UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PRELIMINARY GEOMAGNETIC DATA
COLLEGE OBSERVATORY
FAIRBANKS, ALASKA

APRIL 1976

OPEN FILE REPORT

76-300D

ALASKAN GEOLOGY BRANCH
TECHNICAL DATA FILE

ORDER OF CONTENTS

Explanation of Data & Reports

Magnetic Activity Report

Outstanding Magnetic Effects

Principal Magnetic Storms

Preliminary Calibration Data & Monthly Mean Absolute Values

Magnetogram Hourly Scalings

Sample Format for Normal & Storm Magnetogram

Normal Magnetograms

Storm Magnetograms(When Normal is too disturbed to read)

THIS REPORT WAS PREPARED UNDER THE DIRECTION OF JOHN B. TOWNSHEND, CHIEF OF THE COLLEGE OBSERVATORY WITH THE ASSISTANCE OF OBSERVATORY STAFF MEMBERS J. E. PAPP, M. J. MOORMAN, C. E. DEADMON, AND S. P. TILTON, AND IN COOPERATION WITH THE GEOPHYSICAL INSTITUTE OF THE UNIVERSITY OF ALASKA. THE COLLEGE OBSERVATORY IS A PART OF THE BRANCH OF ELECTROMAGNETISM AND GEOMAGNETISM.

COLLEGE OBSERVATORY PRELIMINARY GEOMAGNETIC DATA

INTRODUCTION

The preliminary geomagnetic data included here is made available to scientific personnel and organizations, as part of a cooperative effort and on a data exchange basis because of the early need by some users. To avoid delay, all of the data is copied from original forms processed at the observatory; therefore it should be regarded as preliminary. Inquiries about this report or about the College Observatory should be addressed to: Chief, College Observatory
U.S. Geological Survey
Yukon Drive on West Ridge
Fairbanks, Alaska 99701

Requests for copies of the magnetograms except for the current month should be addressed to:
World Data Center A-NOAA
Environmental Data Service
Boulder, Colorado 80302

GEOMAGNETIC DATA

Normal, Storm, and Rapid Run magnetograms and appropriate calibration data are processed daily at the observatory and are available for analysis or copying. Also available are mean hourly scalings, K-Indices, selected magnetic phenomena reports, and on a real-time basis are recordings from a 3-component fluxgate magnetometer and F-component proton magnetometer.

Magnetic Activity

The K-Index. The K-Index is a logarithmic measurement of the range of the most disturbed component (D or H) of the geomagnetic field for eight intervals beginning 0000-0300, 0300-0600...2100-2400 UT. It is a measure of the difference between the highest and lowest deviation from a smooth curve to be expected for a component on a magnetically quiet day, within a three hour interval.

The Equivalent Daily Amplitude, AK. The K-Index is converted into an equivalent range, ak, which is near the center of the limiting gamma ranges for a given K. The average of the eight values is called equivalent daily amplitude AK. The unit 10γ has been chosen so as not to give the illusion of an accuracy not justified.

The schedule for converting gamma range to K, and K to ak is as follows:

Gamma Range	K - Index	ak*
0 < 25	0	0
25 < 50	1	3
50 < 100	2	7
100 < 200	3	15
200 < 350	4	27
350 < 600	5	48
600 < 1000	6	80
1000 < 1650	7	140
1650 < 2500	8	240
2500+	9	400 (10γ)

The Magnetic Daily Character Figure, C. To each Universal day a character is assigned on the basis C=0, if it is quiet; C=1 if it is moderately disturbed; C=2 if it is greatly disturbed. The method used to assign characters at the College Observatory is based on AK as follows:

AK Range	C
0 ≈ 11	0
11 ≈ 50	1
50+	2

Routine assignment of C was discontinued at College on January 1, 1976.

OBSERVATORY LOCATION

The College Observatory, operated by the U. S. Geological Survey, is located at the University of Alaska, Fairbanks, Alaska. It is near the Auroral Zone and the northern limit of the world's greatest earthquake belt, the circum-Pacific Seismic belt. Although the observatory's basic operation is in geomagnetism and seismology, it cooperates with other scientists and organizations in areas where the facility and personnel can be of service.

