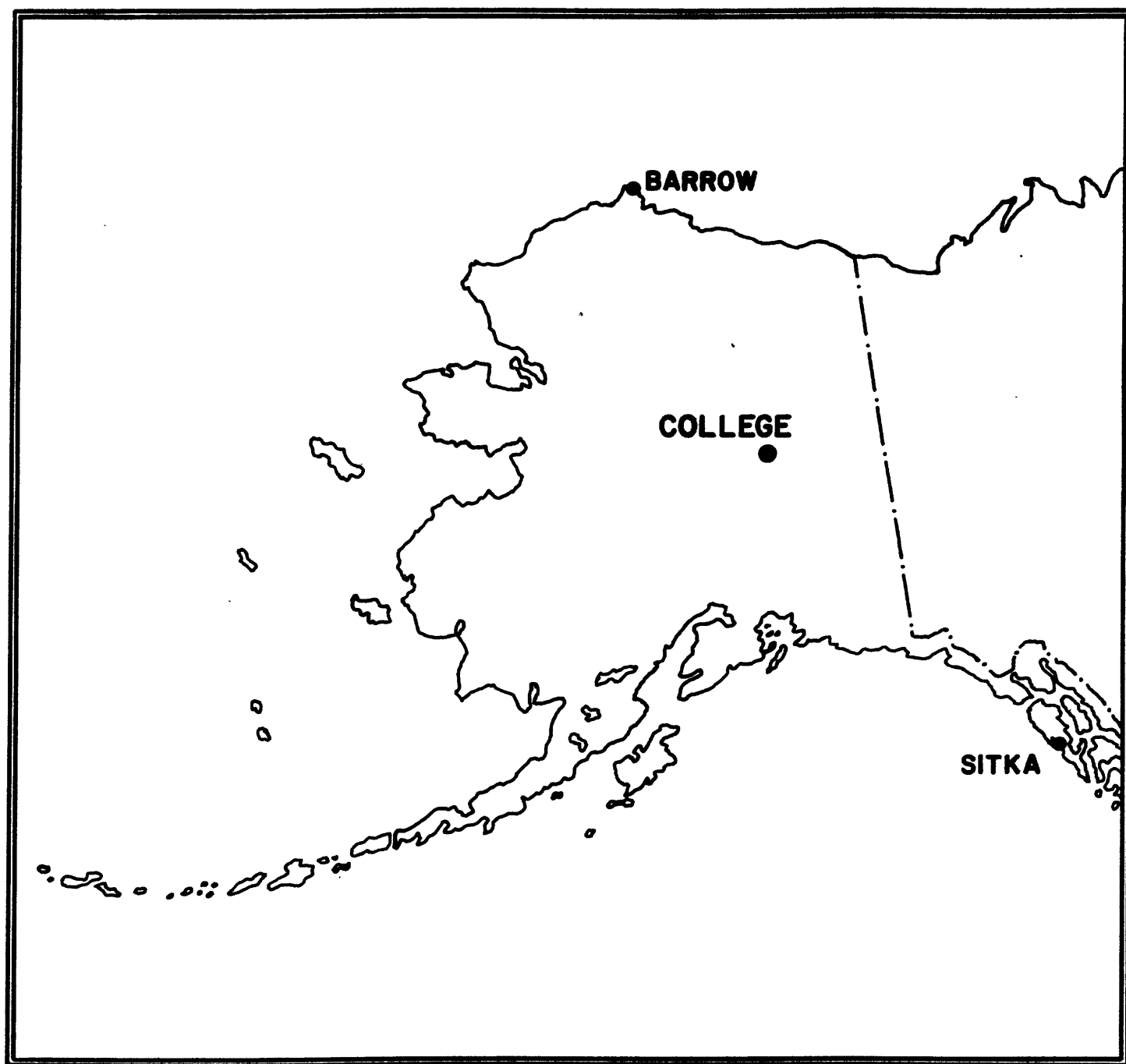


**UNITED STATES DEPARTMENT OF THE INTERIOR**  
**GEOLOGICAL SURVEY**

**PRELIMINARY GEOMAGNETIC DATA**  
**COLLEGE OBSERVATORY**  
**FAIRBANKS, ALASKA**

MAY 1991

**OPEN FILE REPORT 91-0300E**



THIS REPORT WAS PREPARED UNDER THE DIRECTION OF JOHN B TOWNSHEND, CHIEF OF THE COLLEGE OBSERVATORY, WITH THE ASSISTANCE OF THE OBSERVATORY STAFF MEMBERS: R.V. O'CONNELL AND CAROL ANN VARNER AND IN COOPERATION WITH THE GEOPHYSICAL INSTITUTE OF THE UNIVERSITY OF ALASKA FAIRBANKS. THE COLLEGE OBSERVATORY IS PART OF THE BRANCH OF GLOBAL SEISMOLOGY AND GEOMAGNETISM OF THE U.S. GEOLOGICAL SURVEY.

Explanation of Data and Reports

Magnetic Activity Report

Principal Magnetic Storms

Preliminary Calibration Data and Monthly Mean Absolute Values

Magnetogram Hourly Scalings - Five Quietest Days

Sample Format for Normal and Storm Magnetograms

Normal Magnetograms

Storm Magnetograms (When Normal is too disturbed to read)

# 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. 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  
800 Yukon Drive  
Fairbanks, Alaska 99775-5160

Requests for copies of the magnetograms except for the current month should be addressed to:

World Data Center A  
NOAA D63m 325 Broadway  
Boulder, Colorado 80303

## 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 the 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

## EXPLANATION OF DATA & REPORTS

### Available Data & Reports

Normal and storm magnetograms and appropriate calibration data are processed at the observatory and are available for analysis or copying. Magnetic Activity Report (K-Indices & AK values), Principal Magnetic Storms Report, and Magnetogram Hourly Scalings for the five quietest days of the month are also available.

### 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 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 10 $\gamma$  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 (10 $\gamma$ )

### 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 commencement; 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 averaged for successive periods of one hour for the D, H, and Z elements. The Value in the column headed "01" is the average for the hour beginning 0000 and ending 0100. Note that the values on the scaling sheet 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 one is interested in the detailed morphology of the magnetic field, refer directly to the magnetogram.

### 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:

$D=B_D+d S_D$ ;  $H=B_H+h S_H$ ;  $Z=B_Z+z S_Z$   
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.

## MAGNETIC ACTIVITY

(Greenwich civil time, counted from midnight to midnight)

College, Alaska

MONTH AND YEAR

May, 1991

DATE	K-INDICES									A <sub>k</sub>	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	4	3	4	5	6	5	3	3	33	34	SUDDEN COMMENCEMENTS d h m 13 08 57 16 20 41 31 09 01		
2	5	4	6	6	6	6	5	5	43	61			
3	3	5	5	5	5	3	3	3	32	32			
4	3	2	3	2	3	3	3	2	21	12			
5	2	2	2	3	2	2	1	2	16	8			
6	2	2	2	0	2	2	1	1	12	5	POSSIBLE SOLAR-FLARE EFFECTS BASED ON INSPECTION OF GRAMS ALONE (WITHOUT REFERENCE TO DATA FROM OTHER SOURCES)		
7	1	3	2	3	1	1	2	1	14	7			
8	2	3	4	3	3	3	3	2	23	15			
9	2	1	2	2	1	3	4	2	17	10			
10	1	2	3	4	4	2	2	2	20	13			
11	1	1	1	2	0	1	0	0	6	2			
12	0	2	1	1	2	1	1	1	9	4			
13	2	3	3	6	5	5	6	2	32	38			
14	2	4	4	6	6	7	4	2	35	49			
15	2	3	3	3	2	1	1	1	16	9			
16	2	1	1	1	2	2	5	3	17	12			
17	5	6	7	5	4	3	2	2	34	47			
18	1	1	1	1	1	1	1	1	8	3			
19	1	1	0	0	0	1	2	2	7	3			
20	2	2	1	0	1	1	1	1	9	4			
21	1	0	0	3	2	3	3	2	14	8			
22	2	4	4	4	3	3	3	3	26	19			
23	4	3	3	3	6	6	3	3	31	33			
24	4	4	5	5	5	4	4	3	34	33			
25	5	6	6	6	5	5	4	3	40	53			
26	3	4	4	5	5	6	3	3	33	34			
27	5	3	4	6	6	5	3	3	35	41			
28	5	5	4	4	5	5	5	4	37	40			
29	5	3	6	5	5	4	3	3	34	37			
30	3	3	3	6	5	5	2	2	29	29			
31	4	4	5	7	6	6	4	3	39	56			

POSSIBLE SOLAR-FLARE  
EFFECTS BASED ON  
INSPECTION OF GRAMS  
ALONE (WITHOUT  
REFERENCE TO DATA  
FROM OTHER SOURCES)

BEGIN

END

d h m

d h m

## K SCALE USED:

LOWER LIMIT FOR K = 9.....

CURRENT SCALE VALUE.....

LOWER LIMIT FOR K = 9 .....

D

H

Z

675.7

322.2

3.67

7.73

2480

2490

(mm)

(γ/mm)

(to nearest 10γ)

SCALINGS AND COMPUTATIONS HAVE BEEN CHECKED.

APPROVED

John B. Townshend, Chief

OBSERVER IN CHARGE

PRINCIPAL MAGNETIC STORMS  
COLLEGE OBSERVATORY, COLLEGE, ALASKAWDC-A FOR SOLAR-TERRESTRIAL PHYSICS  
ENVIRONMENTAL DATA SERVICE, NOAA  
BOULDER, COLORADO 80502 U.S.A.

Data from Individual Observatories:

MAY  
19 91

Obs. 2 letter 1-4A code	Geomag. lat.	Commencement			SC - amplitudes			Max. 3 hr - index K		Ranges			UT End	
		day	hr min (UT)	type	D(')	H(Y)	Z(Y)	day	(3 hr - period)	K	D(')	H(Y)	Z(Y)	day hr
CO	64.6 N	2	02XX	. .				2	3,4,5,6	6	202	1320	830	2 23
		13	0857	SC	-12	-80	-70	13	4,7	6	117	930	820	13 20
		14	04XX	. .				14	6	7	348	1390	950	14 19
		16	2041	SC	-21	+145	-25	17	3	7	139	1250	740	17 15
		25	00XX	. .				25	2,3,4	6	193	1280	820	25 22
		31	0901	SC	+60	-730	+180	31	4	7	202	1620	770	31 22

## NORMAL MAGNETOGRAPH

COMPONENT	PERIOD		CALIBRATION	
	FROM	TO	SCALE VALUE	BASELINE
D	0001 U.T., 5-1-91	2400 U.T., 5-31-91	1.0' /mm	25° 34.8' E
H	0001 U.T., 5-1-91	2400 U.T., 5-19-91	7.7 γ/mm	12638 γ
	0001 U.T., 5-20-91	2400 U.T., 5-31-91		12640 γ
Z	0001 U.T., 5-1-91	2400 U.T., 5-31-91	7.8 γ/mm	55203 γ

## STORM MAGNETOGRAPH

COMPONENT	PERIOD		CALIBRATION	
	FROM	TO	SCALE VALUE	BASELINE
D	0001 U.T., 5-1-91	2400 U.T., 5-31-91	7.9' /mm	29.4 γ/mm
H	(SAME)	(SAME)	43.4 γ/mm	
Z	(SAME)	(SAME)	49.0 γ/mm	

The College Observatory has used several absolute instruments and different observing piers since it began operations in 1948. To avoid artificial secular shifts in the absolute values published when instruments were changed, corrections were applied to provide continuity in the data from the time the Observatory began operating. For many years the instruments used for observing absolute values have had zero correction. Effective with the May 1989 Preliminary Data Report, in accordance with a directive issued by the USGS Branch of Global Seismology and Geomagnetism analysis personnel, these longstanding corrections are discontinued and all data listed (D, H & Z) are for the position at absolute pier 1a and without any corrections applied. The net effect of these changes is as follows:

Declination (D): No Change

Horizontal Intensity (H): -5γ; i.e., H absolute and baseline values are 5γ less than previously reported.

