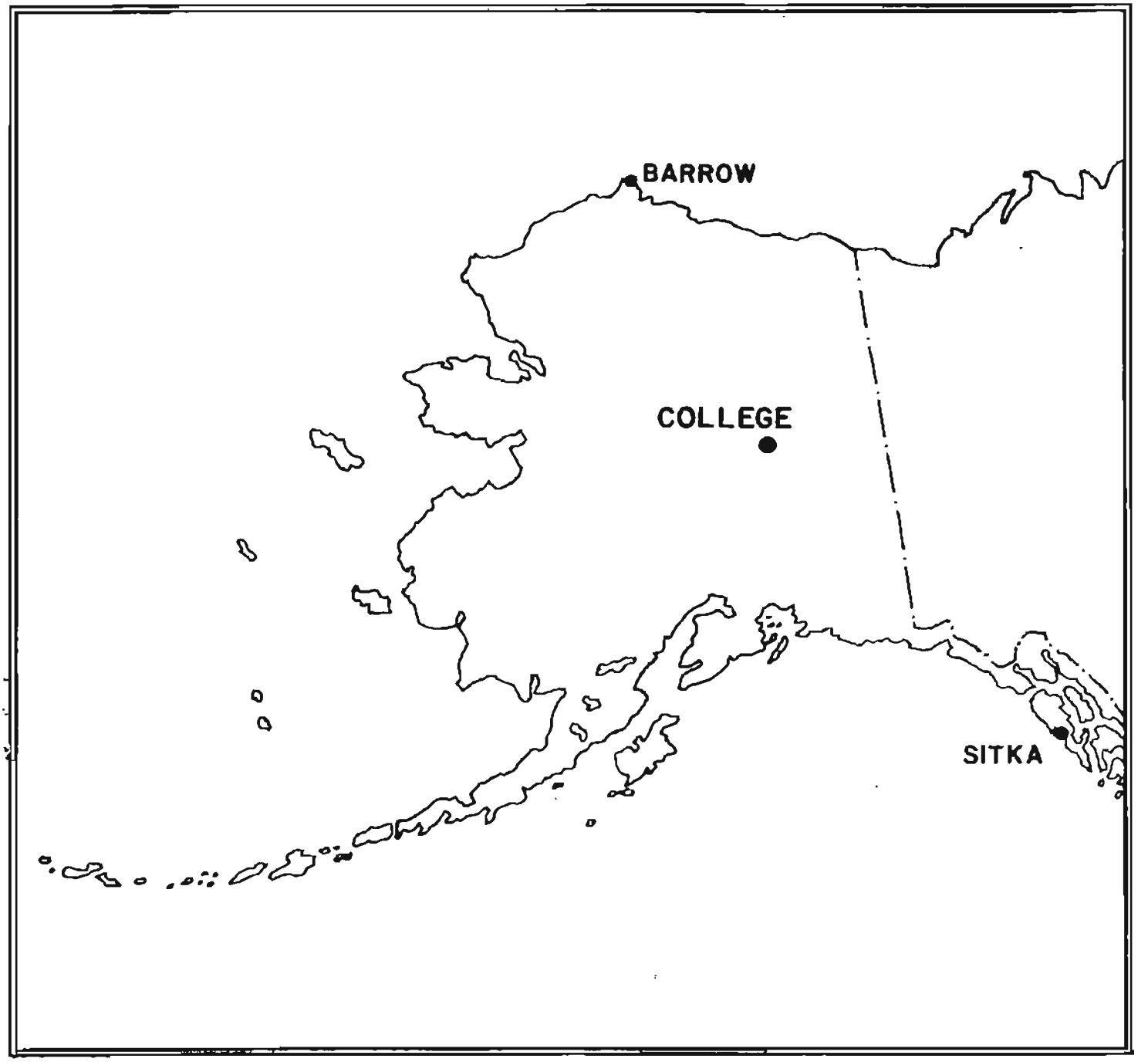
# UNITED STATES DEPARTMENT OF THE INTERIOR

## GEOLOGICAL SURVEY

# PRELIMINARY GEOMAGNETIC DATA
# COLLEGE OBSERVATORY
# FAIRBANKS, ALASKA

SEPTEMBER 1982

OPEN FILE REPORT 82-0300I



THIS REPORT WAS PREPARED UNDER THE DIRECTION OF JOHN B. TOWNSHEND, CHIEF OF THE COLLEGE OBSERVATORY, WITH THE ASSISTANCE OF THE OBSERVATORY STAFF MEMBERS: J.E. PAPP, E.A. SAUTER, L.Y. TORRENCE, T.K. CUNNINGHAM 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 OF THE U.S. GEOLOGICAL SURVEY.

ORDER OF CONTENTS

# 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 99701

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

World Data Center A
NOAA D63, 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 latitude.....64°51.6'N
Geographic longitude.....147°50.2'W
Geomagnetic latitude.....+64.6°
Geomagnetic longitude.....+256.5°
Elevation.....200 meters

### 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.

#### Selected Phenomena & Outstanding Magnetic Effects

Prior to January 1, 1976, the Normal and 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 "01" 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.

NOAA FORM 76-133 (9-72)

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

OBSERVATORY
COLLEGE OBSERVATORY

# MAGNETIC ACTIVITY

(Greenwich civil time, counted from midnight to midnight)

MONTH AND YEAR
September 1982

| DATE | K-INDICES 00-03 | 03-06 | 06-09 | 09-12 | 12-15 | 15-18 | 18-21 | 21-24 | SUM | AK |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 2 | 1 | 2 | 5 | 4 | 2 | 2 | 20 | 14 |
| 2 | 2 | 3 | 4 | 6 | 5 | 3 | 3 | 2 | 28 | 27 |
| 3 | 3 | 4 | 4 | 6 | 3 | 3 | 3 | 2 | 28 | 25 |
| 4 | 3 | 4 | 5 | 6 | 6 | 5 | 3 | 3 | 35 | 41 |
| 5 | 4 | 4 | 7 | 5 | 6 | 6 | 3 | 6 | 41 | 62 |
| 6 | 6 | 6 | 7 | 9 | 6 | 8 | 6 | 4 | 52 | 141 |
| 7 | 5 | 4 | 7 | 7 | 6 | 7 | 7 | 3 | 46 | 91 |
| 8 | 2 | 4 | 3 | 3 | 2 | 2 | 2 | 3 | 21 | 13 |
| 9 | 5 | 4 | 3 | 6 | 6 | 4 | 4 | 4 | 36 | 41 |
| 10 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 14 | 07 |
| 11 | 2 | 2 | 3 | 4 | 5 | 3 | 2 | 2 | 23 | 17 |
| 12 | 2 | 3 | 2 | 4 | 1 | 2 | 2 | 2 | 18 | 10 |
| 13 | 4 | 3 | 2 | 4 | 5 | 5 | 1 | 2 | 26 | 23 |
| 14 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 18 | 10 |
| 15 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 21 | 12 |
| 16 | 3 | 1 | 3 | 2 | 3 | 2 | 2 | 2 | 18 | 10 |
| 17 | 2 | 2 | 5 | 6 | 3 | 3 | 2 | 1 | 24 | 23 |
| 18 | 3 | 4 | 3 | 3 | 5 | 4 | 5 | 4 | 31 | 28 |
| 19 | 3 | 3 | 4 | 4 | 5 | 6 | 5 | 3 | 33 | 34 |
| 20 | 2 | 3 | 6 | 6 | 5 | 5 | 3 | 3 | 33 | 39 |
| 21 | 5 | 6 | 7 | 5 | 7 | 5 | 4 | 6 | 45 | 76 |
| 22 | 5 | 8 | 7 | 8 | 7 | 5 | 3 | 4 | 47 | 112 |
| 23 | 3 | 5 | 5 | 6 | 4 | 4 | 2 | 3 | 32 | 33 |
| 24 | 3 | 4 | 5 | 6 | 5 | 6 | 2 | 1 | 32 | 39 |
| 25 | 2 | 1 | 2 | 3 | 3 | 3 | 3 | 1 | 18 | 10 |
| 26 | 2 | 2 | 5 | 7 | 8 | 8 | 6 | 4 | 42 | 99 |
| 27 | 4 | 3 | 6 | 6 | 4 | 5 | 4 | 2 | 34 | 39 |
| 28 | 4 | 4 | 2 | 3 | 2 | 1 | 1 | 2 | 19 | 12 |
| 29 | 1 | 1 | 6 | 5 | 4 | 1 | 2 | 1 | 21 | 22 |
| 30 | 0 | 1 | 4 | 4 | 4 | 5 | 3 | 3 | 24 | 20 |
| 31 | | | | | | | | | | |