The observatory is one of three operated by the USGS in Alaska. The others are located at Barrow and Sitka.

The position of the observatory site is:

Geographic latitude.....64°51.6'N
Geographic longitude.....147°50.2'W
Geomagnetic latitude.....+64.6°
Geomagnetic longitude.....+256.5°
Elevation.....200 meters

Selected Phenomena & Outstanding Magnetic Effects

Prior to January 1, 1976, the Normal & Rapid Run records were reviewed at the observatory for selected magnetic phenomena and the events identified were forwarded to the IUGG Commission on Magnetic Variations and Disturbances. This was discontinued on January 1, 1976, but a report on Outstanding Magnetic Effects is prepared monthly for this report.

Principal Magnetic Storms

Gradual and sudden commencement magnetic disturbances with at least one K-Index of 5 or greater, which are believed to be part of a world-wide disturbance, are classified as principal magnetic storms. The time of the storm beginning and ending; direction and amplitude of sudden commencements; period of maximum activity; and storm range are reported. Monthly reports of these data are forwarded to the World Data Center A in Boulder, Colorado.

Magnetogram Hourly Scalings

Magnetogram hourly scalings are averages for successive periods of one hour for the D, H, and Z elements. The value in the column headed "Q1" is the average for the hour beginning 0000 and ending 0100. Note that the values on the scaling sheets are in tenths of mm with the decimal point omitted. The user of these scalings should keep in mind that the tabular values are hourly means and if he is interested in the detailed morphology of the magnetic field, he should refer directly to the magnetograms.

Magnetograms

The normal magnetograms in this report are reproduced at about one-third the size of the originals. Preliminary base-line values and scale values adopted for use with the original magnetograms are included. For days when the magnetic field is too disturbed for the Normal magnetogram to be readable, Storm magnetograms are reproduced.

Absolutes, Base-lines, and Scale Values

To determine the absolute value of the magnetic field from the hourly means or from point scalings the following equations should be used:

$D = B_D + d \cdot S_D$; $H = B_H + h \cdot S_H$; $Z = B_Z + z \cdot S_Z$
where D, H, and Z are absolute values;
 B_D , B_H and B_Z are base-line values;
 S_D , S_H and S_Z are scale values;
and d, h, and z are scalings in millimeters.

COLLEGE, ALASKA

MAGNETIC ACTIVITY
(Greenwich civil time, counted from midnight to midnight)

MONTH AND YEAR

APRIL 1976

DATE	K-INDICES								AK	TIME SCALE ON MAGNETOGRAMS
	00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24		
								SUM		20 mm/hr
1	6	8	7	8	6	5	3	3	46	107
2	3	4	3	1	1	1	2	3	18	11
3	3	4	6	3	7	7	4	4	38	59
4	4	3	5	7	6	6	2	3	36	52
5	3	4	6	6	6	3	4	2	34	41
6	3	4	5	6	6	5	4	3	36	43
7	3	2	5	6	7	3	3	4	33	43
8	3	3	2	4	4	3	2	2	23	15
9	4	3	2	2	6	4	2	2	25	22
10	3	3	4	5	5	1	1	2	24	21
11	2	1	1	6	4	3	2	2	21	19
12	1	2	5	5	3	1	1	1	19	16
13	2	2	2	4	2	2	2	2	18	10
14	2	3	5	3	5	3	2	2	25	20
15	1	0	1	2	1	1	1	1	08	03
16	3	2	2	1	1	1	1	1	12	06
17	1	2	2	1	0	1	1	0	08	03
18	0	0	1	2	1	0	0	0	04	02
19	1	0	0	3	2	2	1	0	09	04
20	0	1	0	1	1	0	0	0	03	01
21	0	0	0	5	4	3	0	1	13	12
22	2	4	6	6	4	2	2	3	29	31
23	3	3	2	3	3	2	0	0	16	09
24	1	4	5	5	5	2	3	2	27	25
25	2	3	2	1	3	3	2	1	17	09
26	1	1	3	3	2	2	1	1	14	07
27	3	3	2	2	4	1	1	1	17	10
28	3	2	4	3	1	2	2	1	18	11
29	1	1	1	6	5	6	3	3	26	31
30	3	3	4	4	3	2	1	1	21	14
31										

SUM

K SCALE USED:

LOWER LIMIT FOR K = 9.....