Vertical Intensity (Z): +33γ; i.e., Z absolute and baseline values are 33γ higher than previously reported.

## MONTHLY MEAN ABSOLUTE VALUES\*

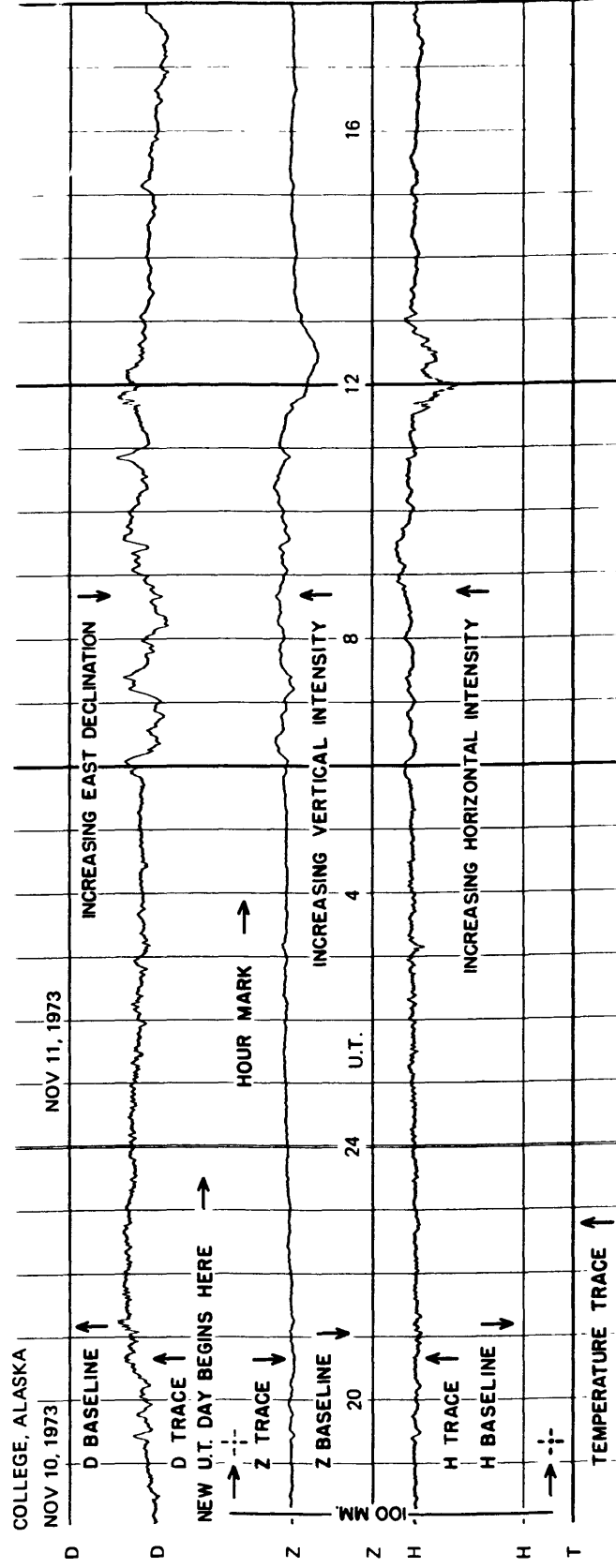
D	H	Z
26° 43.5' E	12755 γ	55323 γ

\*COMPUTED FROM FIVE QUIETEST DAYS DURING MONTH.

DAYS USED: MAY 11, 12, 18, 19, 20.

U.S. Dept. of Interior Geological Survey			Observatory College, Alaska		Month MAY		Year 1991		Jep-CO - 1/86										
MAGNETOGRAM HOURLY SCALINGS - FIVE QUIETEST DAYS (UNIVERSAL TIME)																			
Values are in Tenths of nm and are Averages for Successive Periods of One Hour beginning at Midnight. Shrinkage Corrections have been applied. Negative Values in Red with Minus.																			
COMPONENT		D				H				Z				COMPONENT					
DAY		11	12	18	19	20	11	12	18	19	20	11	12	18	19	20	DAY		
A <sub>k</sub>		2	4	3	3	4	2	4	3	3	4	2	4	3	3	4	A <sub>k</sub>		
HOUR		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	HOUR	
01		10	19	22	3	22	131	130	138	128	136	171	153	160	153	137	01		
02		26	19	25	2	13	142	138	131	140	137	169	154	165	153	146	02		
03		31	30	34	10	9	145	140	130	144	139	161	152	173	159	152	03		
04		40	45	46	40	7	141	154	129	135	153	154	158	176	166	149	04		
05		50	32	71	55	30	145	200	132	138	160	159	161	180	163	151	05		
06		50	40	79	59	42	145	205	140	141	168	157	179	178	160	153	06		
07		50	60	91	70	60	160	179	147	141	164	154	190	174	162	155	07		
08		60	67	80	70	61	164	170	149	149	170	158	174	170	158	153	08		
09		59	51	80	76	63	180	178	151	150	180	160	153	167	160	151	09		
10		71	43	75	79	70	210	182	159	155	181	159	154	167	158	151	10		
11		49	44	56	82	79	211	177	168	154	180	150	146	166	158	152	11		
12		76	62	73	87	89	175	171	148	155	177	142	147	164	159	153	12		
13		92	77	97	100	110	178	168	151	157	168	140	146	169	160	156	13		
14		100	102	103	119	124	181	155	159	152	167	150	147	177	160	154	14		
15		137	132	129	131	131	170	116	162	150	163	158	130	176	161	151	15		
16		176	227	149	138	120	176	116	170	150	178	170	119	172	161	149	16		
17		201	271	169	157	147	171	129	170	148	180	163	113	166	163	157	17		
18		210	273	177	164	169	160	133	168	150	177	156	120	163	158	157	18		
19		170	259	154	171	166	162	110	156	148	171	145	125	155	159	150	19		
20		139	161	139	180	159	160	100	149	149	160	150	115	155	157	145	20		
21		107	108	115	138	130	159	105	130	142	150	149	120	159	140	133	21		
22		90	60	86	99	100	151	114	110	143	140	150	122	159	132	123	22		
23		42	51	71	72	54	140	130	115	137	140	151	139	160	133	125	23		
24		32	22	38	29	31	133	132	117	140	139	154	148	158	129	133	24		
DAILY SUM		2068	2245	2159	2126	1991	3890	3532	3479	3496	3878	3730	3470	4009	3722	3536	DAILY SUM		
DAILY MEAN		86	94	90	89	83	162	147	145	146	162	155	145	167	155	147	DAILY MEAN		
MEAN		88				152				154				154				MEAN	
Scaled		Jep-CO		Checked		Jep-CO		Checked											

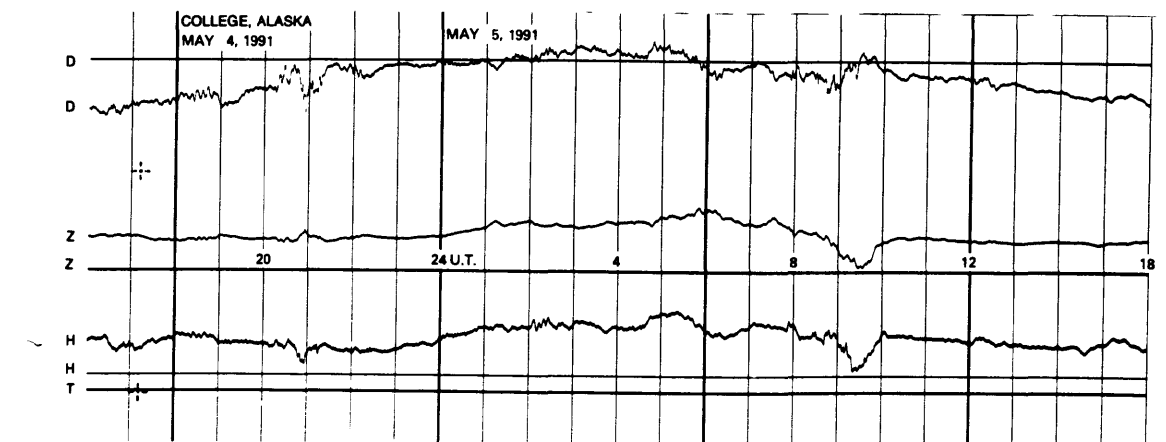
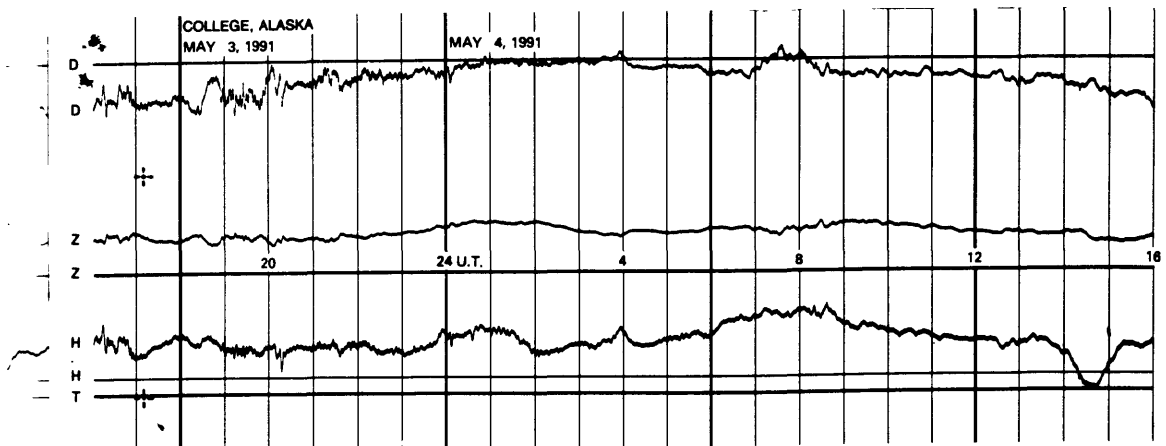
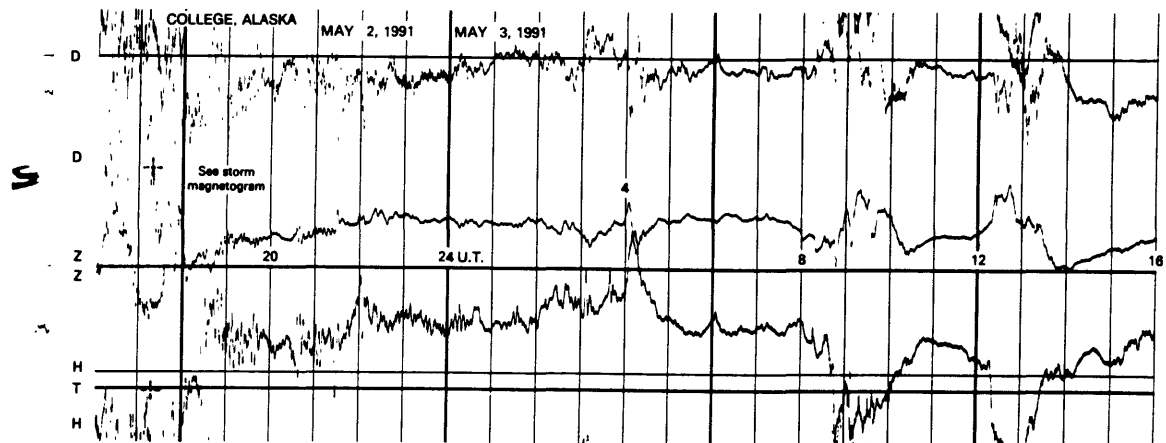
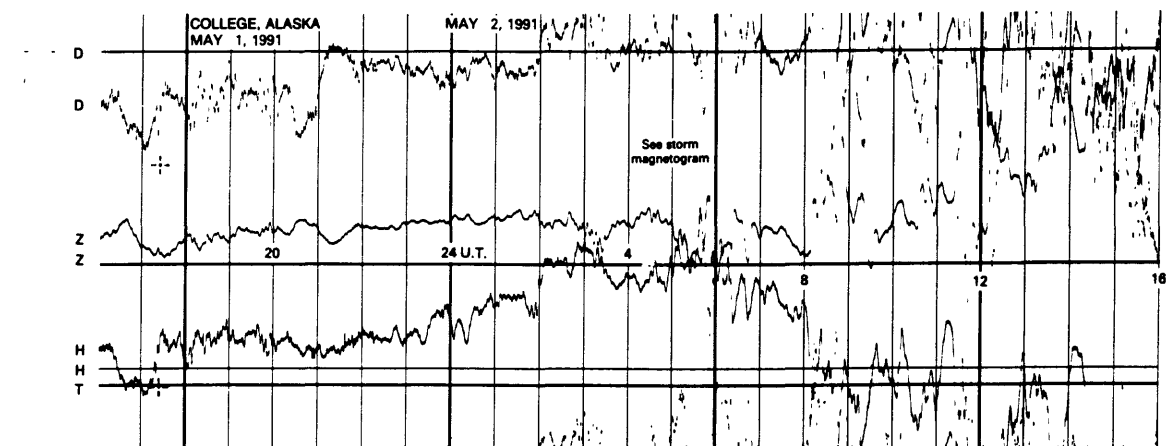
# FORMAT FOR NORMAL & STORM MAGNETOGRAMS (SAMPLE ONLY)



