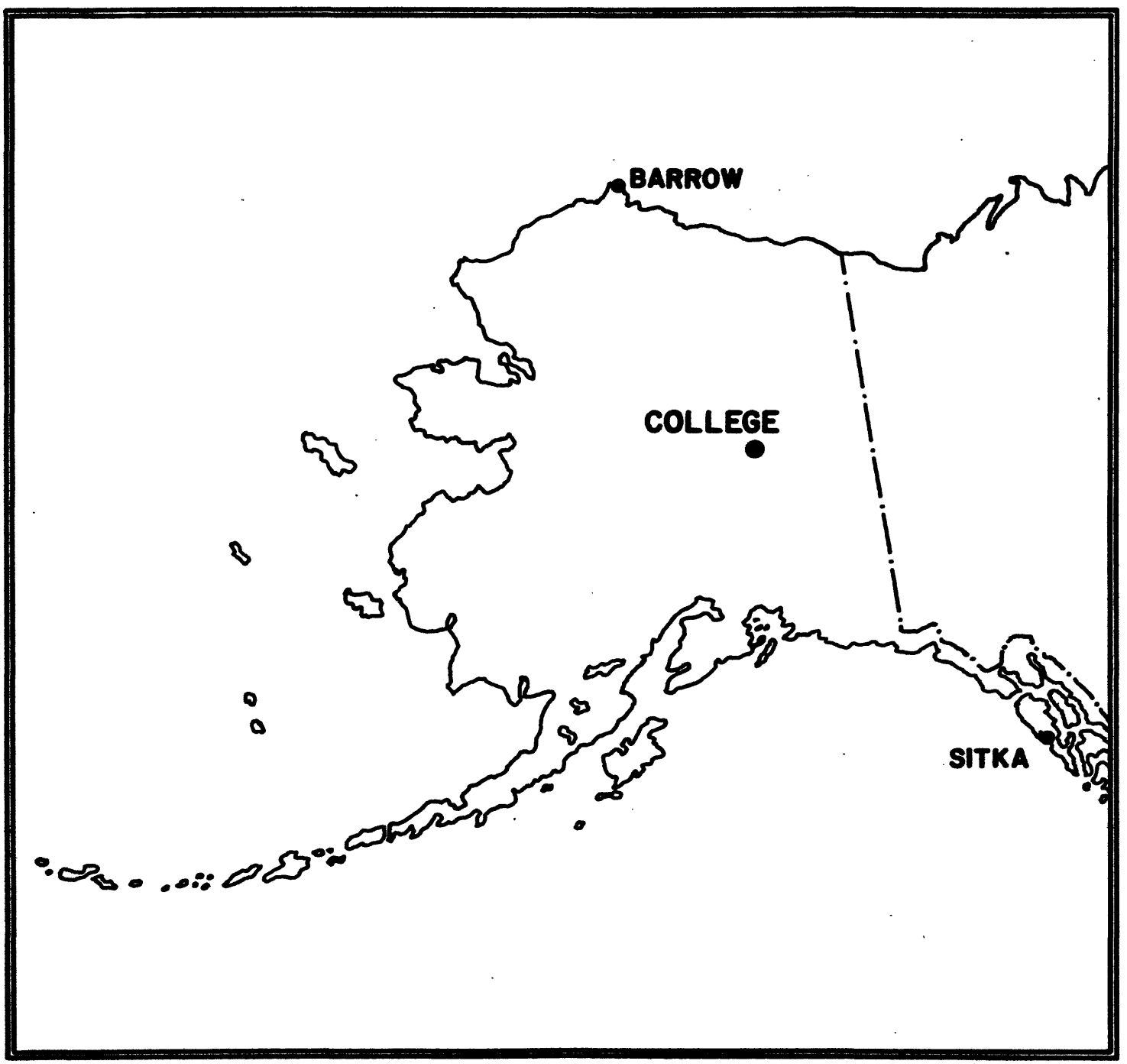
# UNITED STATES DEPARTMENT OF THE INTERIOR

## GEOLOGICAL SURVEY

# PRELIMINARY GEOMAGNETIC DATA
# COLLEGE OBSERVATORY
# FAIRBANKS, ALASKA

MARCH 1989

**OPEN FILE REPORT** 89-0300C



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.

# COLLEGE OBSERVATORY PRELIMINARY GEOMAGNETIC DATA

## EXPLANATION OF DATA AND REPORTS

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

### GEOMAGNETIC DATA

Normal and storm magnetograms and appropriate calibration data are processed at the observatory and are available for analysis or copying. Also available are mean hourly scalings for the five quietest days for the month and K-Indices.

#### 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 10γ has been chosen so as not to give the illusion of a 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) |

#### 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 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 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.

NOAA FORM 76-133 (9-72)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

# MAGNETIC ACTIVITY

(Greenwich civil time, counted from midnight to midnight)

OBSERVATORY: COLLEGE, ALASKA

MONTH AND YEAR: MARCH, 1989

| DATE | K-INDICES 00-03 | 03-06 | 06-09 | 09-12 | 12-15 | 15-18 | 18-21 | 21-24 | SUM | Ak |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 3 | 4 | 5 | 4 | 2 | 2 | 25 | 19 |
| 2 | 3 | 5 | 4 | 4 | 6 | 5 | 4 | 3 | 34 | 36 |
| 3 | 2 | 5 | 6 | 6 | 6 | 6 | 5 | 3 | 39 | 55 |
| 4 | 3 | 1 | 4 | 6 | 6 | 3 | 1 | 1 | 25 | 28 |
| 5 | 2 | 4 | 6 | 7 | 7 | 5 | 3 | 3 | 37 | 59 |
| 6 | 3 | 3 | 5 | 6 | 5 | 5 | 4 | 3 | 34 | 37 |
| 7 | 4 | 4 | 3 | 3 | 4 | 2 | 2 | 1 | 23 | 16 |
| 8 | 2 | 2 | 2 | 1 | 0 | 2 | 4 | 4 | 17 | 11 |
| 9 | 3 | 5 | 4 | 7 | 5 | 5 | 4 | 4 | 37 | 48 |
| 10 | 3 | 3 | 5 | 4 | 3 | 4 | 4 | 3 | 29 | 24 |
| 11 | 2 | 4 | 4 | 6 | 5 | 3 | 3 | 3 | 30 | 29 |
| 12 | 4 | 2 | 3 | 5 | 4 | 6 | 5 | 2 | 31 | 32 |
| 13 | 5 | 7 | 8 | 8 | 7 | 9 | 8 | 8 | 60 | 211 |
| 14 | 7 | 6 | 7 | 6 | 5 | 4 | 7 | 5 | 47 | 88 |
| 15 | 5 | 4 | 7 | 7 | 5 | 5 | 4 | 2 | 39 | 61 |
| 16 | 2 | 4 | 3 | 7 | 5 | 5 | 4 | 4 | 34 | 42 |
| 17 | 3 | 6 | 6 | 7 | 5 | 4 | 5 | 2 | 38 | 56 |
| 18 | 1 | 2 | 2 | 5 | 7 | 7 | 3 | 2 | 29 | 46 |
| 19 | 1 | 5 | 6 | 5 | 7 | 7 | 5 | 2 | 38 | 64 |
| 20 | 2 | 3 | 3 | 4 | 3 | 3 | 2 | 2 | 22 | 14 |
| 21 | 2 | 3 | 5 | 4 | 3 | 3 | 3 | 3 | 26 | 20 |
| 22 | 3 | 4 | 6 | 5 | 5 | 6 | 5 | 5 | 39 | 49 |
| 23 | 4 | 2 | 2 | 6 | 6 | 6 | 5 | 4 | 35 | 45 |
| 24 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 22 | 16 |
| 25 | 1 | 0 | 0 | 3 | 2 | 3 | 4 | 2 | 15 | 09 |
| 26 | 2 | 2 | 1 | 5 | 5 | 3 | 2 | 3 | 23 | 19 |
| 27 | 4 | 2 | 3 | 3 | 4 | 5 | 4 | 5 | 30 | 27 |
| 28 | 3 | 4 | 4 | 6 | 6 | 5 | 4 | 3 | 35 | 40 |
| 29 | 5 | 4 | 7 | 6 | 6 | 5 | 5 | 5 | 43 | 65 |
| 30 | 4 | 4 | 6 | 5 | 5 | 4 | 6 | 5 | 39 | 48 |
| 31 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 4 | 41 | 53 |

TIME SCALE ON MAGNETOGRAMS: 20 mm/hr

SUDDEN COMMENCEMENTS

| d | h | m |
|---|---|---|
| 8 | 17 | 54 |
| 13 | 01 | 27 |
| 16 | 05 | 34 |
| 19 | 04 | 23 |

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

| BEGIN d | BEGIN h | BEGIN m | END d | END h | END m |
|---|---|---|---|---|---|

K SCALE USED:

| | D | H | Z | |
|---|---|---|---|---|
| LOWER LIMIT FOR K = 9..... | 675.7 | 322.2 | | (mm) |
| CURRENT SCALE VALUE..... | 3.67 | 7.77 | | (γ/mm) |
| LOWER LIMIT FOR K = 9 ..... | 2480 | 2500 | | (to nearest 10γ) |

SCALINGS AND COMPUTATIONS HAVE BEEN CHECKED.

APPROVED John B. Townshend, Chief
OBSERVER IN CHARGE

NOAA FORM 76-133 SUPERSEDES C&GS FORM 815

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NOAA FORM 86-500
(11/73)

# PRINCIPAL MAGNETIC STORMS

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

Data from Individual Observatories: COLLEGE OBSERVATORY, COLLEGE, ALASKA

MARCH 1989

| Obs. 2 letter IAGA code | Geomag. lat. | Commencement | | | SC - amplitudes | | | Max. 3 hr - index K | | | Ranges | | | UT End | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | day | hr min (UT) | type | D(') | H(γ) | Z(γ) | day | (3 hr - period) | K | D(') | H(γ) | Z(γ) | day | hr |
| CO | 64.6 N | 3 | 05xx | . . | | | | 3 | 3,4,5,6 | 6 | 224 | 1165 | 760 | 3 | 20 |
| | | 5 | 04xx | . . | | | | 5 | 4,5 | 7 | 276 | 1835 | 830 | 5 | 17 |
| | | 8 | 1754 | SC* | -23 | +72 | -23 | 9 | 4 | 7 | 135 | 1440 | 660 | 9 | 24 |
| | | 13 | 0127 | SC* | -36 | +358 | -77 | 13 | 6 | 9 | 642 | 3590 | 2945 | 15 | 21 |
| | | 16 | 0534 | SC | -22 | +89 | -216 | 16/17 | 4/4 | 7 | 399 | 1750 | 1185 | 17 | 23 |
| | | 19 | 0423 | SC* | -12 | +498 | -78 | 19 | 5,6 | 7 | 276 | 1450 | 1175 | 19 | 23 |