CURRENT SCALE VALUE.....

LOWER LIMIT FOR K = 9

D

683.8

3.76

2570

H

321.7

7.82

2520

Z

(mm)

(γ/mm)

(to nearest 10γ)

SCALINGS AND COMPUTATIONS HAVE BEEN CHECKED.

/s/ John B. Townshend

APPROVED John B. Townshend, Chief, College Observatory

OBSERVER IN CHARGE

OUTSTANDING MAGNETIC EFFECTS			OBSERVATORY COLLEGE. ALASKA	
			MONTH APRIL	YEAR 1976
DATE	TIME U.T.	NATURE OF PHENOMENON ¹	REMARKS	
08	23XX	pg		
09	02XX	pcl		
09	12XX	pg		
09	13XX	pi2		
10	22XX	pc4		
18	08XX	pi2	With series of small bays.	
19	0143	si*		
20	11XX	pi2		
22	0208	ssc*		
27	12XX	bps		
IDENTIFIED BY: JEP, MJM			VERIFIED BY: JBT	

1. NATURE OF PHENOMENON: ssc, ssc*, si, si*, b, bp, bs, bps, pcl, pc2 - - - pc5, pg, pi 1, pi 2, sfe.

NOAA Form 86-500
(11/73)

PRINCIPAL MAGNETIC STORMS
COLLEGE OBSERVATORY, COLLEGE, ALASKA

Data from Individual Observatories:

APRIL 19 76

WDC-A FOR SOLAR-TERRRESTRIAL PHYSICS
ENVIRONMENTAL DATA SERVICE, NOAA
BOULDER, COLORADO 80302 U.S.A.

Obs. 2 letter IAGA code	Geomag. lat.	Commencement			SC - amplitudes			Max. 3 hr - index K			Ranges			UT End day hr
		day	hr min (UT)	type	D(')	H(Y)	Z(Y)	day	(3 hr - period)	K	D(')	H(Y)	Z(Y)	
C0	64°6 N	01	01XX	..	..	..	..	01	2,4	8	632	2580	1840	02 09
		01	0253	s.c.*	+	+306	-219							
		02	17XX	..	..	..	..	03 04 07	5,6 4 5	7 7 7	310	1690	870	08 02
		22	0208	s.c.*	+2	-14	..	22	3,4	6	94	800	370	22 14

APRIL

1976

NORMAL MAGNETOGRAPH					
COMPONENT	PERIOD		CALIBRATION		
	FROM	TO	SCALE VALUE		BASELINE
D	0000 UT, 4-1-76	2400 UT, 4-30-76	1.0/mm	3.8 γ/mm	28° 07' 2 E
H	0000 UT, 4-1-76	2400 UT, 4-30-76	7.8 γ/mm		12755 γ
Z	0000 UT, 4-1-76	2400 UT, 4-30-76	7.6 γ/mm		55128 γ

STORM MAGNETOGRAPH					
COMPONENT	PERIOD		CALIBRATION		
	FROM	TO	SCALE VALUE		BASELINE
D	0000 UT, 4-1-76	2400 UT, 4-30-76	7.9/mm	29.8 γ/mm	24° 22' 9 E
H	0000 UT, 4-1-76	2400 UT, 4-30-76	44.1 γ/mm		11497 γ
Z	0000 UT, 4-1-76	2400 UT, 4-30-76	48.6 γ/mm		54013 γ

RAPID RUN MAGNETOGRAPH					
COMPONENT	PERIOD		CALIBRATION		
	FROM	TO	SCALE VALUE		
D	0000 UT, 4-1-76	2400 UT, 4-30-76	0.3/mm		1.0 γ/mm
H	0000 UT, 4-1-76	2400 UT, 4-30-76	1.0 γ/mm		
Z	0000 UT, 4-1-76	2400 UT, 4-30-76	2.4 γ/mm		

MONTHLY MEAN ABSOLUTE VALUES*		
D	H	Z
28° 23' 6 E	13049 γ	55364 γ

* COMPUTED FROM TEN QUIETEST DAYS DURING MONTH.