SEE PRELIMINARY CALIBRATION DATA FOR SCALE VALUES & BASELINE VALUES

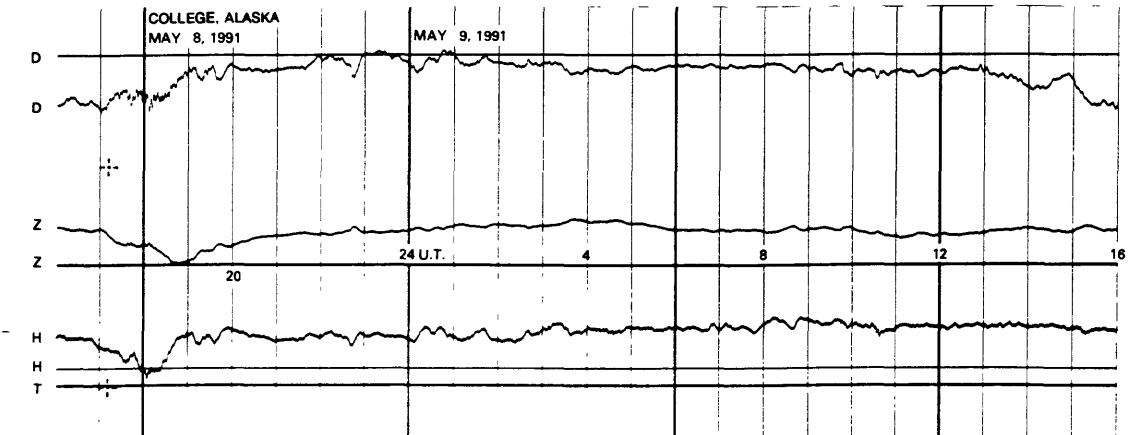
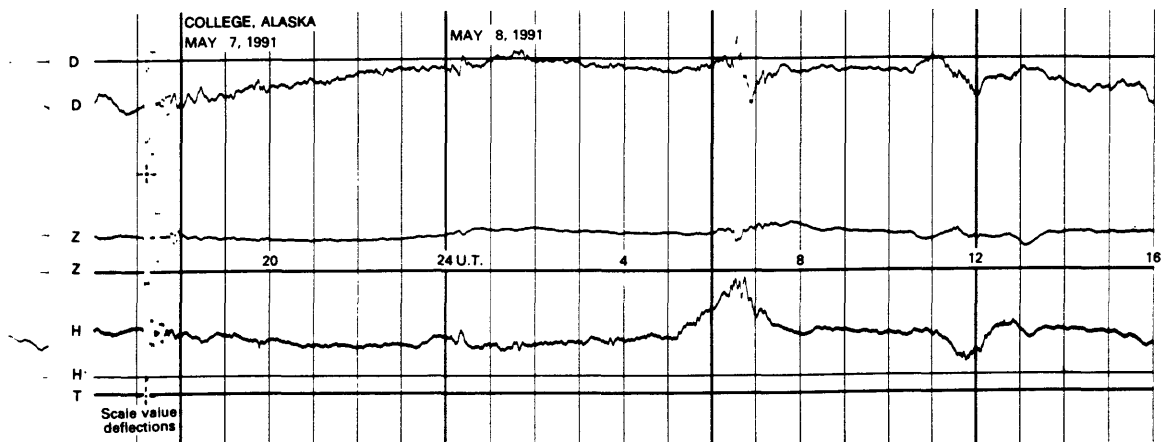
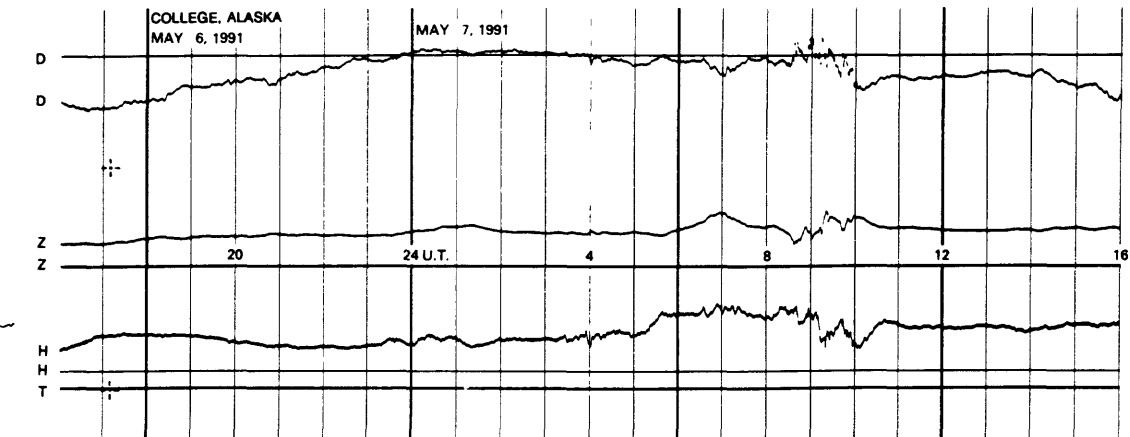
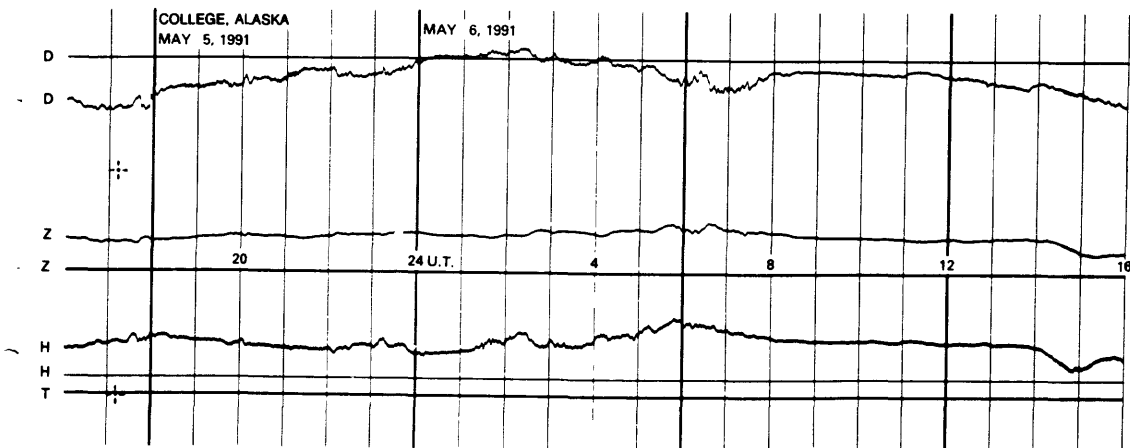