COLLEGE OBSERVATORY, COLLEGE, ALASKA -- PRELIMINARY CALIBRATION DATA FOR: MARCH 1989

NORMAL MAGNETOGRAPH

| COMPONENT | PERIOD FROM | PERIOD TO | CALIBRATION SCALE VALUE | | CALIBRATION BASELINE |
|---|---|---|---|---|---|
| D | 0001 U.T., 3/1/89 | 2400 U.T., 3/31/89 | 1.0'/mm | 3.7 γ/mm | 26° 51.2' E |
| H | 0001 U.T., 3/1/89 | 2400 U.T., 3/31/89 | 7.8 γ/mm | | 12620 γ |
| Z | 0001 UT, 3/1/89 | 2400 U.T., 3/11/89 | 7.7 γ/mm | | 55173 γ |
| | 0001 U.T., 3/12/89 | 2400 U.T., 3/25/89 | (SAME) | | 55171 γ |
| | 0001 U.T., 3/26/89 | 2400 U.T., 3/31/89 | (SAME) | | 55168 γ |

STORM MAGNETOGRAPH

| COMPONENT | PERIOD FROM | PERIOD TO | CALIBRATION SCALE VALUE | | CALIBRATION BASELINE |
|---|---|---|---|---|---|
| D | 0001 U.T., 3/1/89 | 2400 U.T., 3/31/89 | 7.9'/mm | 29.5 γ/mm | |
| H | (SAME) | (SAME) | 43.6 γ/mm | | |
| Z | (SAME) | (SAME) | 49.4 γ/mm | | |

RAPID RUN MAGNETOGRAPH

| COMPONENT | PERIOD FROM | PERIOD TO | CALIBRATION SCALE VALUE | |
|---|---|---|---|---|
| D | | | | |
| H | | | | |
| Z | | | | |

MONTHLY MEAN ABSOLUTE VALUES*

| D | H | Z |
|---|---|---|
| 27° 06.6' E | 12790 γ | 55329 γ |

* COMPUTED FROM FIVE QUIETEST DAYS DURING MONTH.

DAYS USED: MARCH 7, 8, 20, 24, 25,

U.S. Dept. of Interior
Geological Survey

Observatory COLLEGE, ALASKA | Month MARCH | Year 1989

Jep-CO - 1/86

# MAGNETOGRAM HOURLY SCALINGS - FIVE QUIETEST DAYS

(UNIVERSAL TIME)

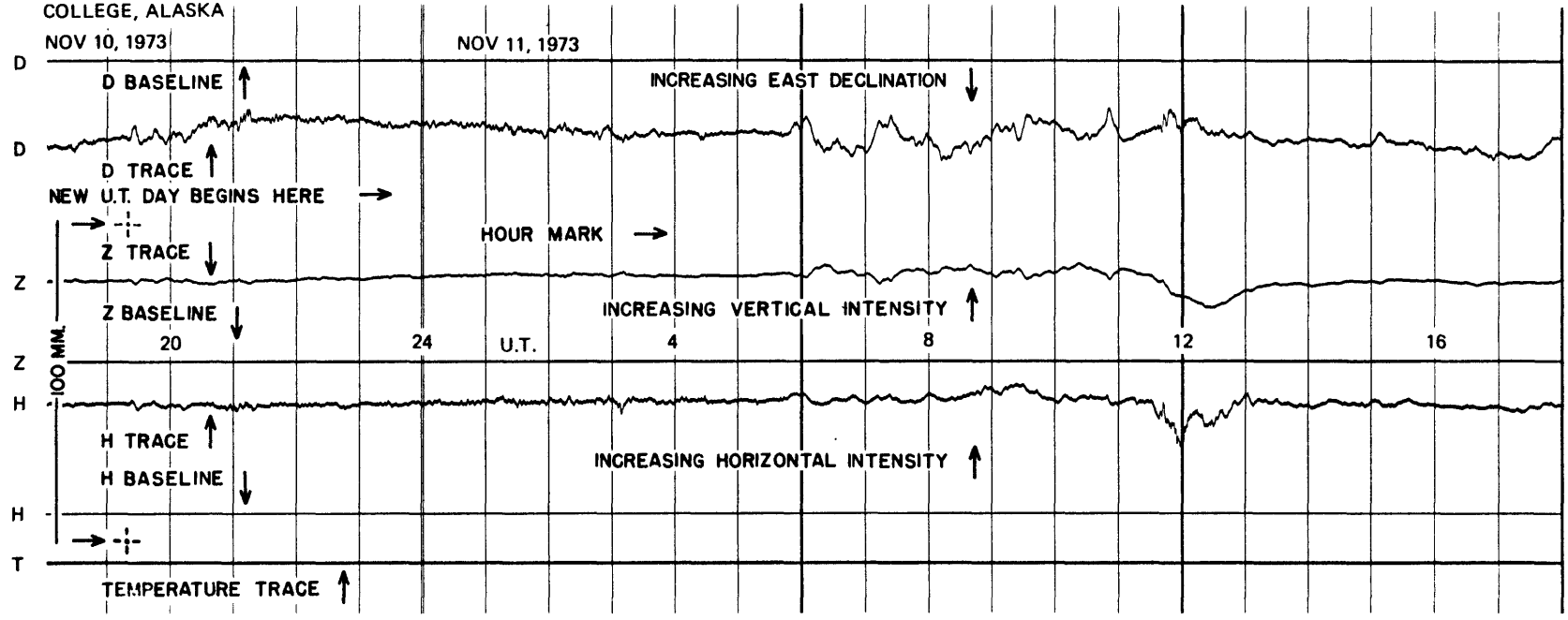
Values are in Tenths of mm and are Averages for Successive Periods of One Hour beginning at Midnight. Shrinkage Corrections have been applied. Negative Values in Red with Minus.

| COMPONENT | | D | | | | | H | | | | | Z | | | | | COMPONENT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | | 7 | 8 | 20 | 24 | 25 | 7 | 8 | 20 | 24 | 25 | 7 | 8 | 20 | 24 | 25 | DAY |
| $A_k$ | | 16 | 11 | 14 | 16 | 09 | 16 | 11 | 14 | 16 | 09 | 16 | 11 | 14 | 16 | 09 | $A_k$ |
| HOUR | 01 | 122 | 110 | 120 | 104 | 128 | 190 | 199 | 210 | 214 | 190 | 220 | 205 | 244 | 287 | 230 | 01 HOUR |
| | 02 | 79 | 99 | 120 | 70 | 118 | 298 | 240 | 230 | 236 | 200 | 218 | 208 | 246 | 264 | 226 | 02 |
| | 03 | 95 | 120 | 110 | 104 | 109 | 282 | 236 | 257 | 452 | 210 | 222 | 210 | 266 | 240 | 220 | 03 |
| | 04 | 80 | 93 | 129 | 48 | 119 | 292 | 260 | 241 | 442 | 211 | 204 | 209 | 283 | 250 | 220 | 04 |
| | 05 | 86 | 127 | 122 | 71 | 112 | 337 | 259 | 277 | 341 | 221 | 241 | 220 | 280 | 319 | 215 | 05 |
| | 06 | 202 | 160 | 101 | 140 | 119 | 464 | 277 | 289 | 211 | 229 | 220 | 230 | 264 | 304 | 215 | 06 |
| | 07 | 100 | 198 | 178 | 123 | 121 | 342 | 267 | 291 | 218 | 230 | 277 | 201 | 227 | 257 | 215 | 07 |
| | 08 | 142 | 137 | 114 | 72 | 123 | 289 | 255 | 250 | 311 | 236 | 252 | 199 | 273 | 219 | 215 | 08 |
| | 09 | 244 | 141 | 118 | 138 | 125 | 285 | 251 | 240 | 312 | 241 | 157 | 200 | 258 | 121 | 216 | 09 |
| | 10 | 72 | 143 | 119 | 88 | 98 | 261 | 251 | 230 | 260 | 257 | 99 | 191 | 241 | 140 | 206 | 10 |
| | 11 | 123 | 140 | 127 | 126 | 210 | 235 | 242 | 219 | 245 | 214 | 160 | 180 | 237 | 243 | 165 | 11 |
| | 12 | 168 | 152 | 136 | 138 | 141 | 190 | 258 | 129 | 203 | 209 | 210 | 182 | 244 | 229 | 184 | 12 |
| | 13 | 183 | 151 | 139 | 137 | 205 | -10 | 254 | 69 | 192 | 181 | 181 | 184 | 225 | 189 | 155 | 13 |
| | 14 | 104 | 158 | 150 | 137 | 160 | 165 | 251 | 167 | 159 | 247 | 120 | 184 | 199 | 194 | 194 | 14 |
| | 15 | 165 | 168 | 160 | 151 | 151 | 178 | 250 | 211 | 150 | 228 | 132 | 184 | 214 | 180 | 207 | 15 |
| | 16 | 199 | 180 | 195 | 170 | 164 | 219 | 248 | 151 | 223 | 149 | 143 | 186 | 203 | 197 | 192 | 16 |
| | 17 | 210 | 201 | 270 | 170 | 201 | 229 | 242 | 77 | 238 | 40 | 165 | 191 | 196 | 223 | 146 | 17 |
| | 18 | 201 | 230 | 275 | 204 | 240 | 241 | 237 | 95 | 248 | 29 | 194 | 198 | 178 | 240 | 82 | 18 |
| | 19 | 209 | 290 | 262 | 224 | 349 | 199 | 96 | 198 | 233 | -56 | 164 | 182 | 175 | 233 | 99 | 19 |
| | 20 | 182 | 328 | 228 | 230 | 148 | 230 | -21 | 219 | 231 | 2 | 170 | 76 | 213 | 230 | 54 | 20 |
| | 21 | 167 | 356 | 216 | 216 | 107 | 223 | 50 | 218 | 218 | 198 | 177 | 64 | 231 | 230 | 135 | 21 |
| | 22 | 179 | 187 | 240 | 189 | 199 | 219 | 190 | 208 | 206 | 193 | 189 | 69 | 245 | 224 | 213 | 22 |
| | 23 | 138 | 238 | 170 | 180 | 111 | 201 | 171 | 171 | 199 | 199 | 195 | 156 | 229 | 220 | 220 | 23 |
| | 24 | 130 | 102 | 142 | 149 | 101 | 219 | 213 | 204 | 208 | 190 | 210 | 223 | 226 | 223 | 216 | 24 |
| DAILY SUM | | 3580 | 4209 | 3941 | 3379 | 3659 | 5778 | 5176 | 4851 | 5950 | 4248 | 4520 | 4332 | 5597 | 5456 | 4440 | DAILY SUM |
| DAILY MEAN | | 149 | 175 | 164 | 141 | 152 | 241 | 216 | 202 | 248 | 177 | 188 | 180 | 233 | 227 | 185 | DAILY MEAN |
| MEAN | | | | 156 | | | | | 217 | | | | | 203 | | | MEAN |

