5

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37-44	INITIAL SUSCEPTIBILITY	F8.0
45-49	KOENIGSBERGER RATIO	A5
50	unused	
51	PHYSICAL RECORD NUMBER	I1

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= EXTRA MEASUREMENTS RECORD =

=====

Record length = 51 characters

COLUMN	FIELD	FORMAT
=====	=====	=====
1	EXTRA MEASUREMENTS CODE "X"	A1
2	THERMOMAGNETIC CURVE	A1
3-6	CURIE TEMPERATURE	I4
	Additional records are used if more than one Curie temperature was read from the thermomagnetic curve.	
7-14	SATURATION INTENSITY	F8.0
15-22	SATURATION REMANENCE	F8.0
23-26	COERCIVE FORCE	A4
27-30	REMANENT COERCIVE FORCE	A4
31-40	GRAIN-SIZE	A10
41-50	unused	
51	PHYSICAL RECORD NUMBER	I1

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= COMMENT RECORD=

=====

Record length = 51 characters

COLUMN	FIELD	FORMAT
=====	=====	=====
1	COMMENT RECORD CODE "C"	A1
2-50	COMMENT	A49
	Additional records are used if necessary.	
51	PHYSICAL RECORD NUMBER	I1

B. FIELD DESCRIPTIONS AND CODES

The definition of leg, site, hole, core and section may be found in the explanatory notes. In addition, the special core designations, as well as the methods of sample labeling and calculating absolute sample depths are discussed.

INTERVAL DEPTH:

Refers to the depth in centimeters within the section at which the rock was sampled. Values are encoded with an implicit decimal point.

TOP OF CORE DEPTH:

The subbottom depth in meters to the top of the core.

SAMPLE MIDPOINT DEPTH:

The subbottom depth in meters to the level at which the core was sampled.

ANALYST CODE:

TABLE 1 - ANALYSTS'/AUTHORS' CODES

LEG	CODE	ANALYST/AUTHOR
====	=====	=====
14	LOW	Lowrie, W.
15	LOW	Lowrie, W.
16	HALL	Hall, J. M.
19	WHIT	Whitney, J.
23	HAM	Hamilton, N.
25	WOLE	Wolejszo, J.
26	PEIR	Peirce, J. W.
27	MCEL	McElhinny, M. W.
28	LOW	Lowrie, W.
29	LOW	Lowrie, W.
32	LARS	Larson, R.
33	CKM	Cockerham, R. S.
34	HALL	Hall, J. M.
	TARA	Tarasiewicz, G.

GROM Gromme, S.  
ELL Ellwood, B.  
DEN Denham, C.  
LOW Lowrie, W.  
37 HALL Hall, J. M.  
BLEI Bleil, U.  
ELL Ellwood, B.  
KENT Kent, D.  
BREC Brecher, A.

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DEUT Deutsch, E.  
SCHW Schwartz, E.  
CARM Carmichael, C.  
38 KENT Kent, D.  
41 KENT Kent, D.  
42 PET Petersen, N.  
43 PET Petersen, N.  
45 JOH Johnson, P.  
46 PET Petersen, N.  
49 DAY Day, R.  
51 BLEI Bleil, U.  
LEVI Levi, S.  
HAMY Hamano, Y.  
52 LEVI Levi, S.  
BLEI Bleil, U.  
HAMY Hamano, Y.  
RIG Rigotti, P.  
53 RIG Rigotti, P.  
HAMY Hamano, Y.  
LEVI Levi, S.  
54 PET Petersen, N.  
55 KONO Kono, M.  
58 KNS Kinoshita, H.  
59 KEA Keating, B.  
60 BLEI Bleil, U.  
61 STR Steiner, M.  
SYR Sayre, W.  
62 SYR Sayre, W.  
63 DEN Denham, C.  
SUR Pal Verma, S.  
64 VAC Vacquier, V.  
SUR Pal Verma, S.  
65 DAY Day, R.  
PECH Pechersky, D. M.  
66 NM Niitsuma, N.  
68 unknown  
69 PECH Pechersky, D. M.  
FUR Furuta, T.  
ODON O'Donovan, J. B.  
70 FUR Furuta, T.  
PECH Pechersky, D. M.  
LEVI Levi, S.

71 SAL Salloway, J.  
 72 HAM Hamilton, N.  
 73 PET Petersen, N.  
 HOUS Housden, J.  
 75 KEA Keating, B.  
 76 TEST Testarmata, M.  
 77 KNS Kinoshita, H.  
 TEST Testarmata, M.  
 78 WIL Wilson, D.  
 81 KRMK Krumsiek, K.  
 82 SMIT Smith, G. M.  
 83 SMIT Smith, G. M.