DAYS USED: APR 13, 15, 16, 17, 18, 19, 20, 23, 25, 26

FORM CAGS-404a
(6-93)

MAGNETOGRAM HOURLY SCALLINGS

(UNIVERSAL TIME)

Values are in tenths of mm, and are averages for successive periods of one hour beginning midnight. Hour 1 of local day (1500 M.T.) is hour 11 of the same universal day.
Shrinkage corrections have been applied. Negative values are in red, with minus signs shown.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
GEOMAGNETISM DIVISION

OBSY. YEAR MONTH ELEMENT
CO 76 APR D

SHRINKAGE CORRECTIONS HAVE BEEN APPLIED. NEGATIVE VALUES ARE IN PARENTS, WITH MINUS SIGNS SHOWN.																														
C	Q	S	T	0	1	2	3	4	5	6	7	8	9	10	11	12	N	13	14	15	16	17	18	19	20	21	22	23	24	SUM
01	130	75	-49	-81	-106	-136	-166	-196	-226	-256	-286	-316	-346	-376	-406	01	459	586	467	316	586	292	240	246	122	72	77	110	3691	
02	110	109	113	80	147	111	173	142	155	160	152	169	169	169	169	02	180	182	194	217	231	248	222	230	218	140	77	107	3867	
03	134	123	102	112	90	344	212	-2	14	135	173	169	169	169	169	03	172	192	514	1141	753	602	342	228	182	143	149	97	6121	
04	61	40	110	152	144	40	387	139	168	-2	-41	101	101	101	101	04	133	364	427	522	257	274	263	245	198	182	140	141	4445	
05	118	107	91	65	90	247	205	236	133	45	40	112	112	112	112	05	129	254	191	237	225	273	243	108	115	141	140	120	3665	
06	113	127	93	85	184	111	325	241	219	-97	91	167	167	167	167	06	171	284	356	230	404	215	229	173	131	131	135	124	4242	
07	133	109	98	154	163	155	173	360	122	-41	-17	284	284	284	284	07	210	323	220	224	254	258	244	195	202	123	69	114	4129	
08	138	139	145	132	155	247	149	164	143	243	114	170	170	170	170	08	228	255	203	228	264	264	227	207	162	143	104	78	4302	
09	94	105	59	129	135	132	148	135	149	139	184	172	172	172	172	09	178	160	222	159	234	204	203	177	158	109	98	118	3601	
10	94	84	104	174	129	121	266	184	182	297	157	284	284	284	284	10	292	223	200	211	254	244	225	215	191	163	148	123	4563	
11	109	119	129	139	139	144	150	153	150	169	170	181	181	181	181	11	293	240	248	194	235	256	269	245	219	137	99	128	4315	
12	132	139	144	139	150	148	163	86	237	188	232	131	131	131	131	12	203	218	221	218	222	232	242	241	209	183	168	139	4405	
13	105	112	134	138	169	180	189	150	188	194	212	209	209	209	209	13	173	178	196	195	204	218	214	209	139	144	123	120	4099	
14	104	99	110	129	134	227	130	138	140	124	129	163	163	163	163	14	181	229	285	229	204	190	198	205	184	148	108	89	3877	
15	92	109	112	143	152	155	153	152	150	156	158	154	154	154	154	15	184	173	189	196	229	239	218	198	169	155	131	108	3875	
16	88	94	112	128	154	145	143	204	173	147	159	204	204	204	204	16	238	207	193	198	239	248	238	231	198	170	138	124	4175	
17	127	119	120	117	127	108	158	153	180	168	172	167	167	167	167	17	168	178	184	199	213	235	203	202	197	182	160	142	3979	
18	129	128	132	139	146	153	154	157	160	188	178	173	173	173	173	18	193	179	192	215	228	224	226	224	219	206	182	153	4276	
19	134	119	119	123	137	153	152	153	153	148	238	208	208	208	208	19	172	162	198	263	261	239	205	219	221	193	170	148	4258	
20	129	119	118	132	143	162	155	159	160	163	159	195	195	195	195	20	176	165	192	204	215	208	208	204	194	185	190	170	4105	
21	149	133	127	133	145	157	154	159	158	148	158	282	282	282	282	21	248	206	213	289	279	269	229	222	200	183	173	137	4491	
22	117	110	92	88	79	-34	-21	9	104	271	262	158	158	158	158	22	233	198	205	243	242	214	221	182	156	136	157	123	3545	
23	113	88	88	92	82	154	93	122	136	127	139	157	157	157	157	23	189	173	203	223	237	225	204	198	189	168	142	123	3665	
24	120	112	123	133	131	77	28	-3	80	70	59	127	127	127	127	24	221	323	243	223	280	284	252	141	168	167	139	98	3596	
25	112	114	114	133	118	149	158	141	174	161	155	163	163	163	163	25	163	169	163	179	268	249	189	188	153	128	118	114	3773	
26	116	115	119	112	120	142	112	109	129	97	143	145	145	145	145	26	179	186	194	210	219	230	203	172	165	148	133	128	3626	
27	97	60	57	39	88	100	87	88	137	132	143	167	167	167	167	27	191	218	209	241	249	246	243	201	178	129	125	96	3521	
28	81	70	87	113	132	125	221	182	113	141	131	155	155	155	155	28	180	198	212	261	279	272	255	198	168	156	119	118	3967	
29	112	102	98	135	134	154	153	145	147	140	295	423	423	423	423	29	183	323	248	319	478	403	208	248	113	27	81	46	4715	
30	62	87	108	77	109	181	132	159	235	120	137	178	178	178	178	30	179	168	173	212	233	248	222	188	173	153	125	116	3775	
31																31														