Scaled rvo | Checked cav

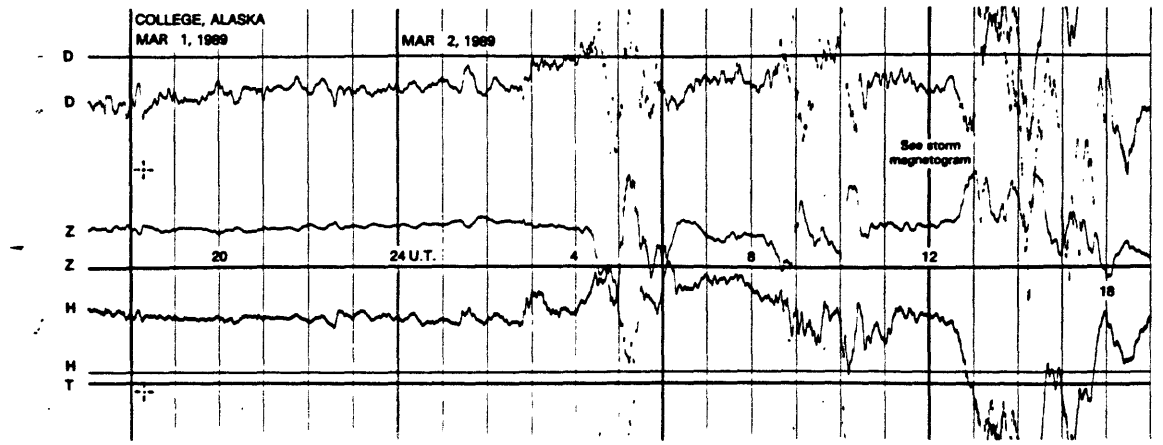
4

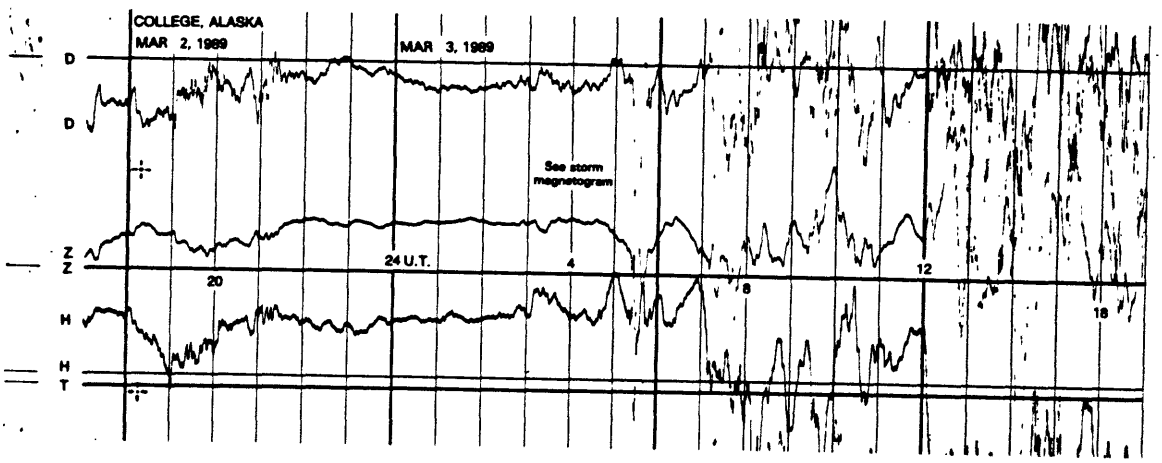
# FORMAT FOR NORMAL & STORM MAGNETOGRAMS
(SAMPLE ONLY)

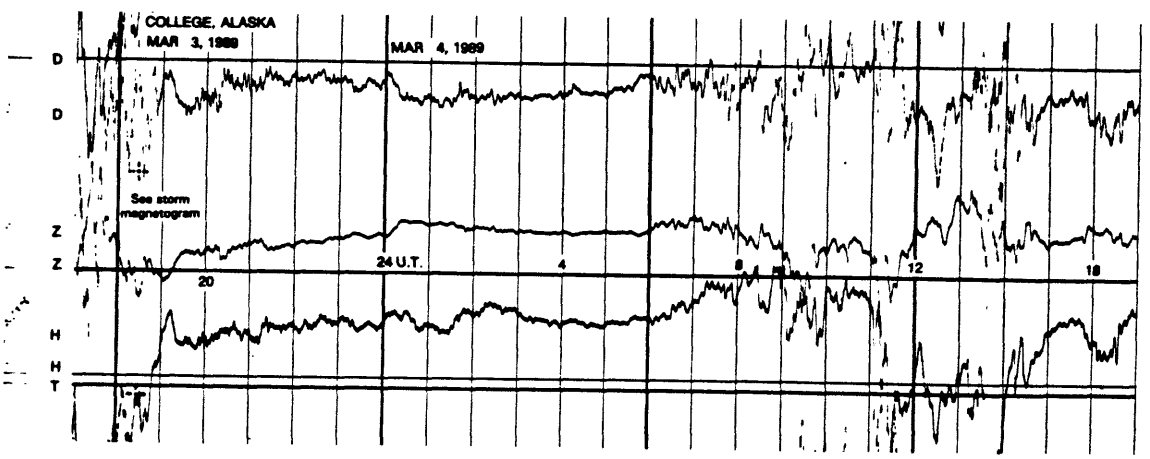


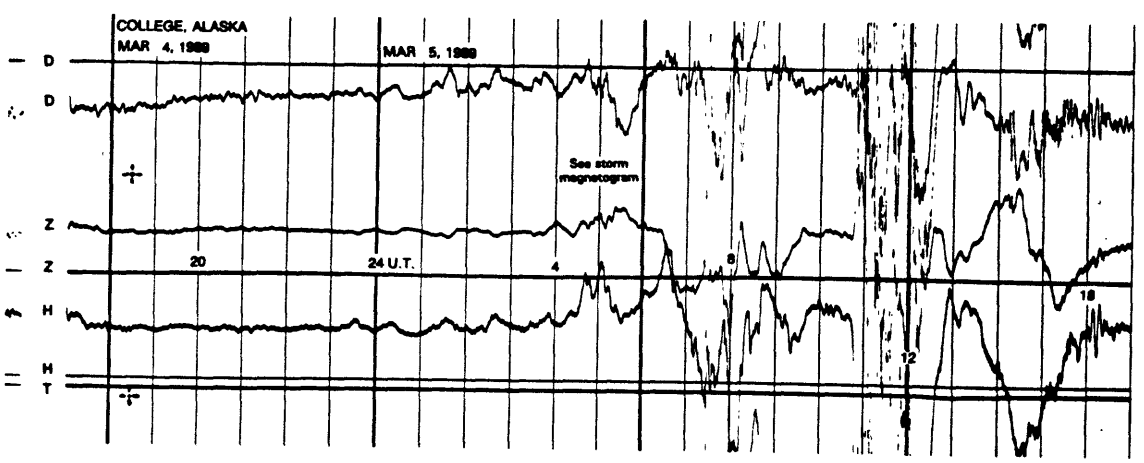

SEE PRELIMINARY CALIBRATION DATA FOR SCALE VALUES & BASELINE VALUES

# NORMAL MAGNETOGRAMS




200 mm
100 mm
0

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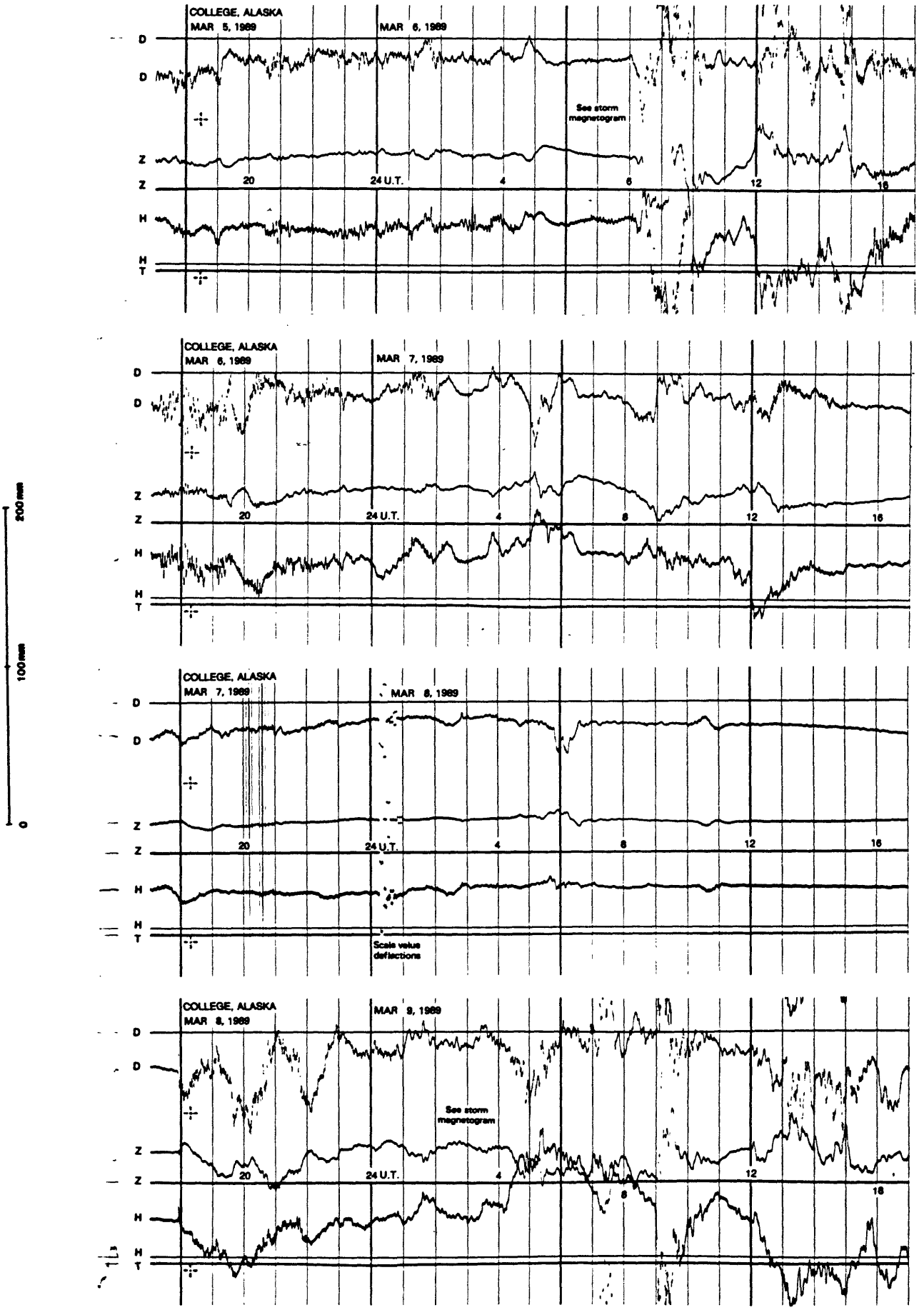