TIME SCALE ON MAGNETOGRAMS
20 mm/hr

SUDDEN COMMENCEMENTS
d h m

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

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

| K SCALE USED: | D | H | Z | |
|---|---|---|---|---|
| LOWER LIMIT FOR K = 9..... | 683.8 | 321.7 | | (mm) |
| CURRENT SCALE VALUE..... | 3.73 | 7.79 | | (γ/mm) |
| LOWER LIMIT FOR K = 9 ..... | 2550 | 2510 | | (to nearest 10γ) |

SCALINGS AND COMPUTATIONS HAVE BEEN CHECKED.

APPROVED JOHN B. TOWNSHEND, CHIEF, COLLEGE OBSERVATORY
OBSERVER IN CHARGE



☆ U.S. GOVERNMENT PRINTING OFFICE: 1973-781-857

# OUTSTANDING MAGNETIC EFFECTS

OBSERVATORY: COLLEGE, ALASKA

MONTH: SEPTEMBER

YEAR: 1982

| DATE | TIME U.T. | NATURE OF PHENOMENON [1] | REMARKS |
|---|---|---|---|
| 04 | 0031 | ssc* | |
| 08 | 03xx | pc5 | |
| 09 | 01xx | pc5 | |
| 09 | 17xx | pc5 | |

IDENTIFIED BY: JBT

VERIFIED BY: JEP

1. NATURE OF PHENOMENON: ssc, ssc*, si, si*, b, bp, bs, bps, pc1, pc2 - - - pc5, pg, pi 1, pi 2, sfe.

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

September 1982

| 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 | 04 | 0031 | s.c.* | +9 | -47 | .. | 06 | 4 | 9 | 574 | 3560 | 2270 | 07 | 21 |
| | | 20 | 06xx | .. | .. | .. | .. | 22 | 2, 4 | 8 | 648 | 2760 | 2310 | 23 | 18 |
| | | 26 | 03xx | .. | .. | .. | .. | 26 | 5, 6 | 8 | 534 | 2280 | 1420 | 27 | 20 |

COLLEGE OBSERVATORY, COLLEGE, ALASKA -- PRELIMINARY CALIBRATION DATA FOR: SEPTEMBER 1982

## NORMAL MAGNETOGRAPH

| COMPONENT | PERIOD FROM | PERIOD TO | CALIBRATION SCALE VALUE | | CALIBRATION BASELINE |
|---|---|---|---|---|---|
| D | 0000 U.T., 9-1-82 | 2400 U.T., 9-30-82 | 1.0/mm | 3.7 γ/mm | 27° 47.0 E |
| H | 0000 U.T., 9-1-82 | 2400 U.T., 9-30-82 | 7.8 γ/mm | | 12774 |
| Z | 0000 U.T., 9-1-82 | 1801 U.T., 9-16-82 | 7.7 γ/mm | | 55142 γ |
| | 1802 U.T., 9-16-82 | 2400 U.T., 9-30-82 | 7.5 γ/mm | | 55118 γ |

## STORM MAGNETOGRAPH

| COMPONENT | PERIOD FROM | PERIOD TO | CALIBRATION SCALE VALUE | | CALIBRATION BASELINE |
|---|---|---|---|---|---|
| D | 0000 U.T., 9-1-82 | 2400 U.T., 9-30-82 | 7.9'/mm | 29.6 γ/mm | 23° 40.0 E |
| H | 0000 U.T., 9-1-82 | 2400 U.T., 9-30-82 | 44.0 γ/mm | | 11529 γ |
| Z | 0000 U.T., 9-1-82 | 2400 U.T., 9-30-82 | 48.5 γ/mm | | 54048 |

## RAPID RUN MAGNETOGRAPH

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

## MONTHLY MEAN ABSOLUTE VALUES*

| D | H | Z |
|---|---|---|
| 27° 57.3 E | 12954 | 55402 |

* COMPUTED FROM ~~TEN~~ SEVEN QUIETEST DAYS DURING MONTH.

DAYS USED: SEP 8, 10, 12, 14, 15, 25, 28, ** (NOTE BELOW)

** DUE TO VERY DISTURBED MAGNETIC CONDITIONS DURING THE MONTH OF SEPTEMBER 1982, ONLY 7 DAYS ARE USED TO COMPUTE MONTHLY MEAN ABSOLUTE VALUES

FORM 76-184

# MAGNETOGRAM HOURLY SCALINGS
(UNIVERSAL TIME)

Values are in tenths of gam, and are averages for successive periods of one hour beginning at midnight. Hour 01 of local day ( 150 U.T.) is hour 11 of the BEGIN universal day.
Shrinkage corrections have been applied. Negative values are in red, with minus signs shown.

U.S. DEPARTMENT OF INTERIOR
Geological Survey, Geomagnetic Division
Denver Federal Center
Denver, CO 80225