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KNS Kinoshita, H.  
 NEW Newmark, R.  
 FACY Facey, D.  
 84 LIE Lienert, B.  
 85 WEIN Weinreich, N.  
 89 OGG Ogg, J.  
 91 MONT Montgomery, A. F.  
 92 NISH Nishitani, T.

PIECE NUMBER:

The sample number assigned to the rock is included when available.

NUMBER OF PHYSICAL RECORDS:

The total number of physical records which together comprise a complete set of paleomagnetic measurements for a sample. Since there is always a lead record, a routine measurements record (R), and a comment record (C), the number of records is never less than 3.

LITHOLOGY CODE:

TABLE 2 - LITHOLOGY CODES

I = Igneous  
 S = Sedimentary  
 M = Metamorphic  
 T = Tuff (sedimentary)  
 V = Volcanic breccia (igneous)  
 B = Brecciated (igneous)



SHIPBOARD OR ONSHORE MEASUREMENTS CODE:

C = Shipboard  
S = Onshore

DATA SOURCE CODE:

TABLE 3 - DATA SOURCE CODES

R = Initial Reports (IR)  
S = Hole Summary Book (HSB)  
A = Prime data archives

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PHYSICAL RECORD NUMBER:

Each physical record in a paleomagnetism measurements set is numbered sequentially in column 51. The physical record number will always be "1" for the lead record and "2" for the routine measurements (R) record.

NATURAL REMANENT MAGNETIZATION INTENSITY:

NRM intensity is encoded in gauss or emu/cc units. It is always represented in scientific notation.

NATURAL REMANENT MAGNETIZATION INCLINATION:

Information about the polarity is contained in the sign preceding the inclination. Units are degrees. No absolute value should exceed 90 degrees.

NATURAL REMANENT MAGNETIZATION DECLINATION:

Values range from 0 to 360 degrees and are always positive.

STABLE INCLINATION:

The value after alternating field demagnetization.

STABLE DECLINATION:

The value after alternating field demagnetization.

QUALITY OF ORIENTATION:

TABLE 4 - QUALITY OF ORIENTATION CODES

G = good  
MG = medium good  
P = poor  
VP = very poor  
U = unstable

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M = medium  
R = reversed  
N = none  
F = fair  
PC = polarity corrected  
UC = unoriented **\*\***(Believed to be 'UO' by NGDC. Found in data  
file as 'UO')**\*\***  
SI = shallow orientation

MEAN DEMAGNETIZING FIELD:

Symbols for greater than ">" and less than "<" may appear  
in the MDF field.

INITIAL SUSCEPTIBILITY:

Always represented in scientific notation.

KOENIGSBERGER RATIO:

Obtained by the formula:  $NRM \text{ intensity} / (\text{initial susceptibility} \times H)$ , where H is the Earth's magnetic field  
at the sampling location.

THERMOMAGNETIC CURVE:

A "C" is encoded in this field if the Curie temperature is from the cooling curve, an "H" if it is from the heating curve.

CURIE TEMPERATURE:

Multiple Curie temperature records: Because of the sorting routine used, the Curie temperature records may not be in the correct order, particularly in data processed after Leg 66.

SATURATION INTENSITY:

Entered as a decimal.

SATURATION REMANENCE:

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Entered as a decimal.

COERCIVE FORCE:

Symbols for greater than ">" and less than "<" may appear in this field.

REMANENT COERCIVE FORCE:

Symbols for greater than ">" and less than "<" may appear in this field.

GRAIN-SIZE:

Grain-size may have been determined by a visual estimate. Units are microns. Often a range is given.

COMMENT RECORD:

The rock name, degree of alteration and comments about the results belong here. Lithological information about the rock sample, including the rock name and a visual estimate

of the degree of alteration, is taken from the Visual Core Descriptions for Igneous Rocks forms, which are completed by the shipboard scientists soon after core recovery.

TABLE 5 - ALTERATION CODES

ALT FRESH	=	ROCK IS FRESH
ALT MOD	=	MODERATELY ALTERED
ALT EXT	=	EXTENSIVELY ALTERED
ALT INTENSE	=	INTENSELY ALTERED
ALT SLIGHT	=	SLIGHTLY ALTERED

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NGDC NOTES: (list of deviations from field descriptions)

Descriptions of deviation =====	Record Number(s) =====
Bottom interval depth is 0, top is not	occurs throughout the file
Unknown quality of orientation - the UO is believed to stand for 'unorientated' but it was flagged as an error just in case 'UO' is incorrect	1342,1373,1375,1375,1377,4332,4343,4344,4357,4358,5116,5121,5123,5128,5133,5138,5143

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