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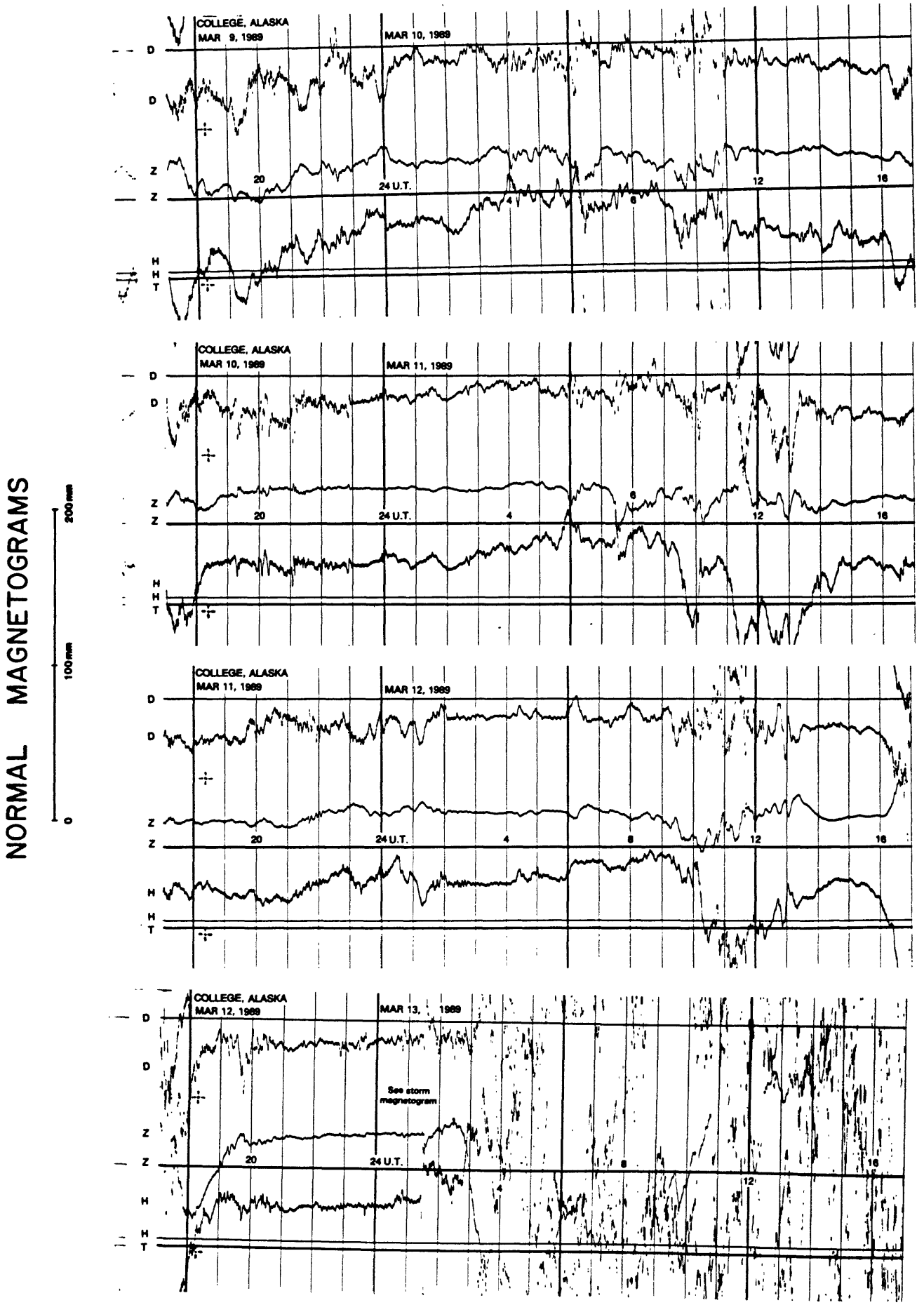

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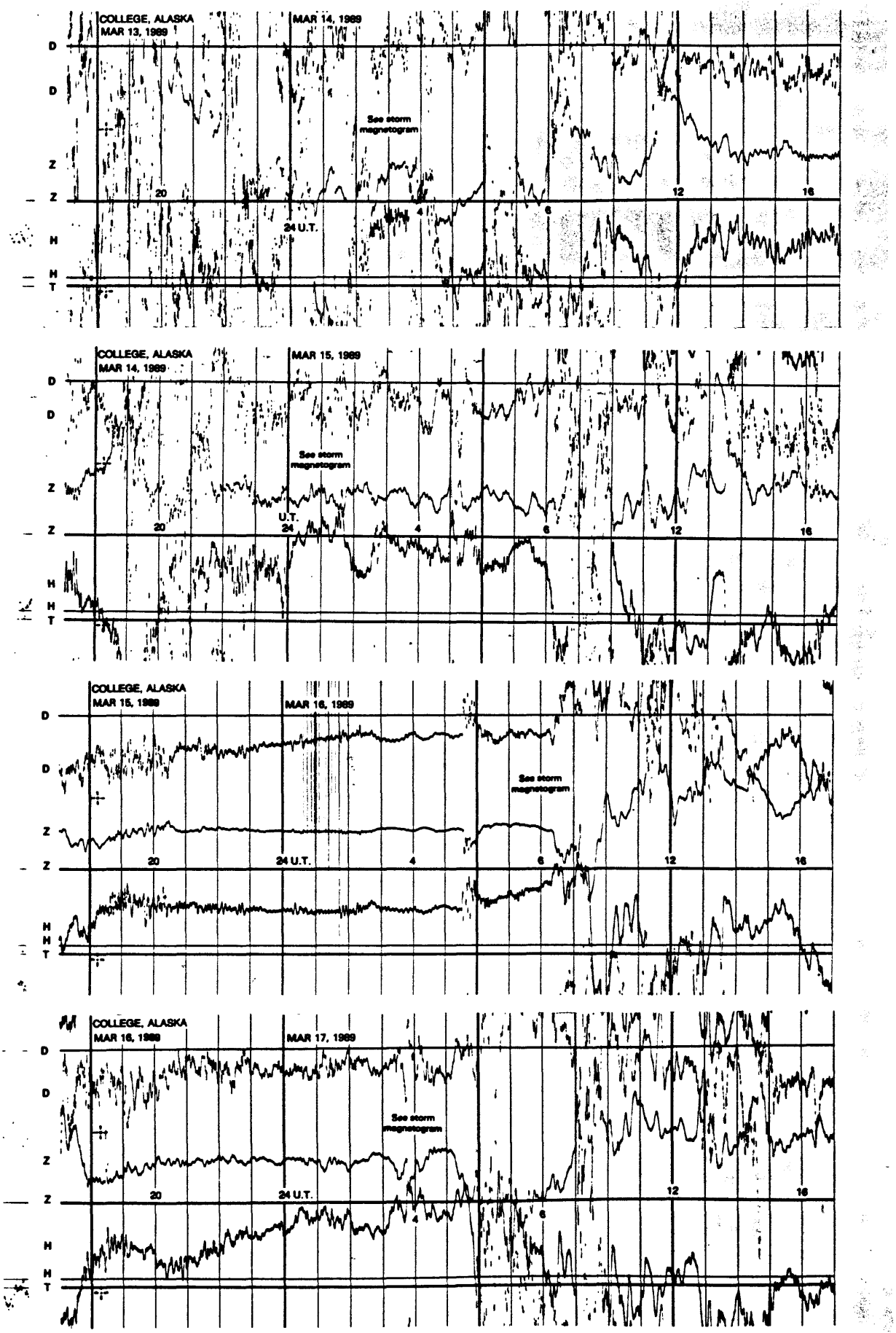


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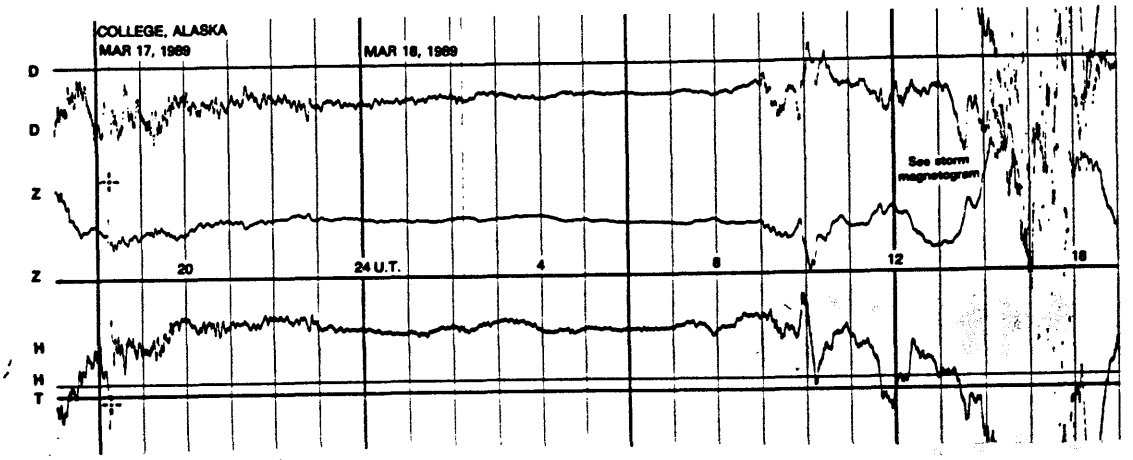