OBSY. CO | YEAR 82 | MONTH SEP | FREQUENCY F

| C | DAYS | TENS | HRS | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | HRS | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | SUM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 01 | 26 | 50 | 55 | 63 | 107 | 90 | 84 | 81 | 58 | 73 | 66 | 79 | 01 | 95 | 122 | 243 | 234 | 196 | 210 | 154 | 130 | 116 | 72 | 53 | 52 | 2529 |
| | | | 02 | 48 | 41 | 39 | 48 | 55 | 62 | 40 | 111 | 49 | 16 | 27 | 232 | 02 | 17 | 185 | 136 | 172 | 199 | 217 | 160 | 117 | 88 | 49 | 59 | -5 | 2162 |
| | | | 03 | 27 | 37 | 20 | 2 | 36 | 68 | 142 | 158 | -70 | 58 | 89 | 105 | 03 | 36 | 125 | 118 | 172 | 171 | 243 | 215 | 145 | 74 | 53 | 16 | 24 | 2073 |
| | | | 04 | 43 | 49 | 31 | 10 | 168 | 122 | 18 | 30 | 62 | 222 | 232 | 56 | 04 | 103 | 199 | 302 | 322 | 304 | 269 | 259 | 137 | 66 | -6 | 86 | 67 | 3143 |
| | | | 05 | 32 | 52 | 13 | 37 | 96 | 93 | -64 | -39 | -142 | 24 | 54 | 45 | 05 | 175 | 276 | 477 | 87 | 317 | 218 | 227 | 168 | 81 | 71 | -47 | 181 | 2434 |
| | | | 06 | 135 | 6 | -111 | -595 | 191 | -103 | -397 | -381 | -492 | -135 | -335 | -547 | 06 | -183 | 119 | 413 | 310 | 581 | 681 | 266 | 362 | 290 | 159 | 205 | 218 | 1169 |
| | | | 07 | -31 | 53 | -87 | -47 | -64 | -111 | 12 | 158 | 24 | 0 | -206 | -95 | 07 | 47 | 127 | 204 | 306 | 652 | 453 | 302 | 56 | 57 | 74 | 103 | 56 | 2073 |
| | | | 08 | 55 | 54 | 60 | 74 | 104 | 96 | 87 | 91 | 89 | 71 | 82 | 87 | 08 | 122 | 161 | 172 | 210 | 239 | 246 | 254 | 189 | 155 | 171 | 49 | 71 | 3020 |
| | | | 09 | 60 | -72 | -21 | 18 | 58 | 72 | 36 | 35 | -12 | 82 | 43 | 151 | 09 | 175 | 143 | 226 | 218 | 225 | 310 | 273 | 141 | 132 | 76 | 18 | 45 | 2382 |
| | | | 10 | 57 | 45 | 17 | 85 | 47 | 77 | 93 | 84 | 89 | 89 | 105 | 102 | 10 | 105 | 98 | 136 | 135 | 184 | 169 | 167 | 159 | 160 | 98 | 91 | 73 | 2465 |
| | | | 11 | 67 | 64 | 37 | 19 | 35 | 42 | 46 | 63 | 49 | 53 | 60 | 97 | 11 | 111 | 56 | 172 | 160 | 194 | 241 | 203 | 84 | 52 | 102 | 53 | 51 | 2111 |
| | | | 12 | 50 | 22 | 10 | 32 | 15 | 56 | 41 | 46 | 53 | 82 | 41 | 110 | 12 | 116 | 117 | 139 | 155 | 138 | 134 | 166 | 178 | 8 | 9 | 92 | 108 | 1926 |
| | | | 13 | 24 | -2 | -9 | -6 | 76 | 79 | 85 | 89 | 87 | 101 | 126 | 94 | 13 | 114 | 124 | 166 | 171 | 126 | 169 | 141 | 141 | 97 | 79 | 94 | 70 | 2261 |
| | | | 14 | 76 | 75 | 69 | 53 | -11 | 71 | 83 | 79 | 58 | 81 | 97 | 113 | 14 | 122 | 121 | 129 | 145 | 174 | 224 | 169 | 21 | 14 | 76 | 52 | 37 | 2128 |
| | | | 15 | 41 | 55 | 56 | 44 | 36 | 60 | 20 | 75 | 62 | 66 | 79 | 96 | 15 | 116 | 145 | 140 | 226 | 212 | 224 | 217 | 128 | 116 | 109 | 78 | 45 | 2465 |
| | | | 16 | 52 | 50 | 76 | 67 | 61 | 56 | 9 | 48 | 46 | 44 | 75 | 116 | 16 | 145 | 213 | 168 | 202 | 204 | 198 | 237 | 167 | 44 | 73 | 42 | 37 | 2430 |
| | | | 17 | 46 | 73 | 56 | 64 | 83 | 76 | 62 | 27 | -7 | 233 | -122 | 91 | 17 | 70 | 143 | 166 | 205 | 216 | 224 | 210 | 154 | 102 | 63 | 42 | 52 | 2340 |
| | | | 18 | 31 | 65 | -27 | 21 | 26 | 54 | 73 | -78 | 89 | 53 | 65 | 89 | 18 | 140 | 226 | 352 | 343 | 189 | 204 | 264 | 345 | 249 | -17 | 55 | 19 | 2636 |
| | | | 19 | 40 | 21 | -46 | 22 | -52 | -4 | -7 | 103 | 65 | 19 | 94 | 61 | 19 | 95 | 79 | 141 | 266 | 224 | 262 | 218 | 132 | 11 | 31 | 45 | 33 | 1692 |
| | | | 20 | 46 | 34 | 54 | 19 | 49 | 34 | -51 | -51 | -122 | 77 | 26 | 164 | 20 | 100 | 164 | 216 | 217 | 196 | 197 | 165 | 158 | 164 | 167 | 124 | 103 | 2339 |
| | | | 21 | 1 | 9 | 22 | 21 | 201 | 11 | -90 | 61 | 100 | -217 | -170 | 30 | 21 | 164 | 44 | 237 | 201 | 184 | 177 | 141 | 103 | -6 | 77 | -83 | 58 | 1285 |
| | | | 22 | 46 | 92 | 147 | -11 | 61 | -567 | 370 | -344 | -34 | -233 | 402 | -464 | 22 | 489 | 243 | 189 | 338 | 346 | 234 | 117 | 62 | 42 | 69 | 127 | 142 | 1923 |
| | | | 23 | 83 | 68 | 120 | 63 | -3 | 65 | 120 | 36 | -16 | -94 | 209 | 73 | 23 | 119 | 230 | 225 | 207 | 163 | 151 | 125 | 151 | 65 | 100 | 94 | 37 | 2473 |
| | | | 24 | 54 | 46 | 43 | -4 | 37 | -4 | 47 | 221 | 65 | 76 | 62 | 12 | 24 | 91 | 323 | 298 | 91 | 172 | 159 | 160 | 167 | 182 | 106 | 94 | 66 | 2578 |
| | | | 25 | 55 | 49 | 59 | 76 | 62 | 64 | 90 | 66 | 64 | 109 | 132 | 105 | 25 | 151 | 145 | 145 | 167 | 199 | 243 | 258 | 135 | 165 | 109 | 71 | 43 | 2804 |
| | | | 26 | 37 | 40 | 57 | 54 | 52 | 46 | 89 | 58 | 99 | -7 | 210 | 710 | 26 | 115 | 520 | 266 | 242 | 829 | 385 | 210 | 298 | -35 | 68 | 119 | 103 | 4565 |
| | | | 27 | 63 | -15 | -26 | 42 | 54 | 66 | 99 | 92 | 171 | 115 | 75 | 126 | 27 | 92 | 128 | 159 | 206 | 404 | 219 | 192 | 130 | 124 | 120 | 128 | 87 | 2851 |
| | | | 28 | 82 | 88 | 42 | 74 | 137 | 66 | 91 | 120 | 58 | 64 | 84 | 99 | 28 | 140 | 127 | 130 | 145 | 177 | 161 | 156 | 138 | 137 | 139 | 71 | 76 | 2622 |
| | | | 29 | 81 | 65 | 68 | 68 | 70 | 71 | 54 | 31 | -107 | 22 | 152 | 254 | 29 | 224 | 136 | 146 | 169 | 176 | 162 | 150 | 108 | 101 | 67 | 74 | 80 | 2442 |
| | | | 30 | 81 | 81 | 82 | 76 | 74 | 73 | 70 | 92 | 54 | -28 | 23 | 62 | 30 | 221 | 245 | 159 | 204 | 251 | 167 | 119 | 25 | 102 | 76 | -35 | -8 | 2286 |
| | | | 31 | | | | | | | | | | | | | 31 | | | | | | | | | | | | | |

| | |
|---|---|
| SCALED BY | TKC, LYT |
| CHECKED BY | ERS, JEP |
| SIGNIFICANT REVISED BY | ERS |
| PUNCHED BY | |

Preliminary baseline and scale values.

| Interval Beginning | Baseline Value | Scale Value |
|---|---|---|
| | | |

( ) Interpolated

[ ] Significant portion of hour interpolated.