# NORMAL MAGNETOGRAMS

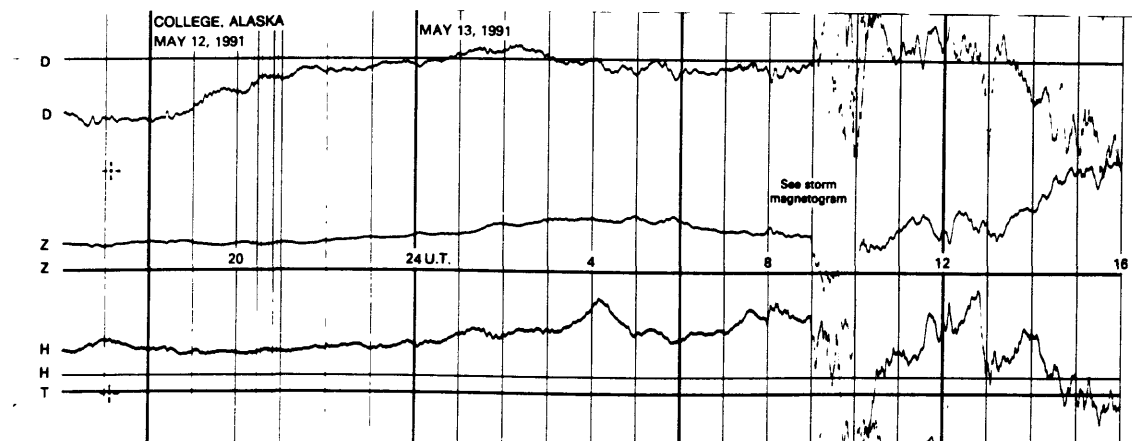
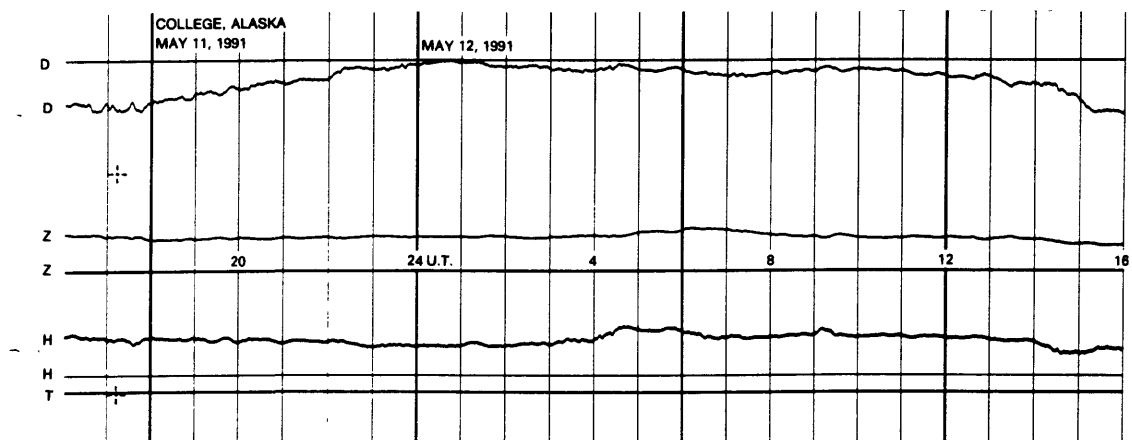
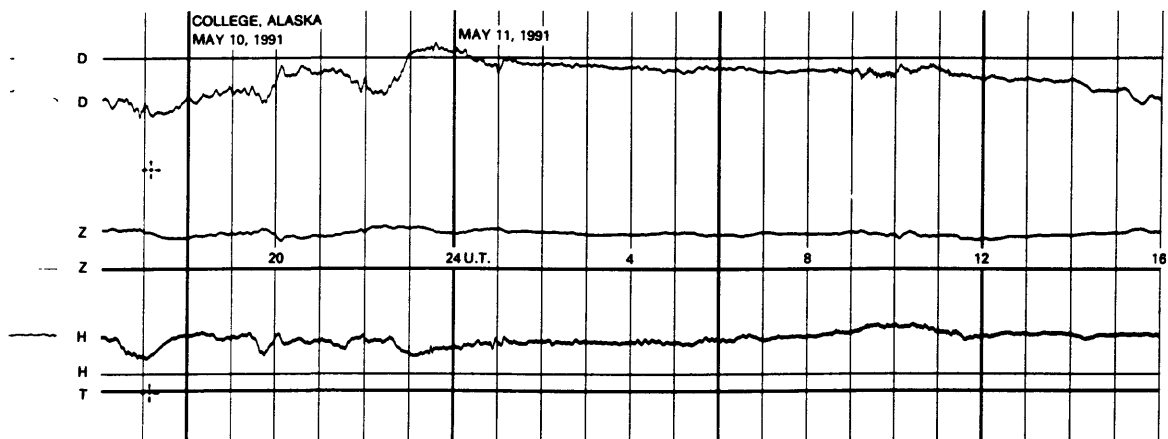
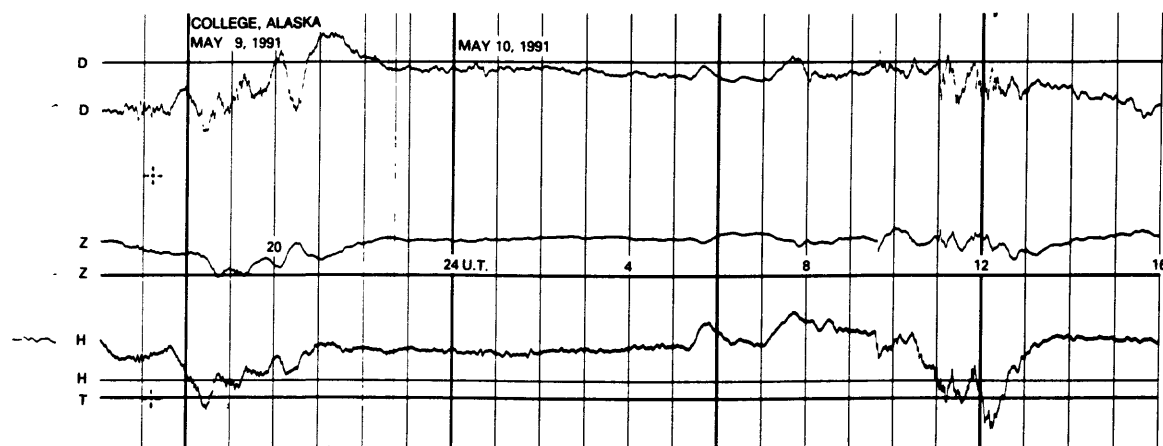


# NORMAL MAGNETOGRAMS

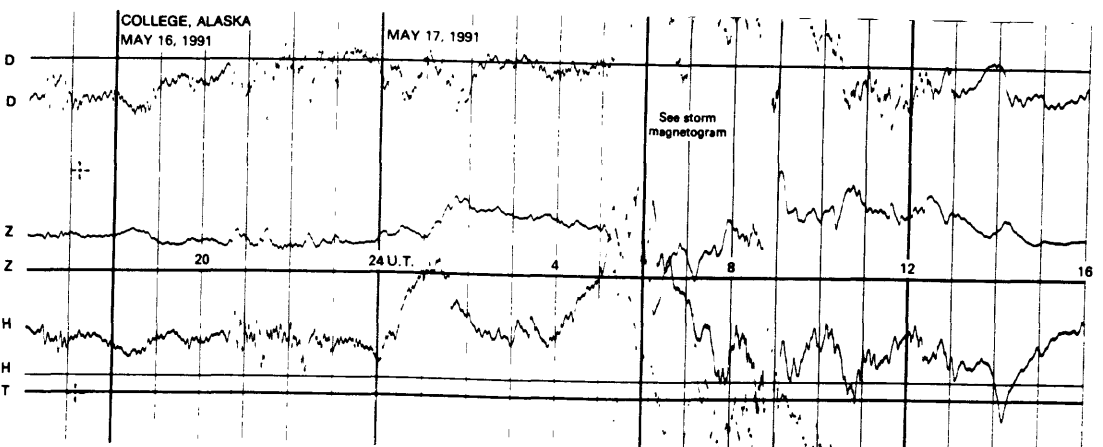
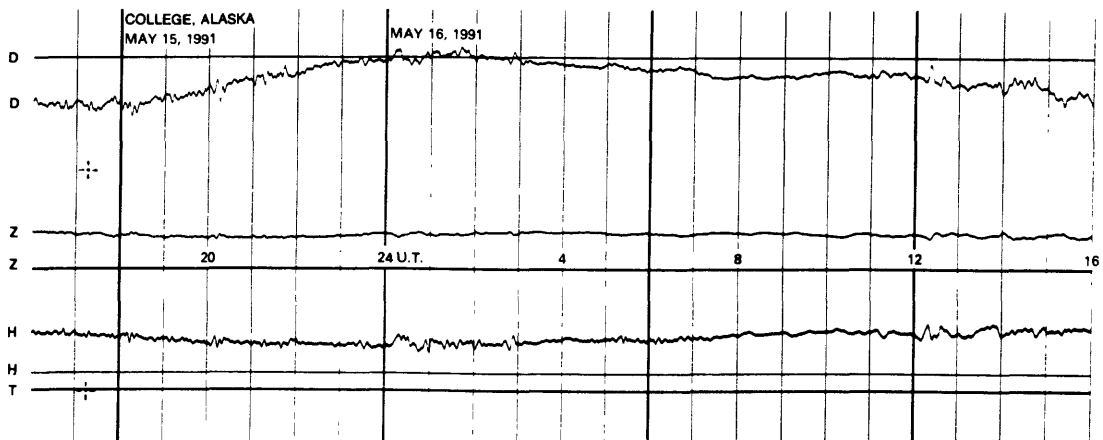
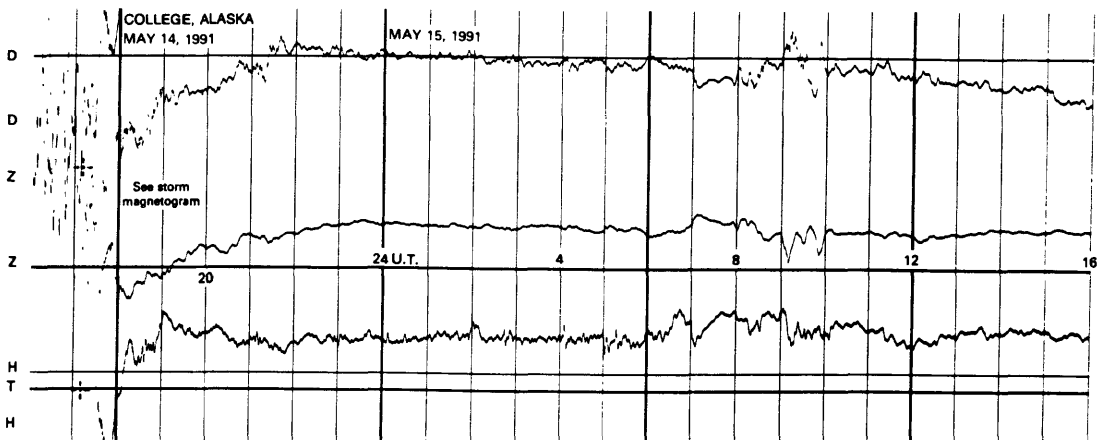
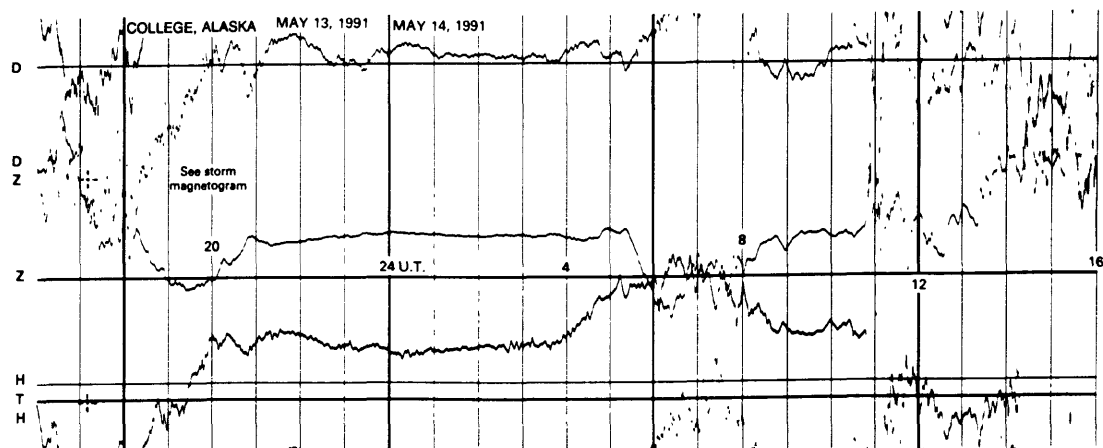
200 mm  
100 mm  
0