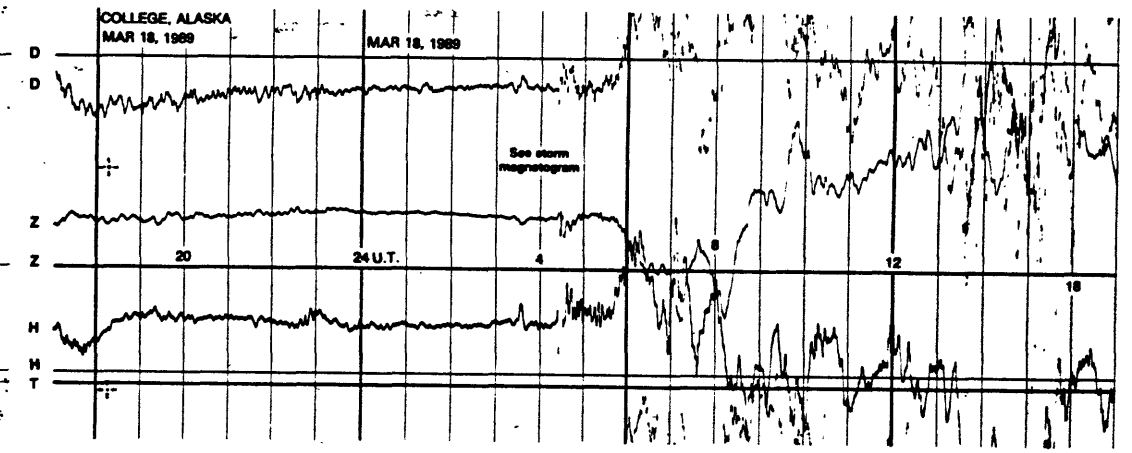


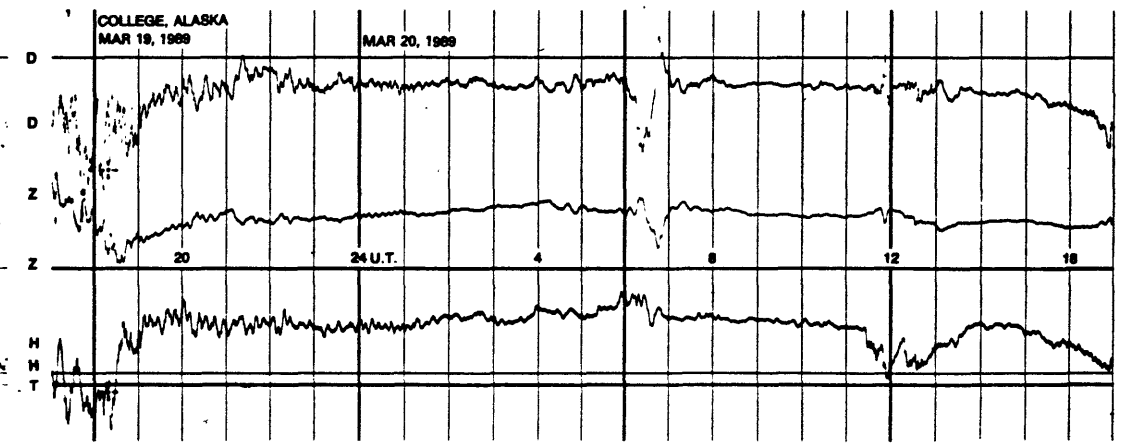


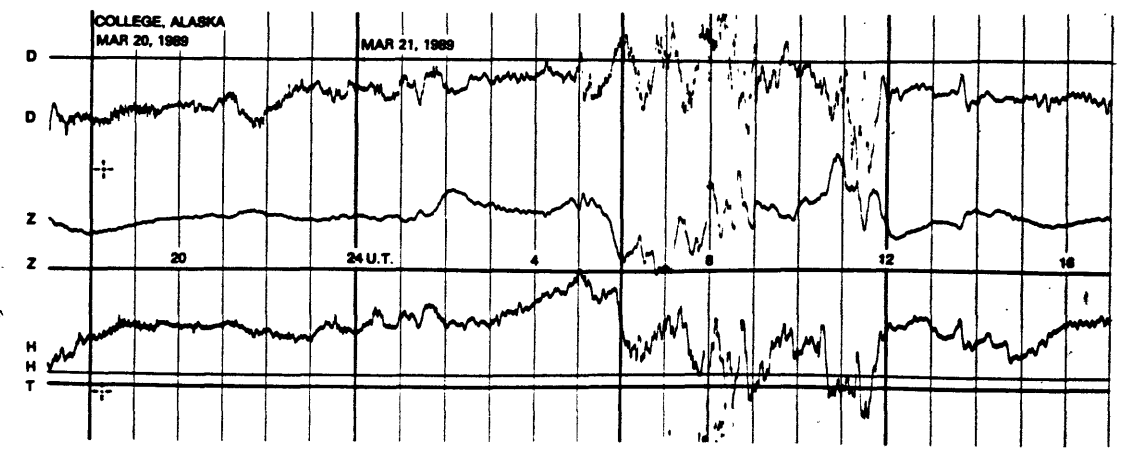

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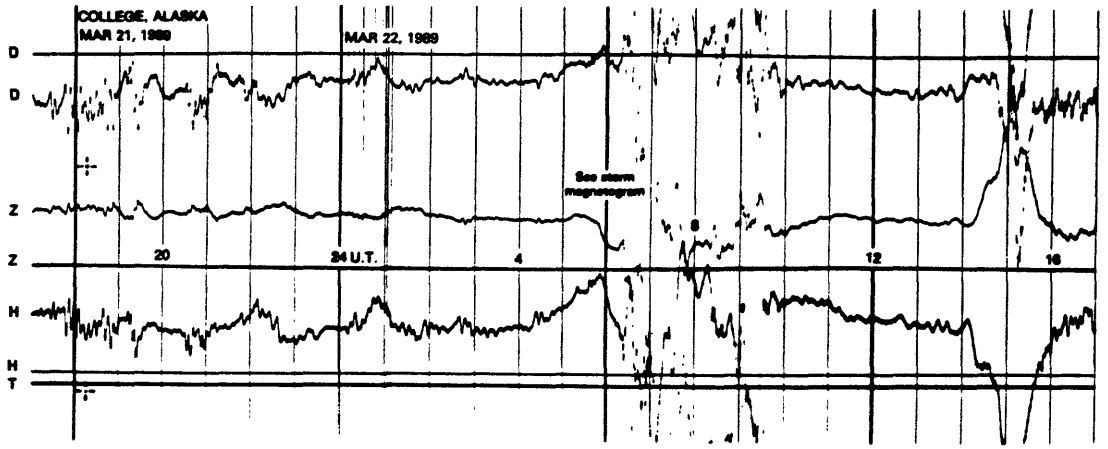
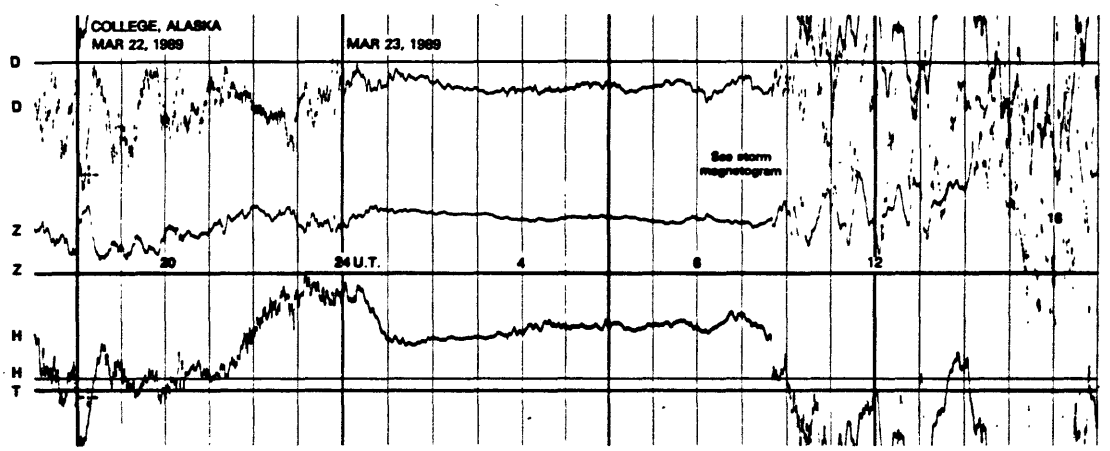
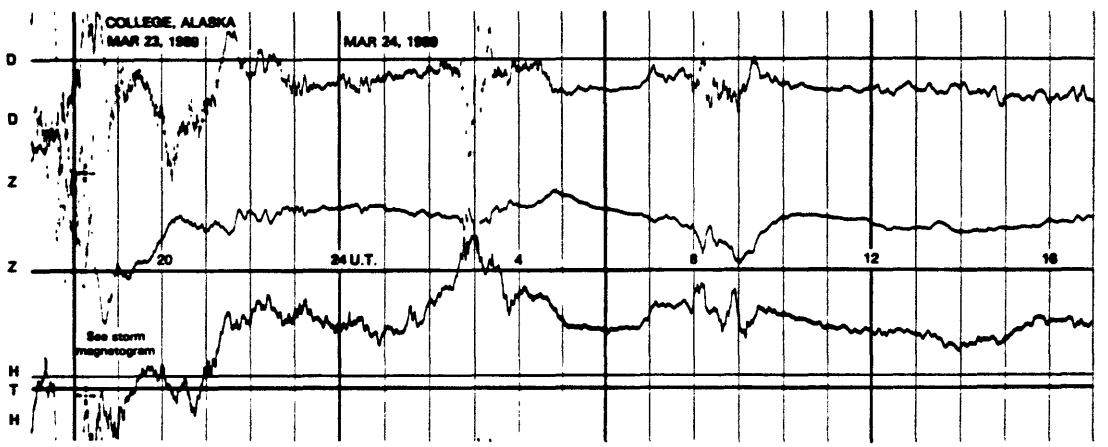
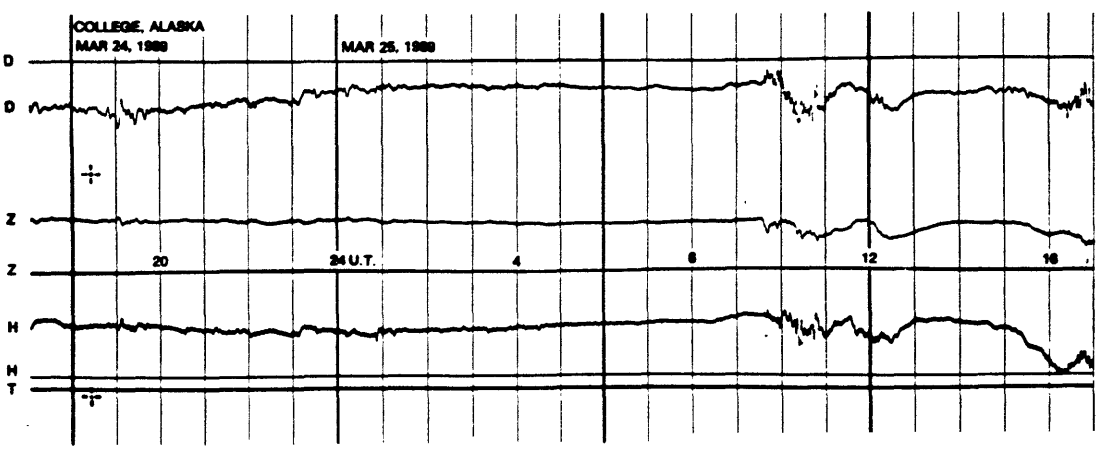