□ No record, or no values available because of faulty record.

# Derived from STORM Mgphs., converted to Normal Mgphs.

[ ] Scaling uncertain because of magnetic storm.

<> Record all sheet for part or all of hour; if value is given, curve was estimated for missing part.

| | |
|---|---|
| MONTHLY SUM | 72052 |
| MONTHLY MEAN | 100 |
| DAILY MEAN CHECK | |

FORM 76-106

# MAGNETOGRAM HOURLY SCALINGS
(UNIVERSAL TIME)

Values are in gamma of nT, and are averages for successive periods of one hour beginning at midnight. Hour 01 of local day ( 150 M.T.) is hour 11 of the 8610 universal day.
Shrinkage corrections have been applied. Negative values are in old, with minus signs shown.

U.S. DEPARTMENT OF COMMERCE
Geological Survey, Geologic Division
Denver Federal Center
DENVER, CO 80225

| OBSY. | YEAR | MONTH | ELEMENT |
|---|---|---|---|
| CO | 82 | SEP | Z |

| C | U or S | Fro Q | DY | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | DY | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | SUM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 01 | 360 | 360 | 358 | 351 | 355 | 342 | 334 | 344 | 341 | 342 | 310 | 320 | 01 | 304 | 166 | 232 | 298 | 312 | 295 | 294 | 305 | 313 | 321 | 330 | 334 | 7638 |
| | | | 02 | 342 | 340 | 371 | 397 | 388 | 379 | 356 | 258 | 345 | 338 | 358 | 358 | 02 | 222 | 406 | 223 | 300 | 326 | 306 | 292 | 303 | 311 | 316 | 332 | 351 | 7926 |
| | | | 03 | 380 | 369 | 381 | 393 | 310 | 417 | 309 | 162 | 166 | 345 | 283 | 535 | 03 | 405 | 419 | 440 | 424 | 338 | 311 | 320 | 309 | 306 | 331 | 300 | 334 | 8348 |
| | | | 04 | 352 | 351 | 371 | 400 | 408 | 364 | 273 | 346 | 366 | 337 | 426 | 490 | 04 | 382 | 495 | 634 | 409 | 237 | 316 | 299 | 260 | 306 | 329 | 376 | 391 | 8958 |
| | | | 05 | 373 | 399 | 369 | 399 | 363 | 321 | 72 | 208 | 291 | 427 | 384 | 382 | 05 | 514 | 583 | 495 | 470 | 188 | 232 | 302 | 297 | 308 | 364 | 363 | 493 | 8597 |
| | | | 06 | 501 | 401 | -237 | -572 | -376 | 195 | -35 | 154 | 552 | 388 | 829 | 609 | 06 | 786 | 647 | 605 | 868 | 1051 | 760 | 186 | 349 | 278 | 221 | 173 | 49 | 9062 |
| | | | 07 | 79 | 129 | -33 | 18 | 115 | 144 | 365 | 297 | 349 | 85 | 350 | 786 | 07 | 578 | 585 | 421 | 352 | 603 | 634 | 641 | 318 | 328 | 378 | 365 | 376 | 8256 |
| | | | 08 | 370 | 367 | 374 | 369 | 374 | 372 | 365 | 367 | 379 | 373 | 356 | 362 | 08 | 364 | 364 | 353 | 350 | 357 | 349 | 351 | 329 | 343 | 350 | 320 | 328 | 8283 |
| | | | 09 | 340 | 324 | 344 | 397 | 398 | 393 | 352 | 343 | 295 | 274 | 365 | 501 | 09 | 483 | 323 | 358 | 358 | 286 | 306 | 316 | 300 | 330 | 348 | 369 | 371 | 8474 |
| | | | 10 | 374 | 372 | 369 | 372 | 350 | 360 | 351 | 343 | 349 | 347 | 348 | 340 | 10 | 339 | 340 | 342 | 343 | 323 | 281 | 291 | 312 | 329 | 322 | 330 | 332 | 8159 |
| | | | 11 | 337 | 343 | 351 | 359 | 373 | 371 | 372 | 370 | 354 | 365 | 339 | 351 | 11 | 445 | 244 | 238 | 300 | 266 | 285 | 294 | 306 | 325 | 341 | 342 | 333 | 8026 |
| | | | 12 | 359 | 340 | 343 | 357 | 412 | 404 | 375 | 363 | 369 | 313 | 351 | 378 | 12 | 342 | 345 | 341 | 336 | 309 | 323 | 339 | 329 | 296 | 303 | 326 | 303 | 8300 |
| | | | 13 | 343 | 339 | 392 | 417 | 378 | 342 | 341 | 340 | 339 | 335 | 263 | 297 | 13 | 321 | 378 | 322 | 236 | 234 | 319 | 322 | 333 | 325 | 331 | 340 | 339 | 7686 |
| | | | 14 | 342 | 335 | 326 | 339 | 367 | 382 | 364 | 356 | 352 | 345 | 358 | 342 | 14 | 339 | 392 | 330 | 319 | 323 | 341 | 262 | 219 | 227 | 307 | 322 | 329 | 7889 |
| | | | 15 | 332 | 337 | 341 | 338 | 361 | 371 | 395 | 374 | 350 | 328 | 362 | 357 | 15 | 350 | 339 | 344 | 324 | 282 | 280 | 311 | 297 | 306 | 314 | 316 | 320 | 6026 |
| | | | 16 | 331 | 339 | 348 | 332 | 329 | 330 | 342 | 309 | 356 | 360 | 339 | 332 | 16 | 330 | 308 | 309 | 315 | 315 | 312 | 340 | 321 | 298 | 329 | 331 | 346 | 7902 |
| | | | 17 | 357 | 360 | 354 | 340 | 361 | 359 | 365 | 367 | 328 | 521 | 338 | 361 | 17 | 362 | 350 | 371 | 363 | 356 | 331 | 322 | 324 | 340 | 341 | 352 | 359 | 8633 |
| | | | 18 | 361 | 369 | 360 | 328 | 443 | 421 | 350 | 306 | 309 | 303 | 372 | 361 | 18 | 353 | 342 | 292 | 321 | 301 | 341 | 329 | 306 | 261 | 215 | 319 | 342 | 8201 |
| | | | 19 | 367 | 378 | 360 | 402 | 371 | 342 | 210 | 323 | 339 | 329 | 363 | 342 | 19 | 347 | 440 | 463 | 249 | 203 | 301 | 267 | 213 | 238 | 313 | 350 | 371 | 7926 |
| | | | 20 | 360 | 367 | 372 | 366 | 407 | 394 | 243 | 180 | 116 | 342 | 448 | 649 | 20 | 426 | 388 | 1167 | 317 | 332 | 355 | 377 | 346 | 369 | 370 | 371 | 394 | 8796 |
| | | | 21 | 369 | 391 | 429 | 370 | 79 | 287 | 174 | 159 | 93 | -30 | 231 | 372 | 21 | 806 | 310 | 262 | 356 | 334 | 301 | 327 | 314 | 310 | 458 | 119 | 423 | 7563 |
| | | | 22 | 419 | 291 | -60 | -111 | -198 | 73 | -9 | 288 | 711 | 477 | 944 | 1001 | 22 | 736 | 585 | 523 | 547 | 534 | 419 | 337 | 353 | 360 | 401 | 414 | 385 | 9410 |
| | | | 23 | 379 | 401 | 403 | 409 | 359 | 178 | 178 | 315 | 210 | 376 | 331 | 327 | 23 | 339 | 421 | 389 | 316 | 230 | 241 | 271 | 331 | 354 | 374 | 369 | 366 | 7783 |
| | | | 24 | 418 | 413 | 389 | 361 | 411 | 413 | 255 | 243 | 321 | 462 | 404 | 697 | 24 | 544 | 366 | 647 | 312 | 236 | 332 | 380 | 382 | 362 | 371 | 378 | 378 | 9475 |
| | | | 25 | 360 | 378 | 379 | 379 | 378 | 376 | 372 | 371 | 382 | 350 | 313 | 328 | 25 | 390 | 371 | 362 | 371 | 378 | 366 | 266 | 278 | 334 | 340 | 358 | 366 | 8638 |
| | | | 26 | 379 | 378 | 387 | 386 | 416 | 437 | 410 | 277 | 305 | 516 | 652 | 539 | 26 | 703 | 754 | 931 | 811 | 931 | 590 | 680 | 603 | 373 | 438 | 431 | 454 | 13.197 |
| | | | 27 | 371 | 337 | 418 | 466 | 412 | 353 | 354 | 364 | 355 | 299 | 353 | 404 | 27 | 373 | 410 | 409 | 425 | 399 | 311 | 322 | 334 | 378 | 368 | 392 | 403 | 9052 |
| | | | 28 | 410 | 429 | 422 | 433 | 469 | 422 | 422 | 402 | 402 | 403 | 402 | 382 | 28 | 340 | 354 | 378 | 389 | 365 | 393 | 368 | 364 | 366 | 370 | 364 | 372 | 9411 |
| | | | 29 | 384 | 383 | 394 | 394 | 387 | 382 | 381 | 371 | 221 | 245 | 410 | 450 | 29 | 494 | 377 | 358 | 379 | 360 | 371 | 356 | 356 | 368 | 378 | 380 | 390 | 8989 |
| | | | 30 | 391 | 386 | 381 | 374 | 379 | 374 | 380 | 376 | 241 | 305 | 342 | 453 | 30 | 544 | 514 | 410 | 404 | 282 | 272 | 254 | 248 | 332 | 380 | 371 | 393 | 6780 |
| | | | 31 | | | | | | | | | | | | | 31 | | | | | | | | | | | | | |