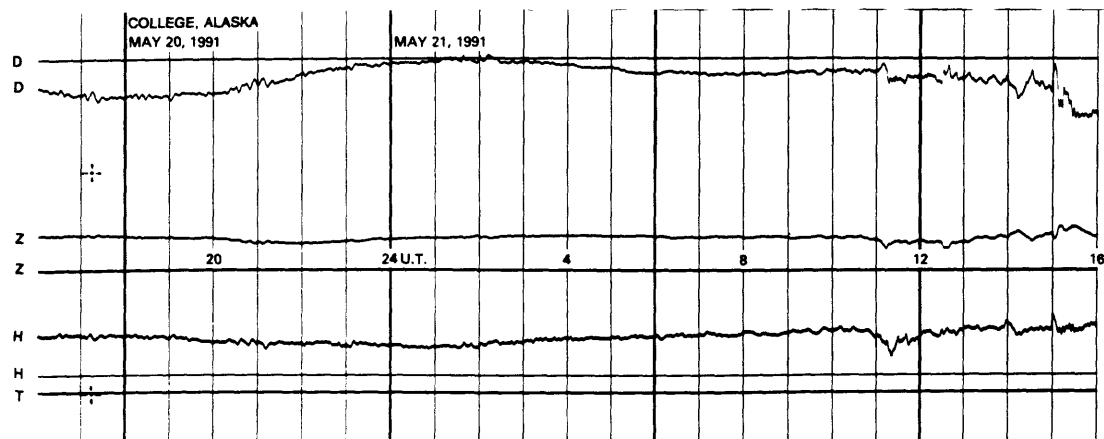
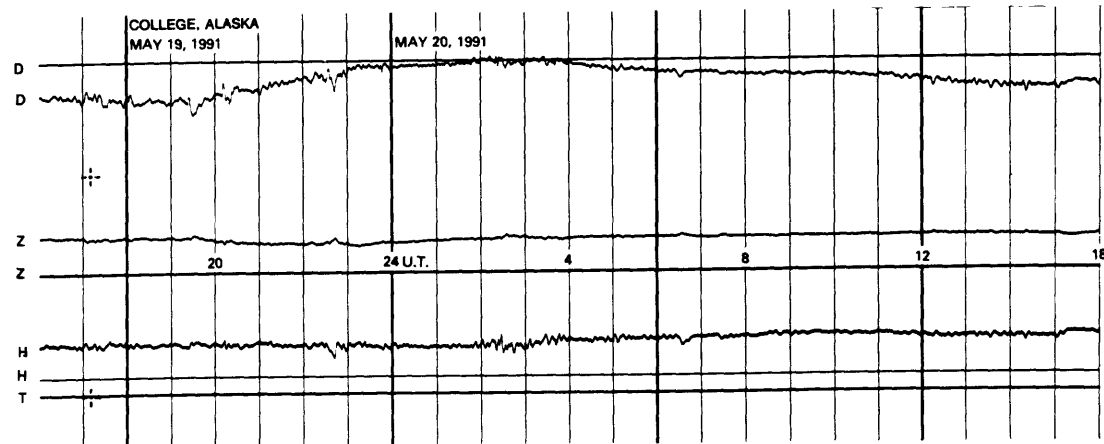
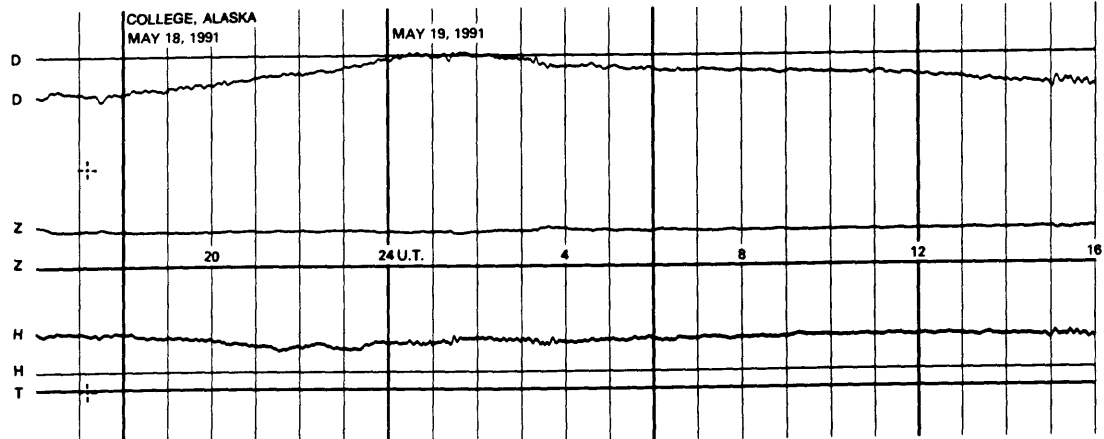
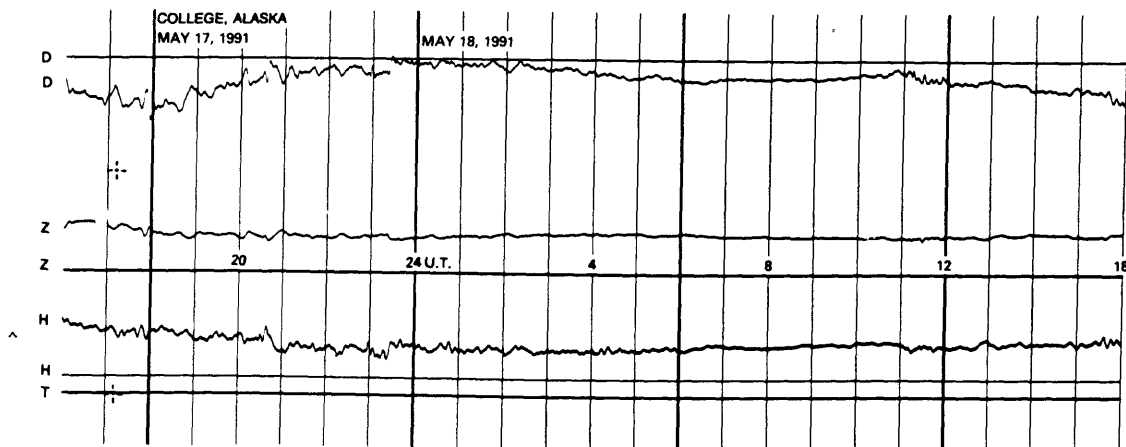
# NORMAL MAGNETOGRAMS



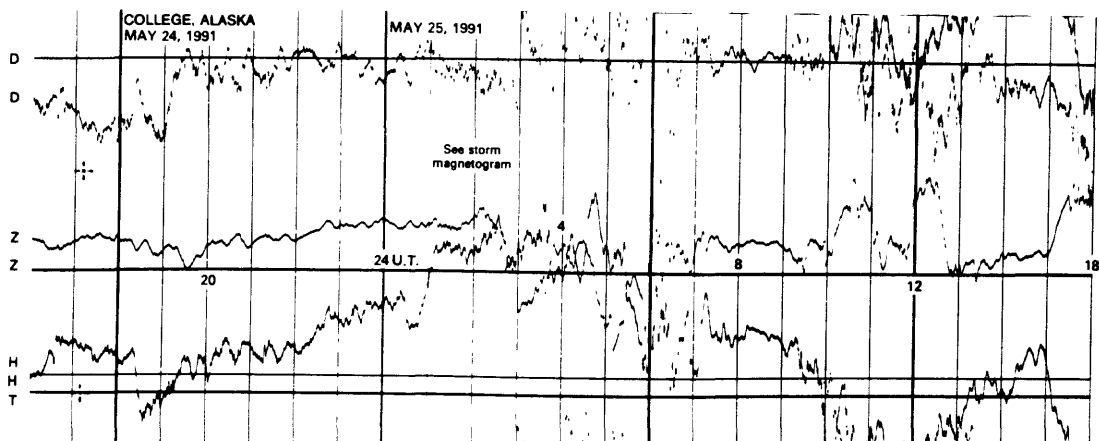
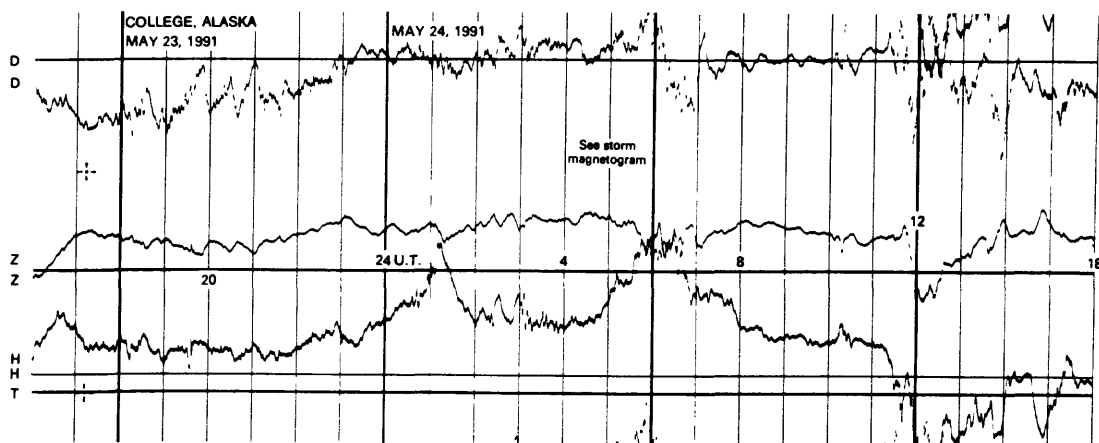
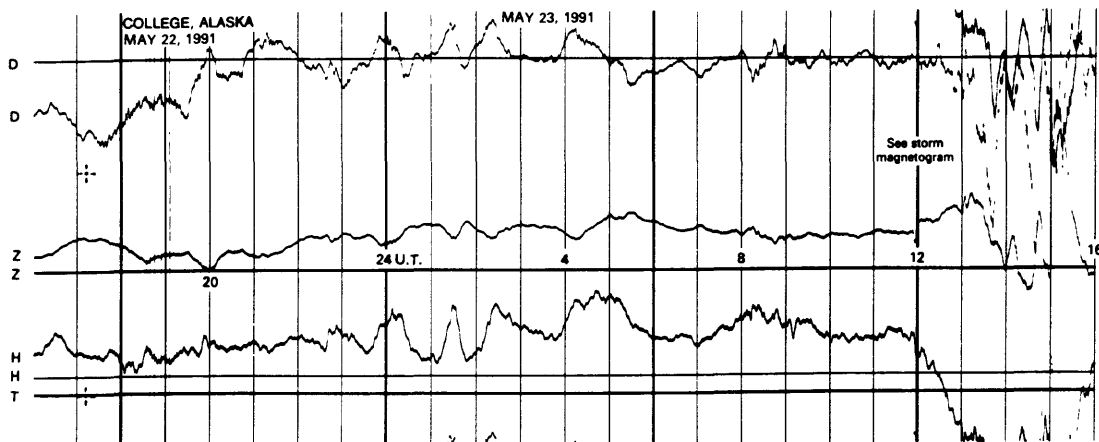
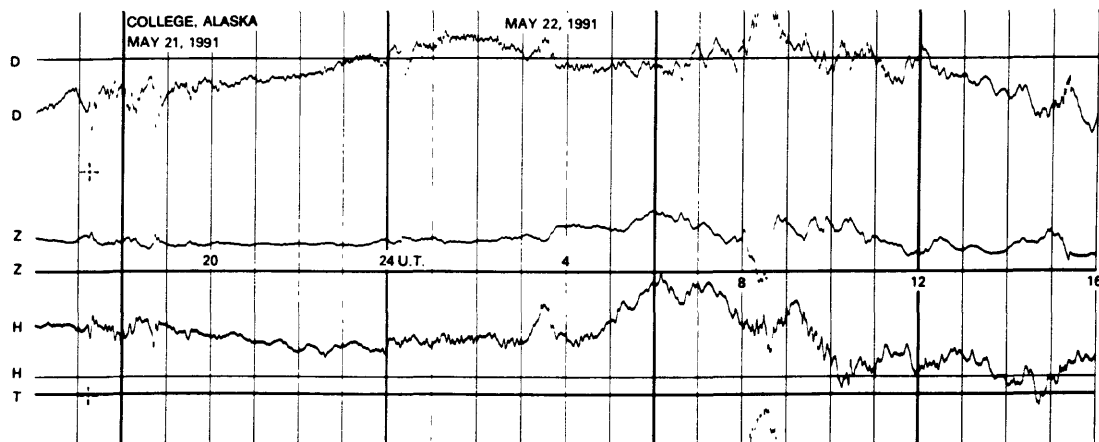
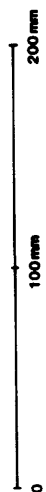
# NORMAL MAGNETOGRAMS