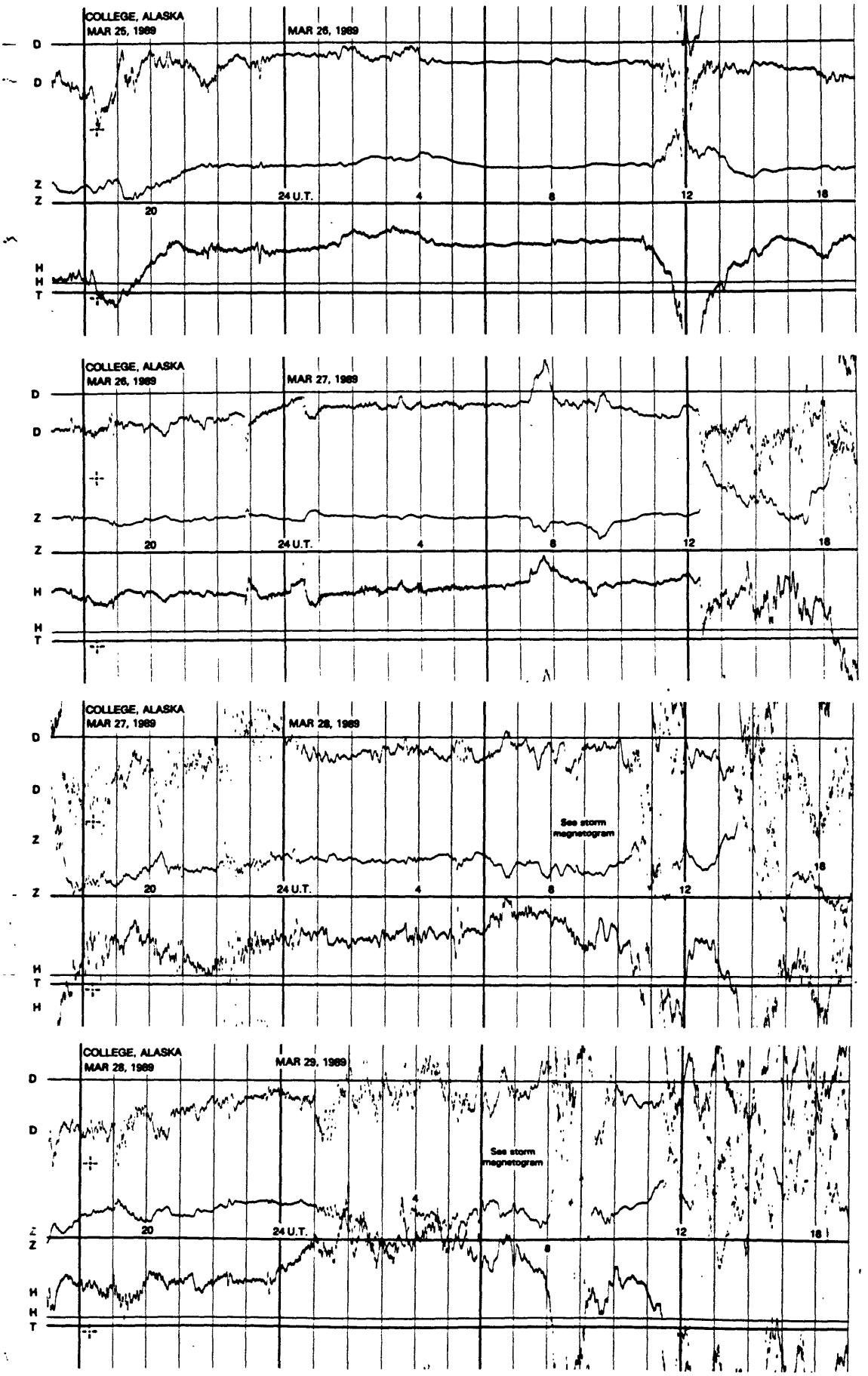




200 mm
100 mm
0

# NORMAL MAGNETOGRAMS




200 mm

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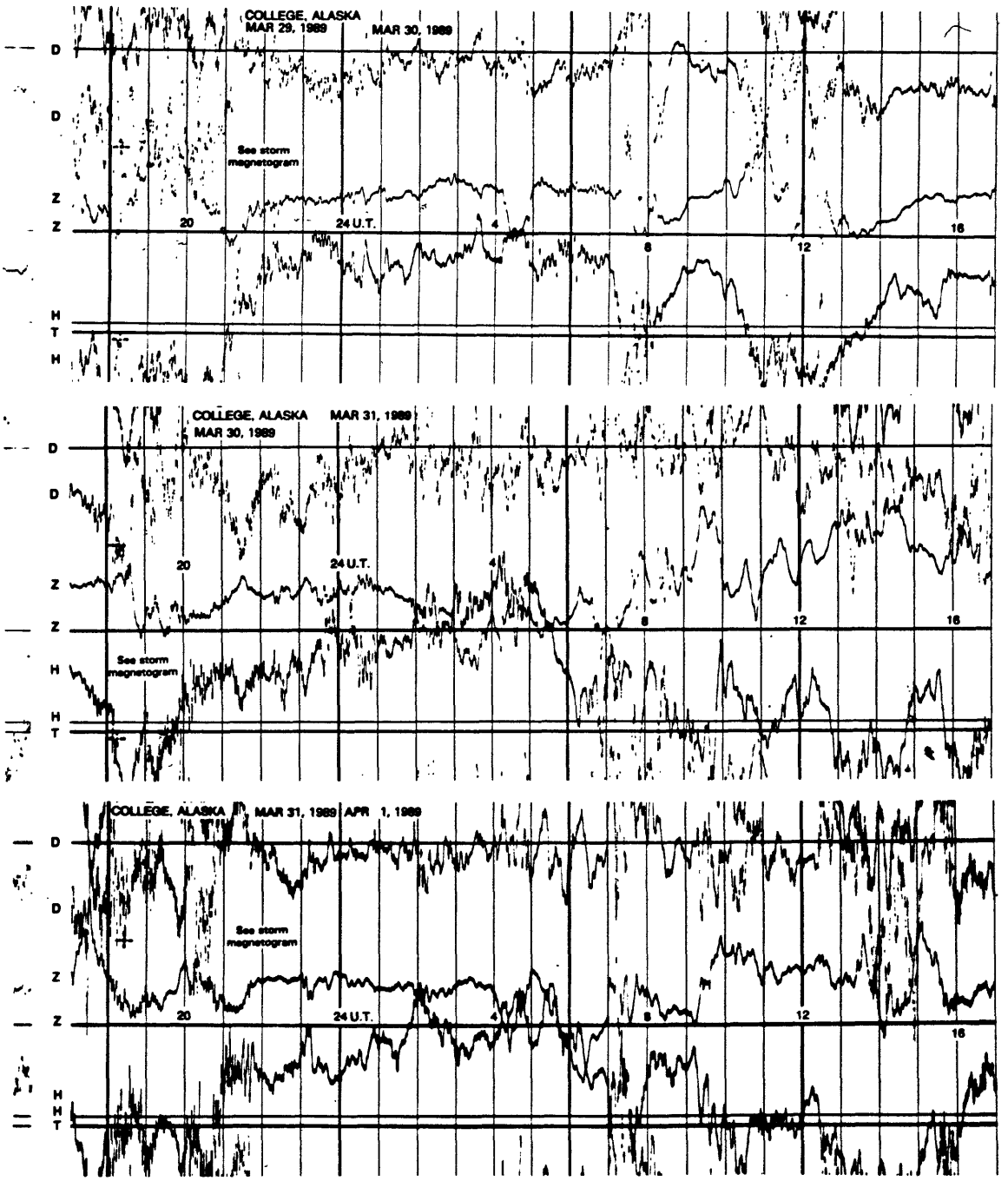
NORMAL MAGNETOGRAMS

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100 mm
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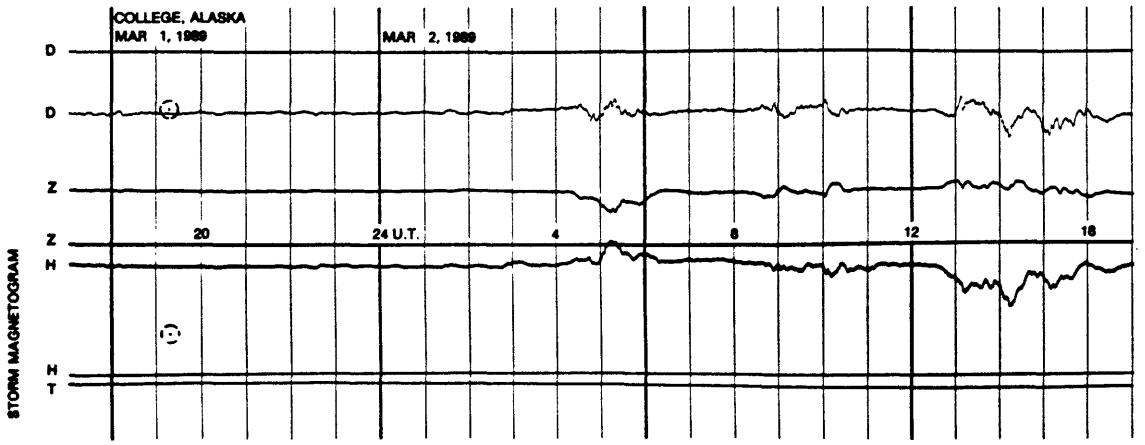
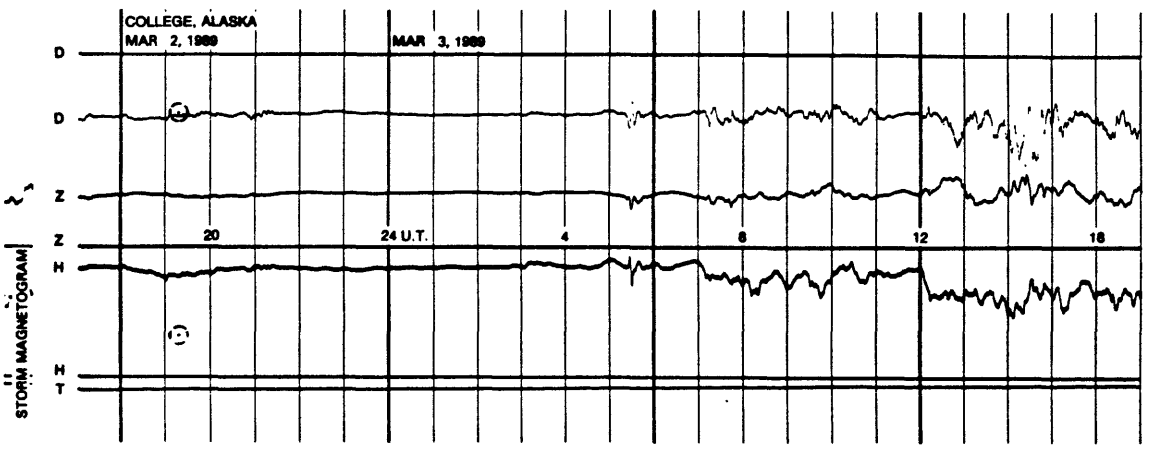
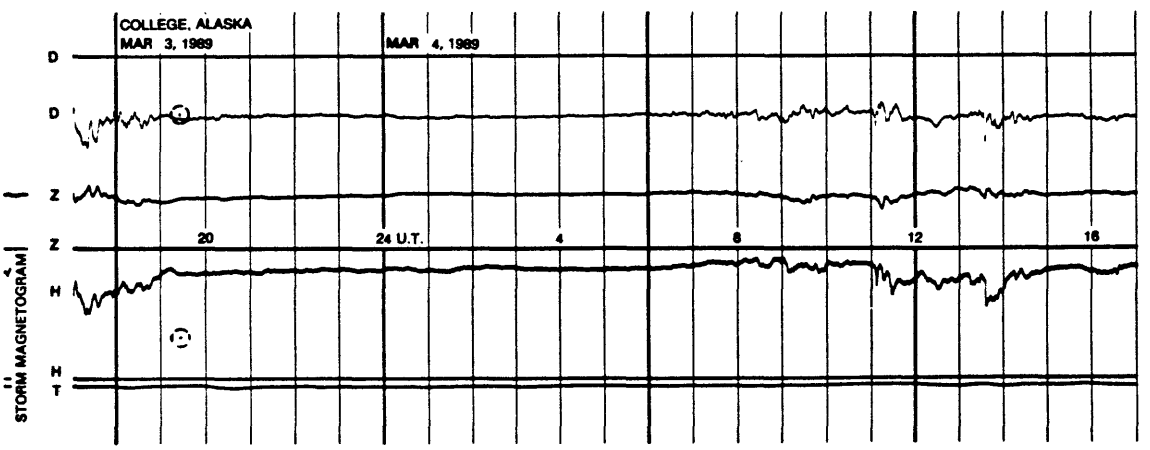
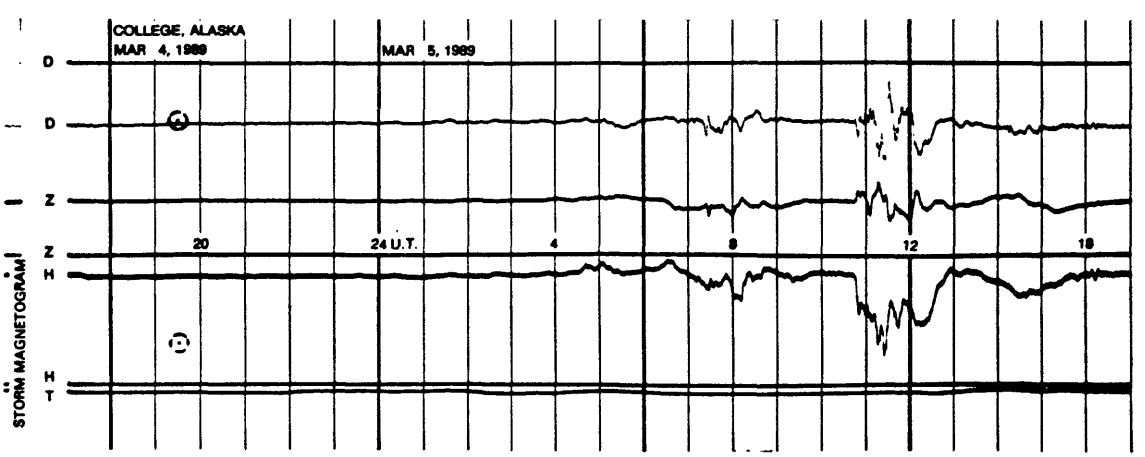
# STORM MAGNETOGRAMS