SCALED BY: TKC, LYT
CHECKED BY: EAS, JEP
SIGNS RE-VIEWED BY: EAS
PUNCHED BY:

Preliminary baseline and scale values:

| | Interval Beginning | Baseline Value | 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 scale for part or all of hour; if value is given, curve was estimated for missing part.
* Derived from STORM Mags., converted to Normal Mags.

| | |
|---|---|
| MONTHLY SUM | 257619 |
| MONTHLY MEAN | 338 |
| DATES WITH GAPS | |

FORM 76-106

# MAGNETOGRAM HOURLY SCALINGS
(UNIVERSAL TIME)

U.S. DEPARTMENT OF INTERIOR
Geological Survey, Geologic Division
Denver Federal Center
Denver, CO 80225

OBST. CO | YEAR 82 | MONTH SEP | ELEMENT H

Values are in gamma of nan, and are averages for successive periods of one hour beginning at midnight. Hour 01 of local day ( 330 M.T.) is hour 13 of the SEPT universal day.
Shrinkage corrections have been applied. Negative values are in red, with minus signs shown.

| C | Qual S | Exp O | Day | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | Day | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 01 | 242 | 238 | 264 | 272 | 276 | 235 | 262 | 262 | 264 | 265 | 265 | 234 | 01 | 24 | -111 | 54 | 165 | 246 | 203 | 209 | 189 | 192 | 193 | 204 | 226 | 4873 |
| | | | 02 | 257 | 259 | 277 | 286 | 269 | 306 | 364 | 356 | 361 | 294 | 156 | -144 | 02 | 32 | -88 | 78 | 308 | 250 | 231 | 220 | 244 | 206 | 220 | 200 | 198 | 5160 |
| | | | 03 | 276 | 245 | 303 | 329 | 457 | 466 | 421 | 273 | 322 | 59 | -274 | -302 | 03 | 169 | 133 | 195 | 192 | 217 | 211 | 211 | 229 | 246 | 226 | 216 | 246 | 5072 |
| | | | 04 | 244 | 269 | 361 | 423 | 380 | 439 | 434 | 406 | 351 | -72 | -429 | -60 | 04 | -350 | -48 | -242 | -208 | -67 | 82 | 204 | 192 | 205 | 280 | 303 | 269 | 3386 |
| | | | 05 | 346 | 315 | 323 | 511 | 563 | 551 | 268 | 165 | 259 | -89 | -100 | 36 | 05 | -21 | -407 | -463 | -384 | -77 | 286 | 321 | 265 | 219 | 204 | 279 | 329 | 3699 |
| | | | 06 | 732 | 667 | 674 | 301 | 115 | 231 | -265 | -570 | -378 | -820 | -502 | -44 | 06 | -84 | -112 | -398 | 293 | 1233 | -905 | -265 | -112 | 97 | 214 | 233 | 226 | -2031 |
| | | | 07 | 509 | 539 | 414 | 436 | 305 | 414 | 446 | 332 | 1 | -876 | -254 | -332 | 07 | -72 | -112 | 53 | -18 | -506 | -757 | -650 | 103 | 251 | 220 | 256 | 210 | 912 |
| | | | 08 | 230 | 210 | 201 | 239 | 218 | 215 | 222 | 228 | 218 | 232 | 269 | 286 | 08 | 207 | 200 | 232 | 241 | 239 | 230 | 203 | 214 | 213 | 198 | 211 | 219 | 5375 |
| | | | 09 | 205 | 415 | 257 | 300 | 394 | 302 | 331 | 301 | 305 | 257 | 229 | 8 | 09 | -174 | 118 | 45 | -37 | 188 | 182 | 160 | 162 | 151 | 211 | 231 | 224 | 4675 |
| | | | 10 | 221 | 227 | 200 | 259 | 258 | 230 | 231 | 232 | 226 | 232 | 231 | 233 | 10 | 232 | 236 | 225 | 196 | 160 | 181 | 206 | 209 | 202 | 209 | 205 | 209 | 5342 |
| | | | 11 | 207 | 204 | 230 | 253 | 260 | 241 | 272 | 263 | 332 | 287 | 222 | 157 | 11 | -270 | -18 | 161 | 232 | 175 | 131 | 189 | 244 | 212 | 211 | 212 | 234 | 4681 |
| | | | 12 | 237 | 231 | 236 | 241 | 309 | 272 | 260 | 279 | 323 | 319 | 352 | 256 | 12 | 229 | 230 | 220 | 169 | 217 | 238 | 202 | 203 | 194 | 208 | 221 | 229 | 5909 |