SCALED BY	SPT	Preliminary base-line and scale values:	Scale Value	☐ Interpolated ☐ Significant portion of hour interpolated. ☐ No record; or no values available because of faulty record. ☐ Scaling uncertain because of magnetic storm. <> Record off sheet for part or all of hour; if value is given, curve was estimated for missing part.	MONTHLY SUM	12269
CHECKED BY	MM, CDP	Base-line Value			MONTHLY MEAN	170
SIGNS RE-VIEWED BY	MM	Interval Beginning			DATES WITH GAPS:	
PUNCHED BY						

FORM C&G-404e
(6-55)

MAGNETOGRAM HOURLY SCALINGS
(UNIVERSAL TIME)

Values are in tenths of mm. and are averages for successive periods of one hour beginning at midnight. Hour 01 of local day (1500 M.T.) is hour 11 of the same universal day.
Shrinkage corrections have been applied. Negative values are in red, with minus signs shown.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
GEOMAGNETISM DIVISION

OBSV. YEAR MONTH ELE-
00 76 APR 2

C	U	of	Ter	Q	S	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	SUM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
						01	311	321	219	-212	-82	-122	114	*	584	*	673	*	1124	*	660	*	820	*	756	*	895	*	558	*	323	263	152	96	138	204	254	292	298	8609																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
						02	338	352	352	353	371	391	391	381	373	355	351	349	345	344	342	340	342	343	331	321	319	302	302	302	321	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	3

SCALED BY	SPT	Preliminary base-line and scale values:	Scale Value	☐ Interpolated ☐ Significant portion of hour interpolated. ☐ No record; or no values available because of faulty record. • Derived from Storm Mph., converted to Normal Mph.	MONTHLY SUM 218795 MONTHLY MEAN 304 DATES WITH GAPS:
CHECKED BY	MJM, CED	Interval Beginning	Baseline Value		
SIGNS RE-VIEWED BY	MJM				
PUNCHED BY					

FORMAT FOR NORMAL & STORM MAGNETOGRAMS (SAMPLE ONLY)

SEE PRELIMINARY CALIBRATION DATA FOR SCALE VALUES & BASELINE VALUES

NORMAL MAGNETOGRAMS

200 mm
100 mm
0

NORMAL MAGNETOGRAMS

NORMAL MAGNETOGRAMS

NORMAL MAGNETOGRAMS

NORMAL MAGNETOGRAMS

NORMAL MAGNETOGRAMS

200 mm
100 mm
0

NORMAL MAGNETOGRAMS

NORMAL MAGNETOGRAMS

STORM MAGNETOGRAMS

200 mm
100 mm
0

STORM MAGNETOGRAMS

200 mm
100 mm
0

STORM MAGNETOGRAMS