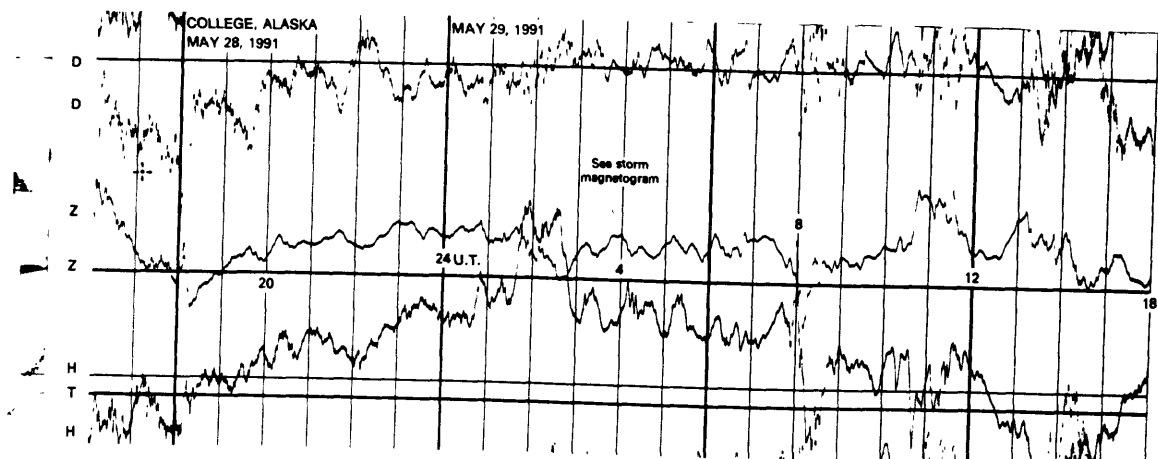
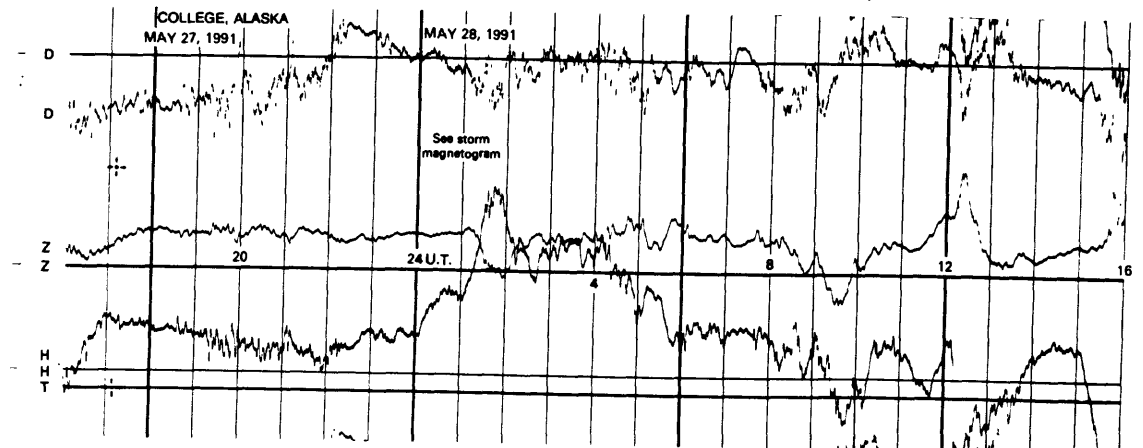
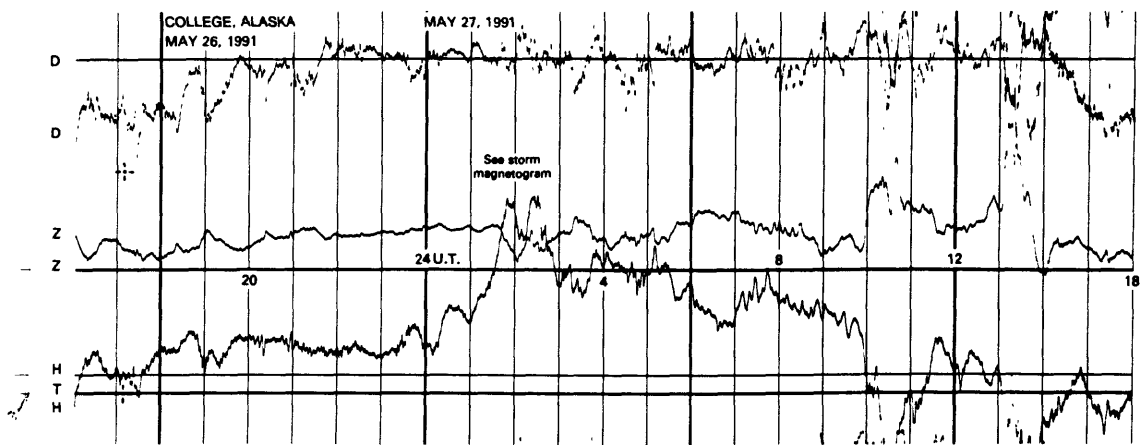
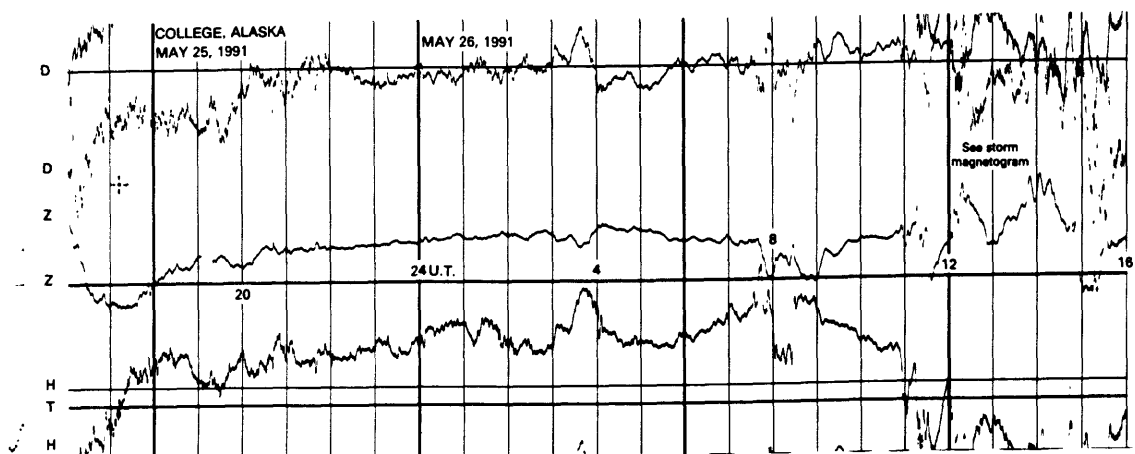
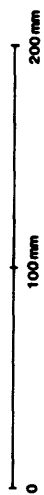
# NORMAL MAGNETOGRAMS