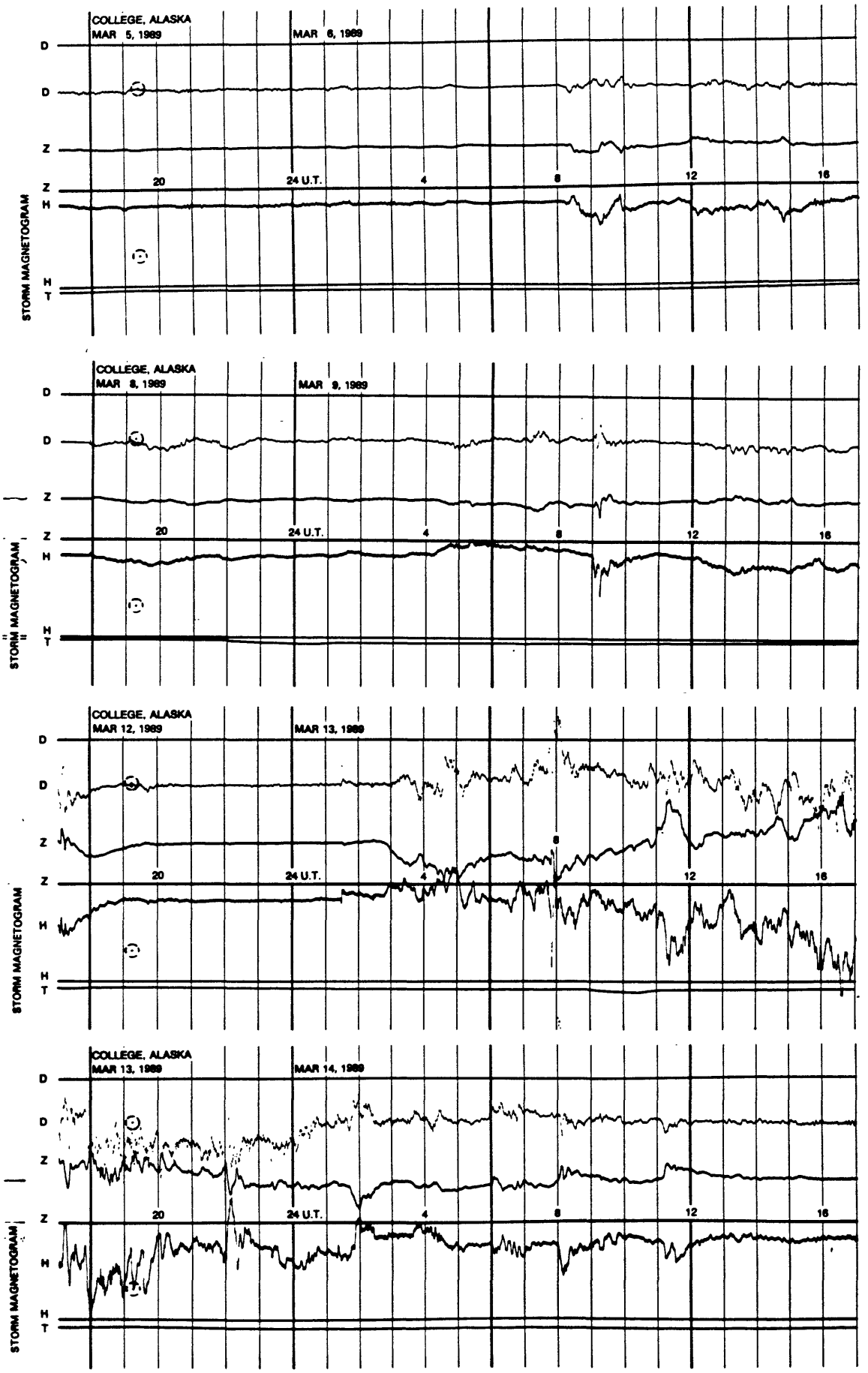



# STORM MAGNETOGRAMS

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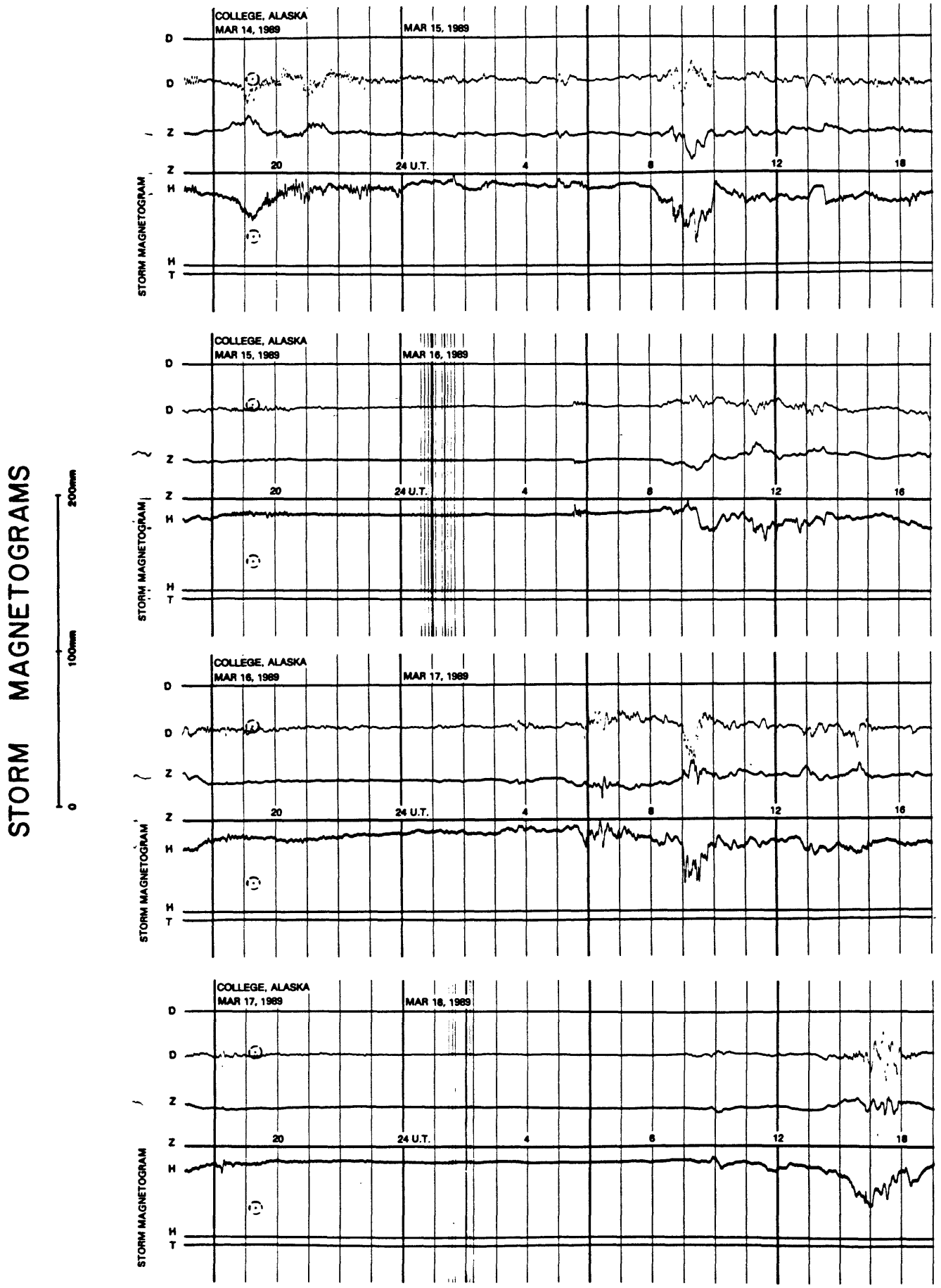