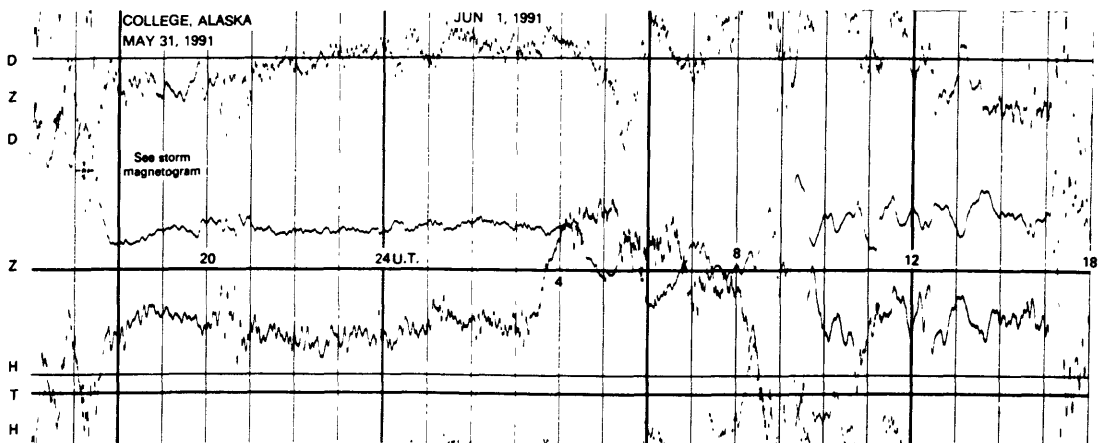
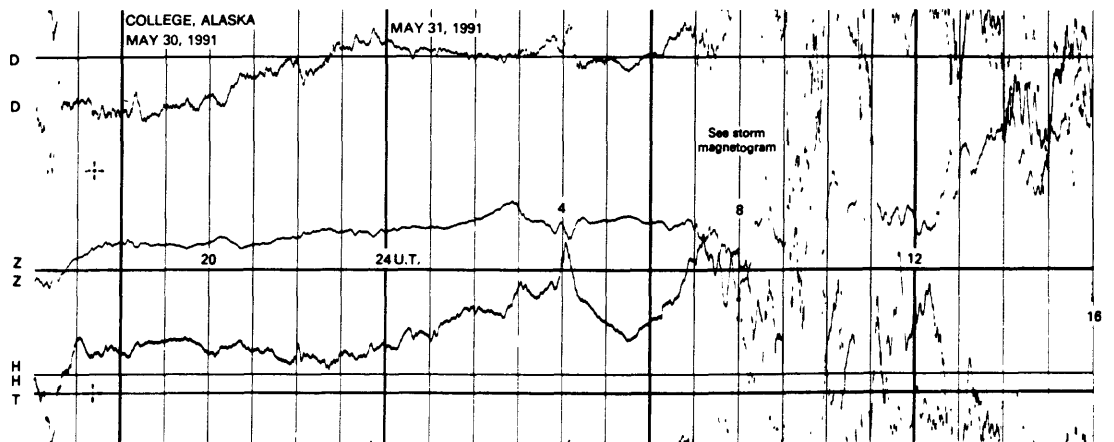
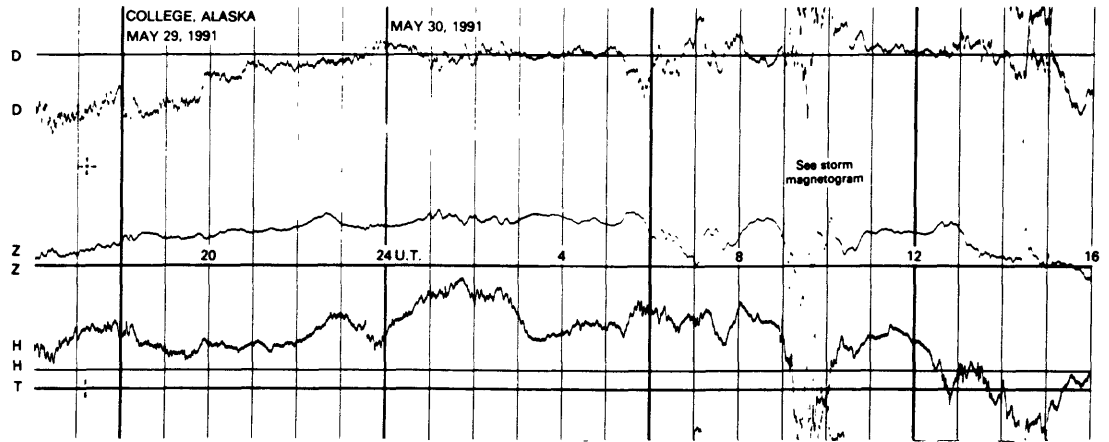
# NORMAL MAGNETOGRAMS



# NORMAL MAGNETOGRAMS

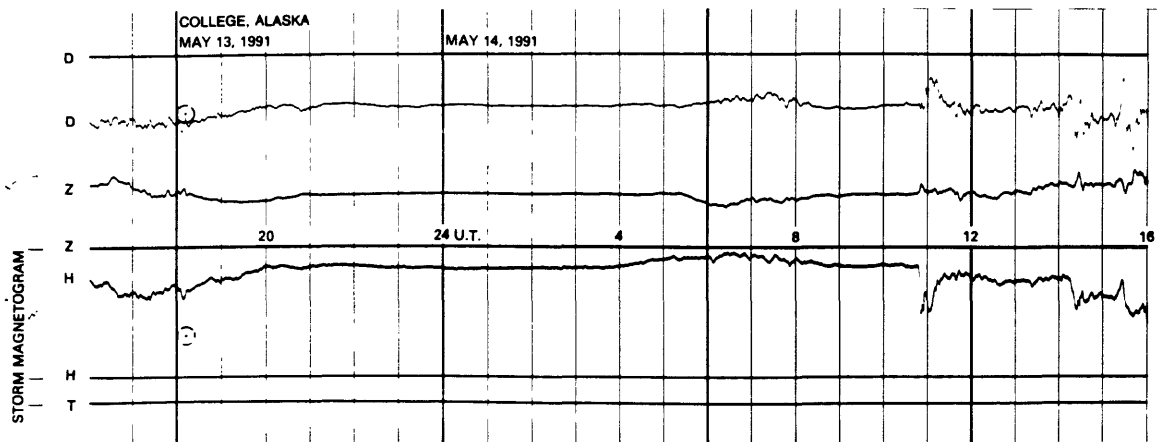
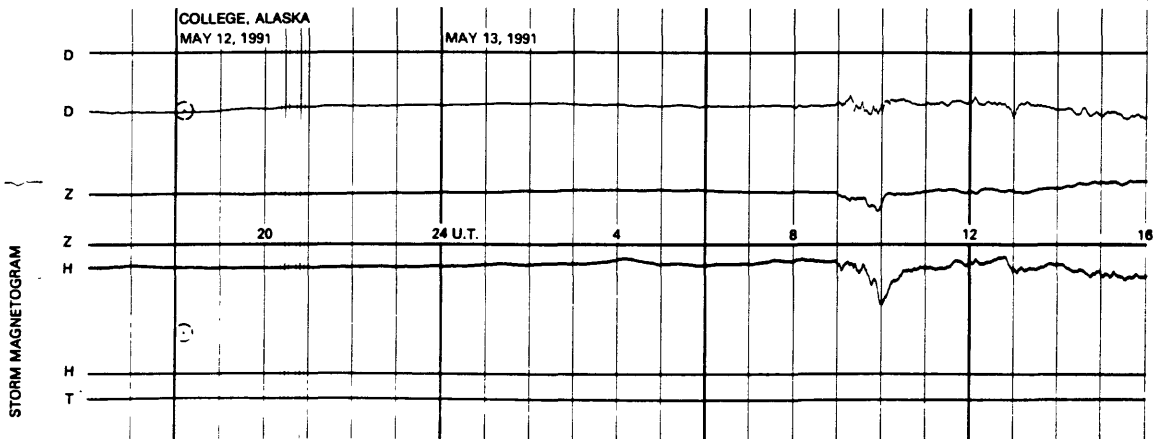
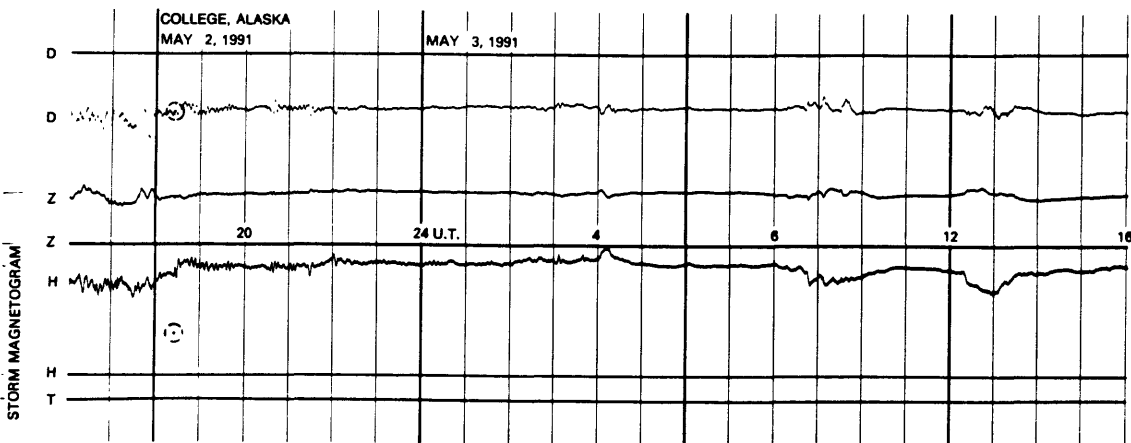
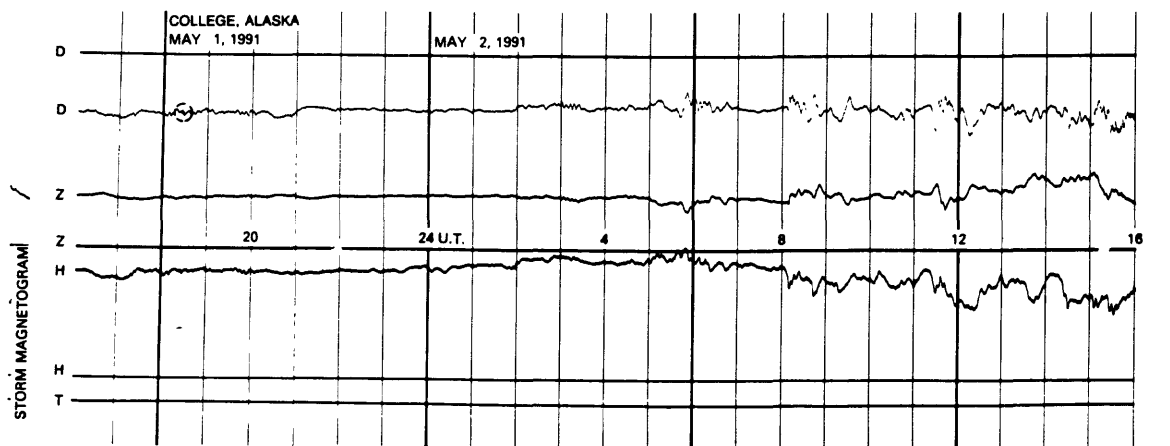


# NORMAL MAGNETOGRAMS

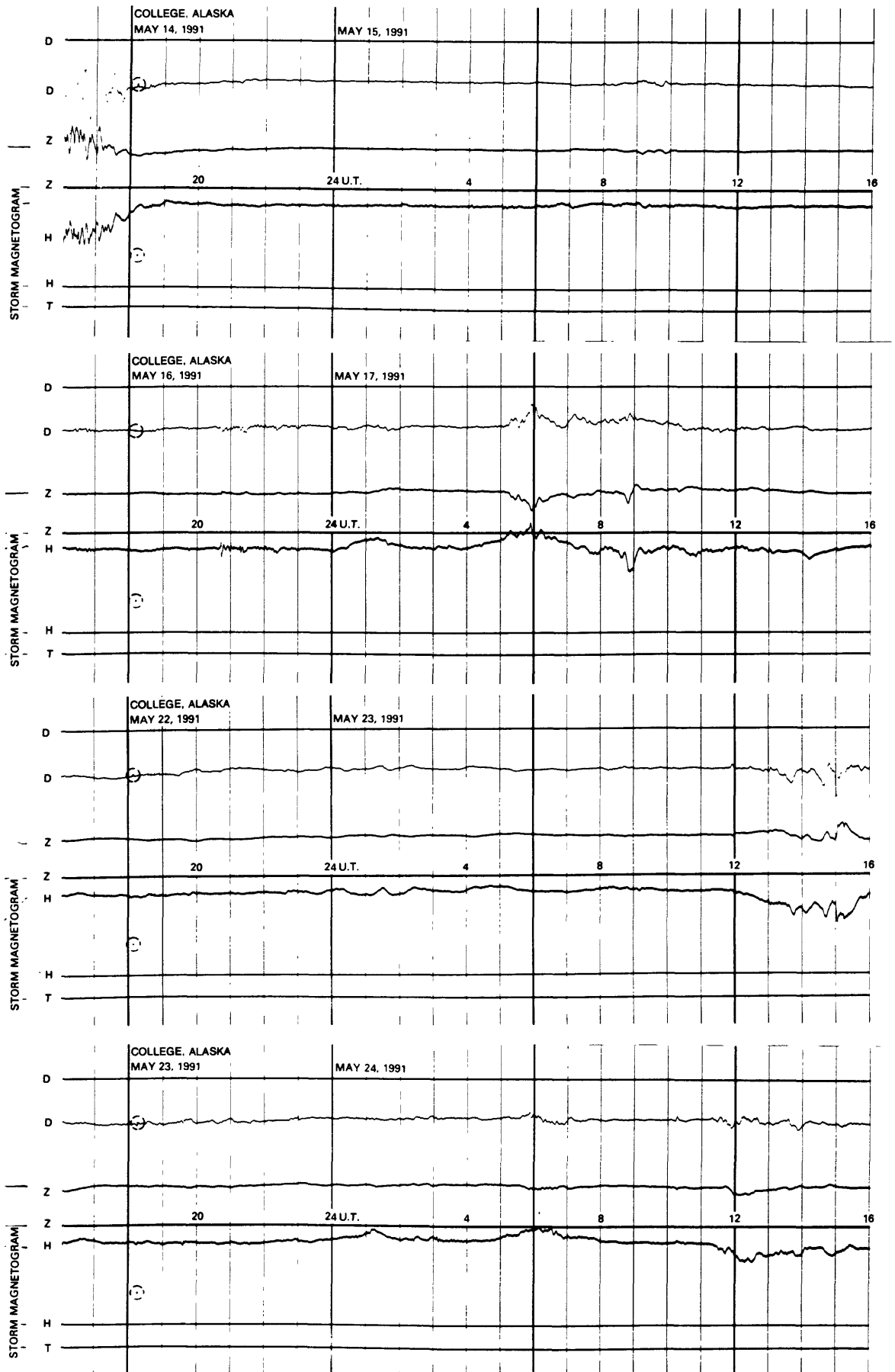




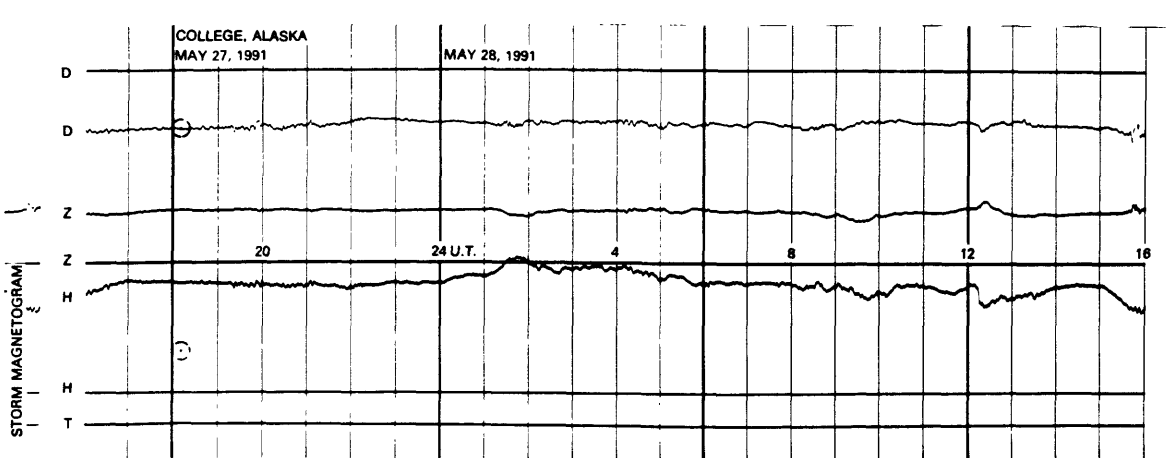
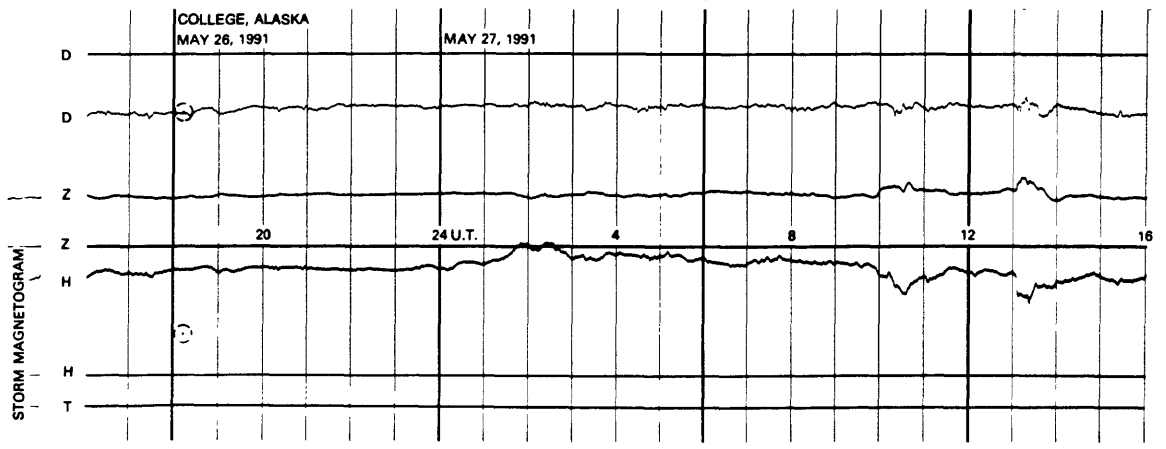
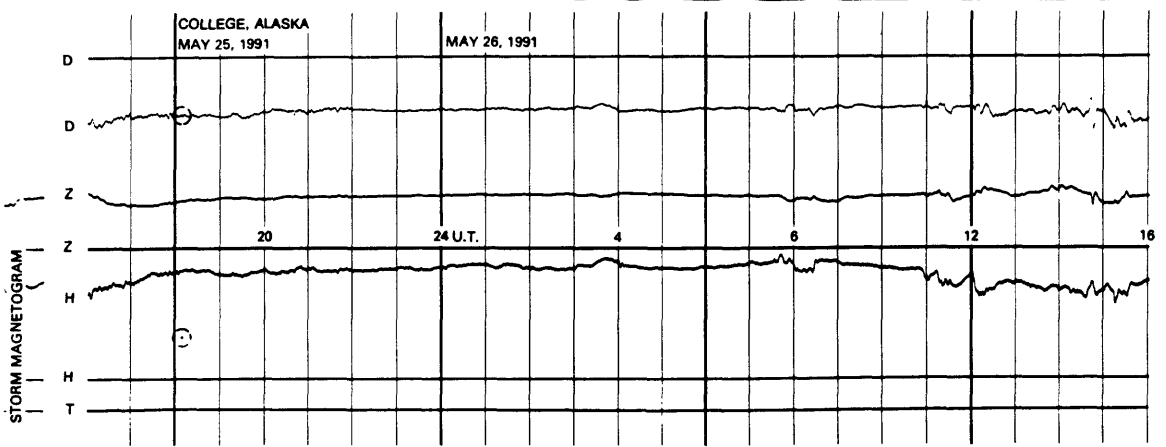
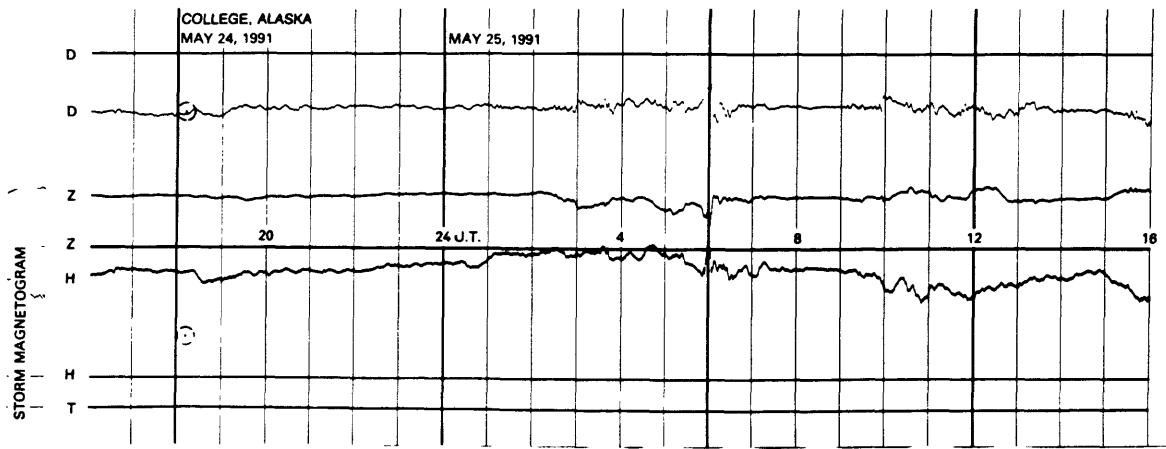
# STORM MAGNETOGRAMS



# STORM MAGNETOGRAMS



STORM MAGNETOGRAMS



The figure displays four panels of storm magnetograms from College, Alaska, covering the period from May 28 to June 1, 1991. Each panel shows the time variation of four magnetic field components: D (Decade), Z (Z-component), H (Horizontal), and T (Total). The time axis is marked in Universal Time (U.T.) with major ticks at 20, 24, 4, 8, 12, and 16. The panels are labeled as follows:

- Panel 1: COLLEGE, ALASKA MAY 28, 1991 (left) and MAY 29, 1991 (right).
- Panel 2: COLLEGE, ALASKA MAY 29, 1991 (left) and MAY 30, 1991 (right).
- Panel 3: COLLEGE, ALASKA MAY 30, 1991 (left) and MAY 31, 1991 (right).
- Panel 4: COLLEGE, ALASKA MAY 31, 1991 (left) and JUN 1, 1991 (right).

The magnetograms show the storm's progression, with significant fluctuations in the Z and H components, particularly during the storm's main phase. The D component shows a clear step-like change, and the T component shows a corresponding increase. The storm appears to be a moderate to strong event, with a duration of approximately 48 hours.

The figure consists of four vertically stacked panels, each representing a day of storm magnetograms from College, Alaska. Each panel contains four traces labeled D, Z, H, and T, representing different magnetic field components. The horizontal axis for each panel is time in Universal Time (U.T.), with major ticks at 20, 24, 4, 8, 12, and 16. The vertical axis represents magnetic field strength, with a central zero line. The traces show various fluctuations and disturbances, particularly around the 24 U.T. mark, which corresponds to the local midnight. The D trace shows a clear step-like change at 24 U.T. in each panel. The Z trace shows a similar step-like change. The H trace shows a more gradual change. The T trace shows a sharp, narrow peak at 24 U.T. in each panel.

COLLEGE, ALASKA  
MAY 28, 1991

MAY 29, 1991

COLLEGE, ALASKA  
MAY 29, 1991

MAY 30, 1991

COLLEGE, ALASKA  
MAY 30, 1991

MAY 31, 1991

COLLEGE, ALASKA  
MAY 31, 1991

JUN 1, 1991