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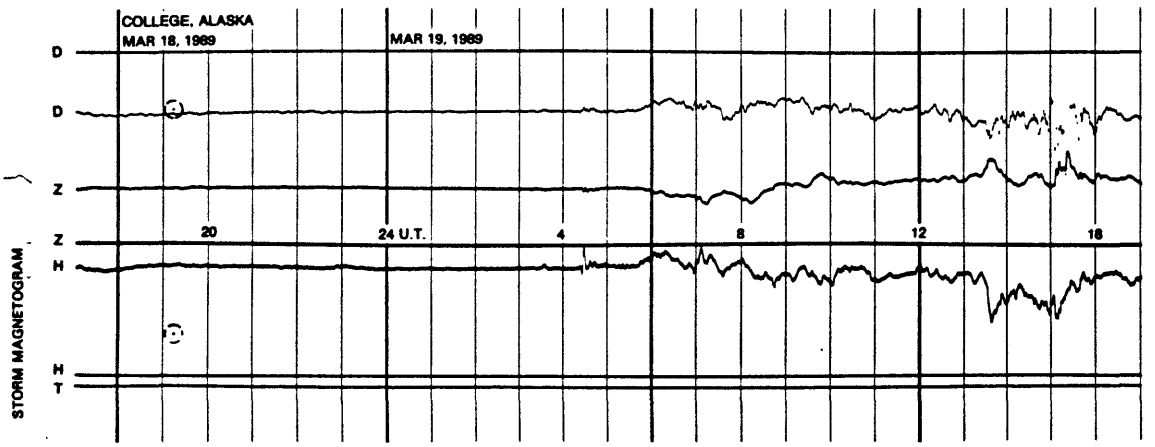


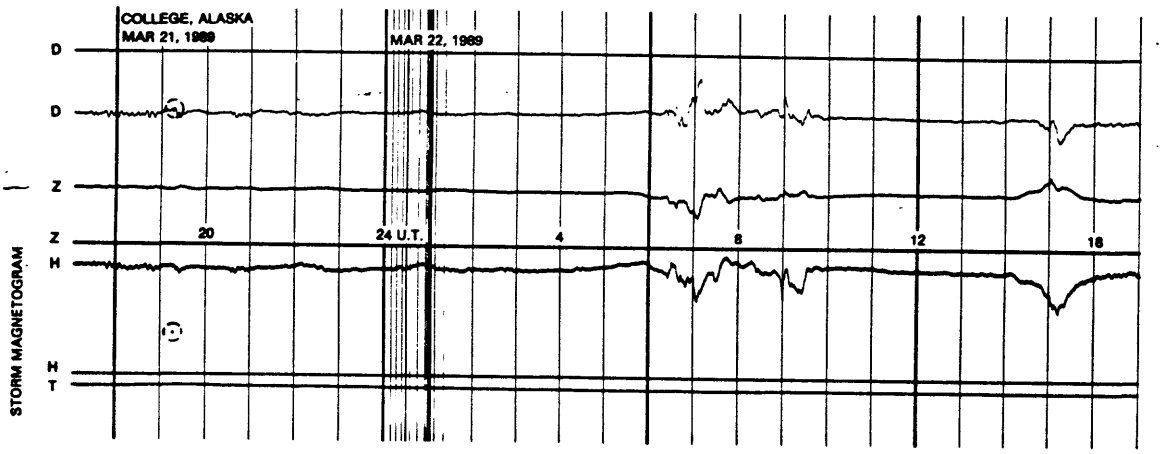


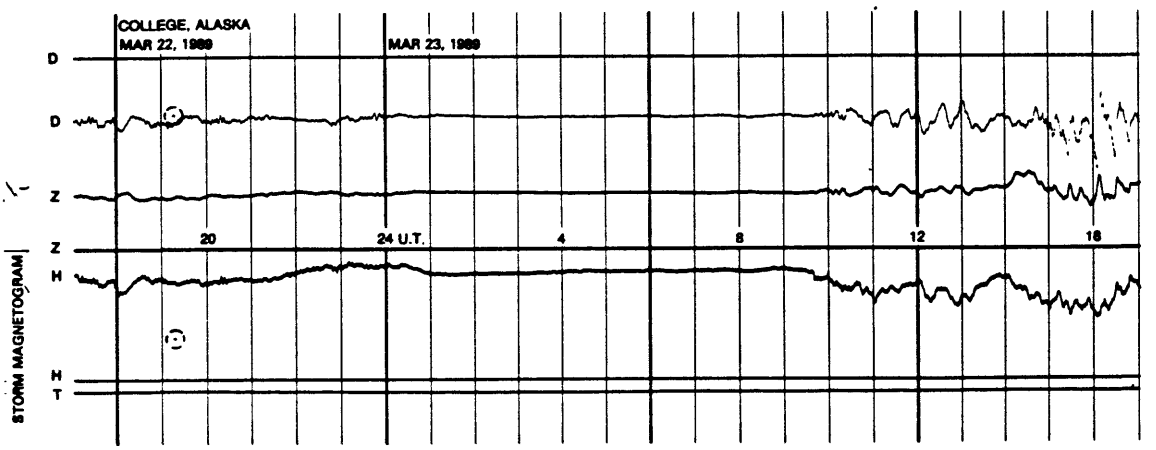


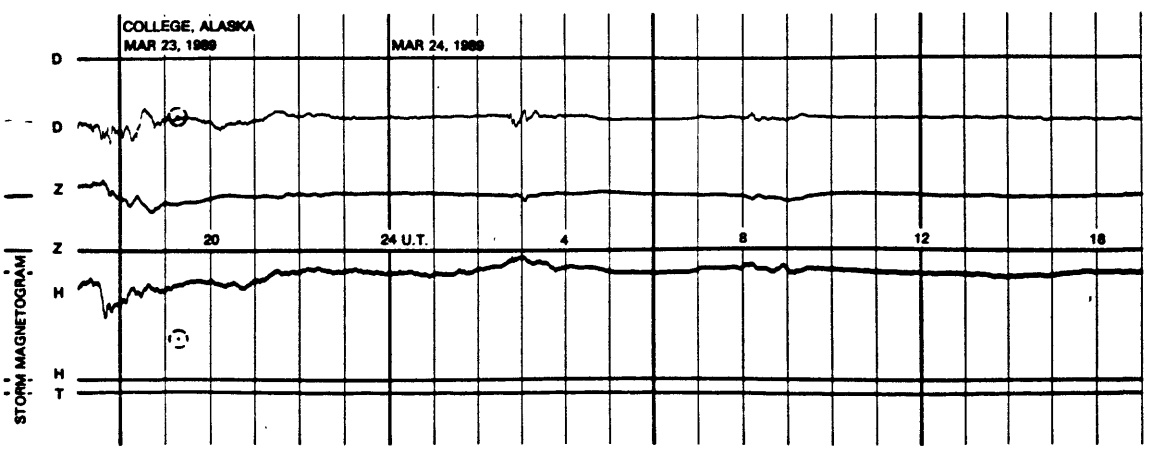

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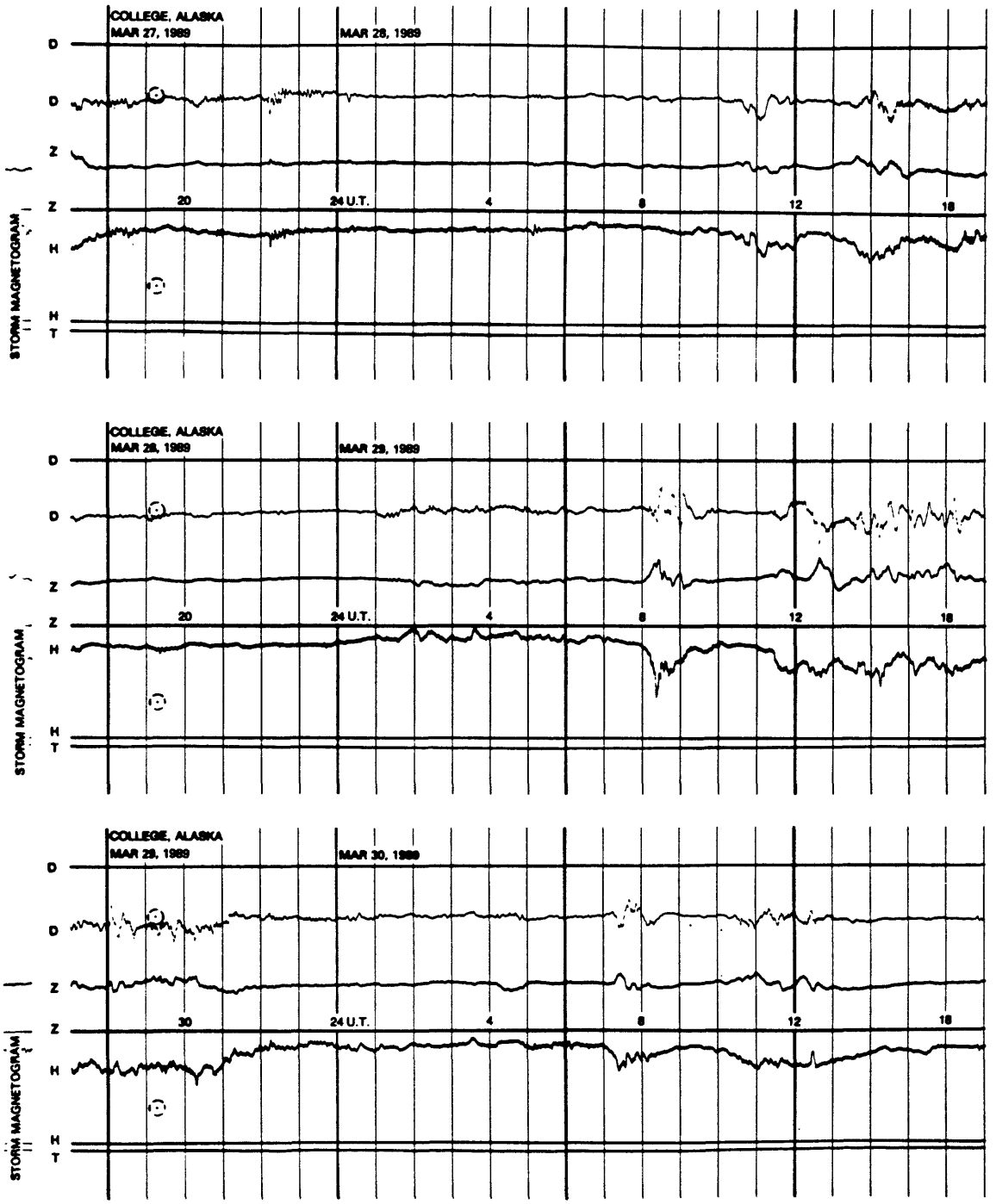


200mm
100mm
0

# STORM MAGNETOGRAMS