| | | | 13 | 277 | 433 | 437 | 230 | 190 | 215 | 317 | 216 | 220 | 228 | 174 | 209 | 13 | 249 | 216 | 99 | -219 | 205 | 212 | 231 | 210 | 206 | 205 | 218 | 224 | 5106 |
| | | | 14 | 201 | 220 | 229 | 246 | 352 | 291 | 253 | 241 | 301 | 300 | 261 | 240 | 14 | 230 | 225 | 209 | 216 | 225 | 173 | 109 | 91 | 180 | 223 | 211 | 203 | 5455 |
| | | | 15 | 206 | 206 | 233 | 256 | 309 | 369 | 345 | 296 | 333 | 321 | 275 | 246 | 15 | 237 | 230 | 221 | 162 | 193 | 225 | 213 | 211 | 203 | 213 | 210 | 209 | 5946 |
| | | | 16 | 241 | 231 | 239 | 232 | 239 | 250 | 301 | 392 | 348 | 263 | 287 | 270 | 16 | 216 | 172 | 245 | 231 | 224 | 220 | 168 | 168 | 181 | 202 | 203 | 223 | 5779 |
| | | | 17 | 214 | 221 | 236 | 230 | 220 | 232 | 254 | 252 | 256 | 256 | 277 | 294 | 17 | 309 | 243 | 211 | 210 | 171 | 192 | 199 | 201 | 200 | 203 | 212 | 238 | 5077 |
| | | | 18 | 272 | 219 | 227 | 361 | 309 | 199 | 183 | 350 | 305 | 220 | 270 | 239 | 18 | 221 | 33 | -43 | 56 | 236 | 207 | 142 | -37 | -183 | 171 | 253 | 225 | 4616 |
| | | | 19 | 223 | 231 | 262 | 285 | 342 | 398 | 432 | 376 | 252 | 274 | 137 | 266 | 19 | 249 | 94 | -126 | -254 | 220 | 161 | 92 | 63 | 162 | 188 | 209 | 227 | 4818 |
| | | | 20 | 231 | 251 | 236 | 260 | 251 | 346 | 180 | 79 | 320 | 185 | 115 | 358 | 20 | -53 | 75 | -101 | 33 | 281 | 245 | 260 | 243 | 220 | 213 | 198 | 223 | 3957 |
| | | | 21 | 160 | 342 | 367 | 497 | 265 | 433 | 309 | 33 | -46 | 345 | 306 | 202 | 21 | -613 | -143 | 165 | 300 | 265 | 216 | 231 | 77 | 109 | 15 | 214 | 377 | 4477 |
| | | | 22 | 423 | 685 | 463 | -75 | -103 | -341 | -929 | -86 | -737 | -703 | -324 | -448 | 22 | -499 | 64 | 282 | 78 | -51 | -22 | 108 | 130 | 160 | 211 | 268 | 296 | -1748 |
| | | | 23 | 256 | 323 | 273 | 252 | 345 | 264 | 441 | 345 | 263 | -91 | -21 | 45 | 23 | 151 | 28 | 64 | -62 | 111 | 160 | 212 | 197 | 153 | 174 | 194 | 203 | 4303 |
| | | | 24 | 194 | 220 | 210 | 238 | 262 | 376 | 300 | 260 | 317 | 279 | 250 | -301 | 24 | -199 | -169 | -250 | -91 | 170 | 242 | 242 | 226 | 214 | 210 | 200 | 188 | 3697 |
| | | | 25 | 194 | 208 | 218 | 230 | 237 | 230 | 233 | 256 | 303 | 263 | 291 | 224 | 25 | 182 | 168 | 220 | 230 | 237 | 172 | 136 | 189 | 219 | 220 | 211 | 210 | 5299 |
| | | | 26 | 214 | 234 | 239 | 282 | 269 | 276 | 361 | 281 | 43 | 67 | -245 | -551 | 26 | -41 | -834 | -505 | 95 | -964 | -811 | -120 | 18 | 231 | 268 | 276 | 333 | -5604 |
| | | | 27 | 514 | 512 | 453 | 352 | 402 | 426 | 401 | 281 | 33 | -306 | -1 | 81 | 27 | 199 | 154 | 193 | 132 | -115 | 87 | 123 | 247 | 226 | 231 | 212 | 227 | 5064 |
| | | | 28 | 240 | 241 | 270 | 308 | 319 | 256 | 274 | 255 | 244 | 244 | 236 | 189 | 28 | 176 | 230 | 236 | 220 | 226 | 198 | 212 | 211 | 216 | 222 | 211 | 212 | 5646 |
| | | | 29 | 200 | 212 | 214 | 212 | 224 | 234 | 243 | 311 | 147 | 169 | 141 | -1 | 29 | 14 | 140 | 212 | 234 | 222 | 209 | 195 | 194 | 218 | 229 | 228 | 216 | 4617 |
| | | | 30 | 217 | 213 | 214 | 220 | 222 | 234 | 242 | 328 | 324 | 226 | 150 | 27 | 30 | -6 | 45 | 104 | -196 | -20 | 187 | 131 | 187 | 229 | 169 | 141 | 248 | 3890 |
| | | | 31 | | | | | | | | | | | | | 31 | | | | | | | | | | | | | |

SCALED BY: TKC, LYT
CHECKED BY: EAS, JEP
SIGNATURE-VIFIED BY: EAS
PUNCHED BY:

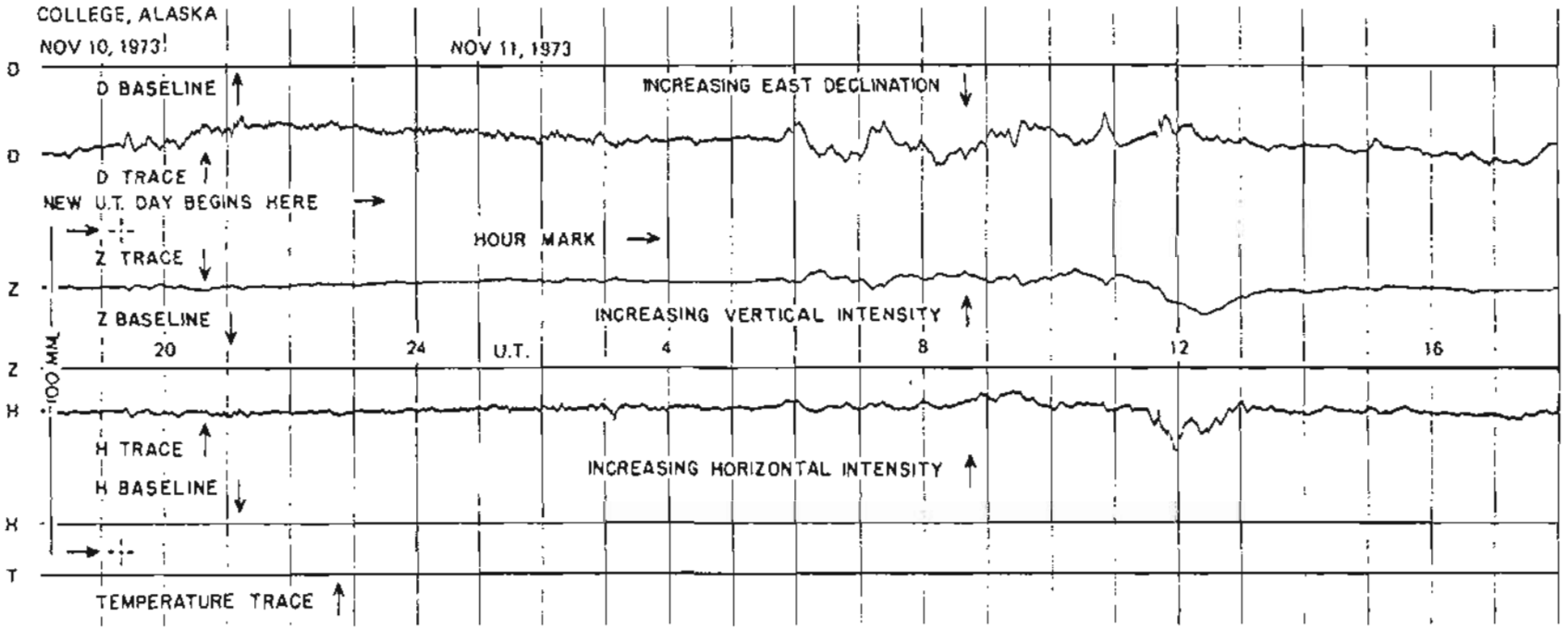
Preliminary baseline and scale values:

| Interval Beginning | Base-line Value | Scale Value |
|---|---|---|

( ) Interpolated
[ Significant portion of hour interpolated.
□ No record; or no values available because of faulty record.
* Derived from STORM Mgph., converted to Normal Mgph.
( ) Scaling uncertain because of magnetic storm.
< > Record off chart for part or all of hour; if value is given, curve was extrapolated for missing part.

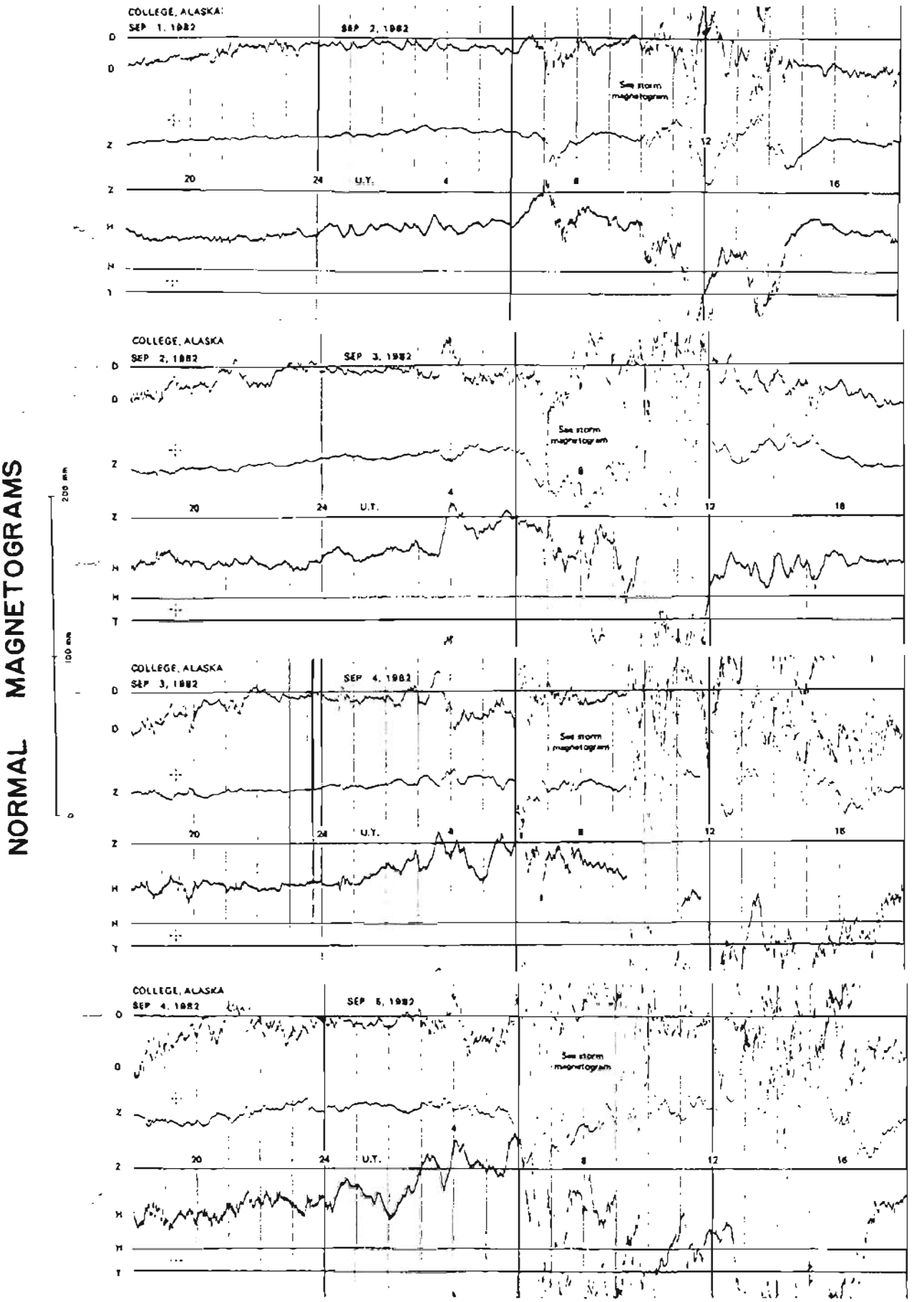
MONTHLY SUM: 122690
MONTHLY MEAN: 170
DATES WITH GAPS:

# FORMAT FOR NORMAL & STORM MAGNETOGRAMS
(SAMPLE ONLY)

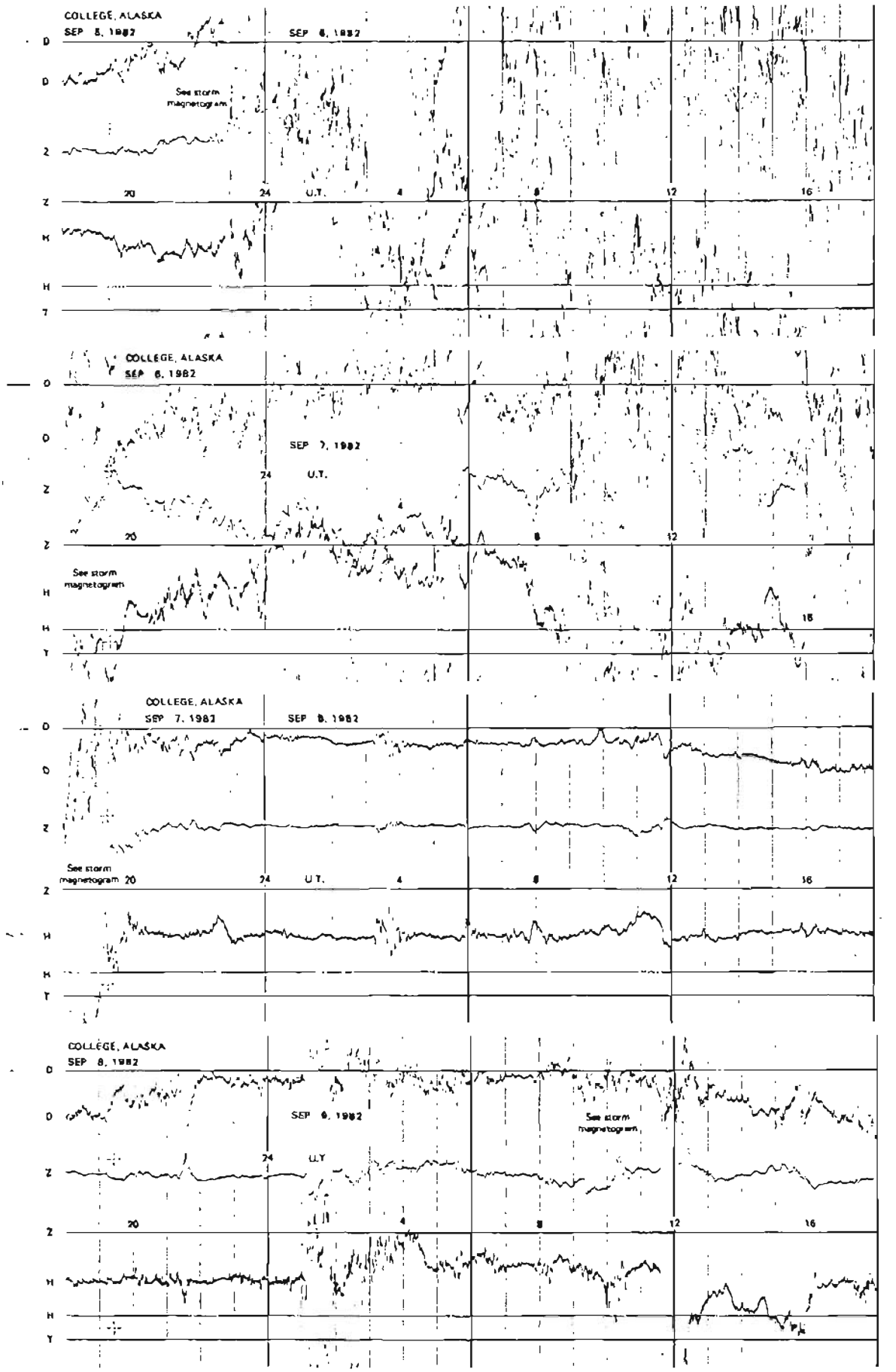



SEE PRELIMINARY CALIBRATION DATA FOR SCALE VALUES & BASELINE VALUES

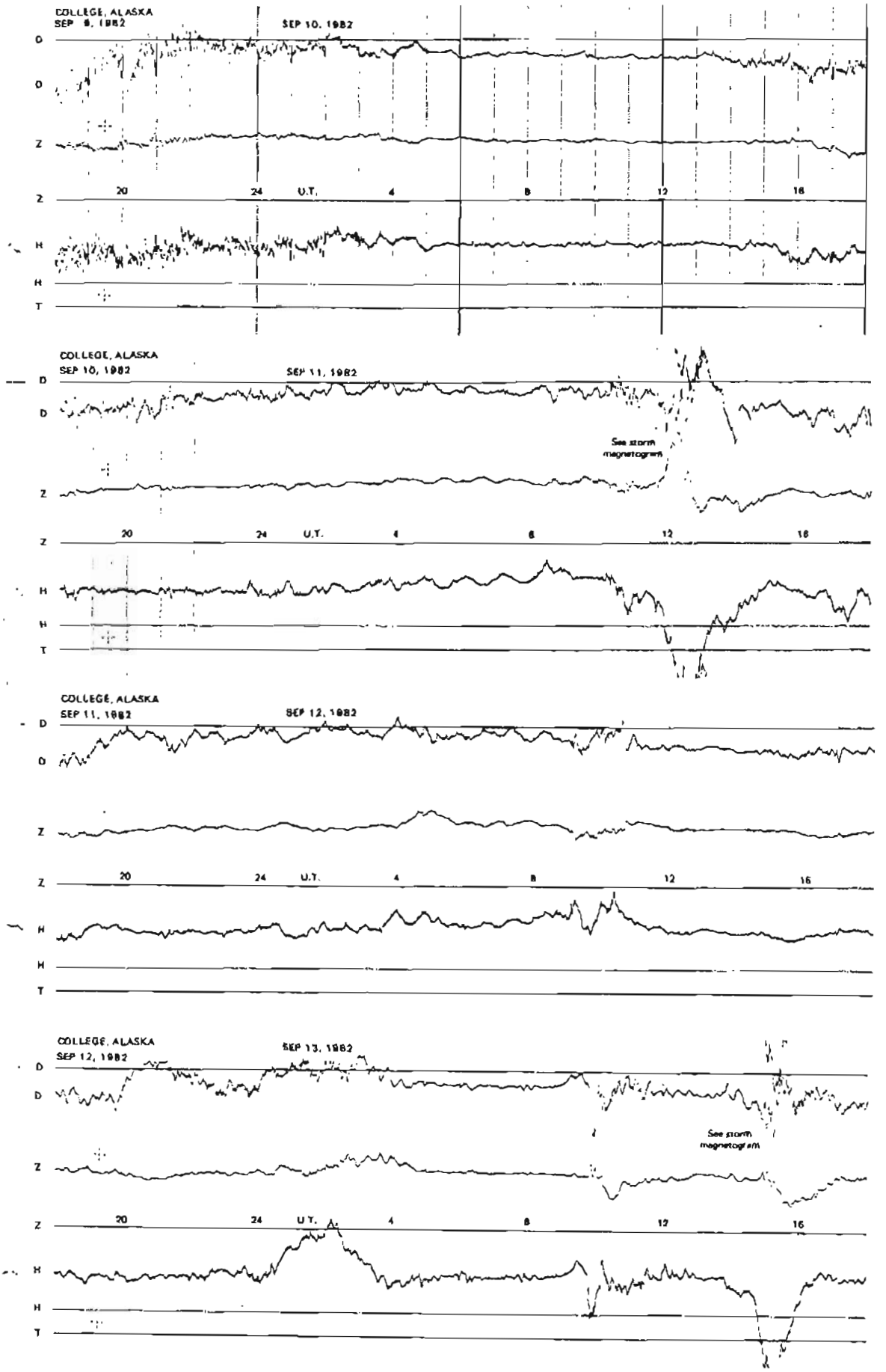
# NORMAL MAGNETOGRAMS



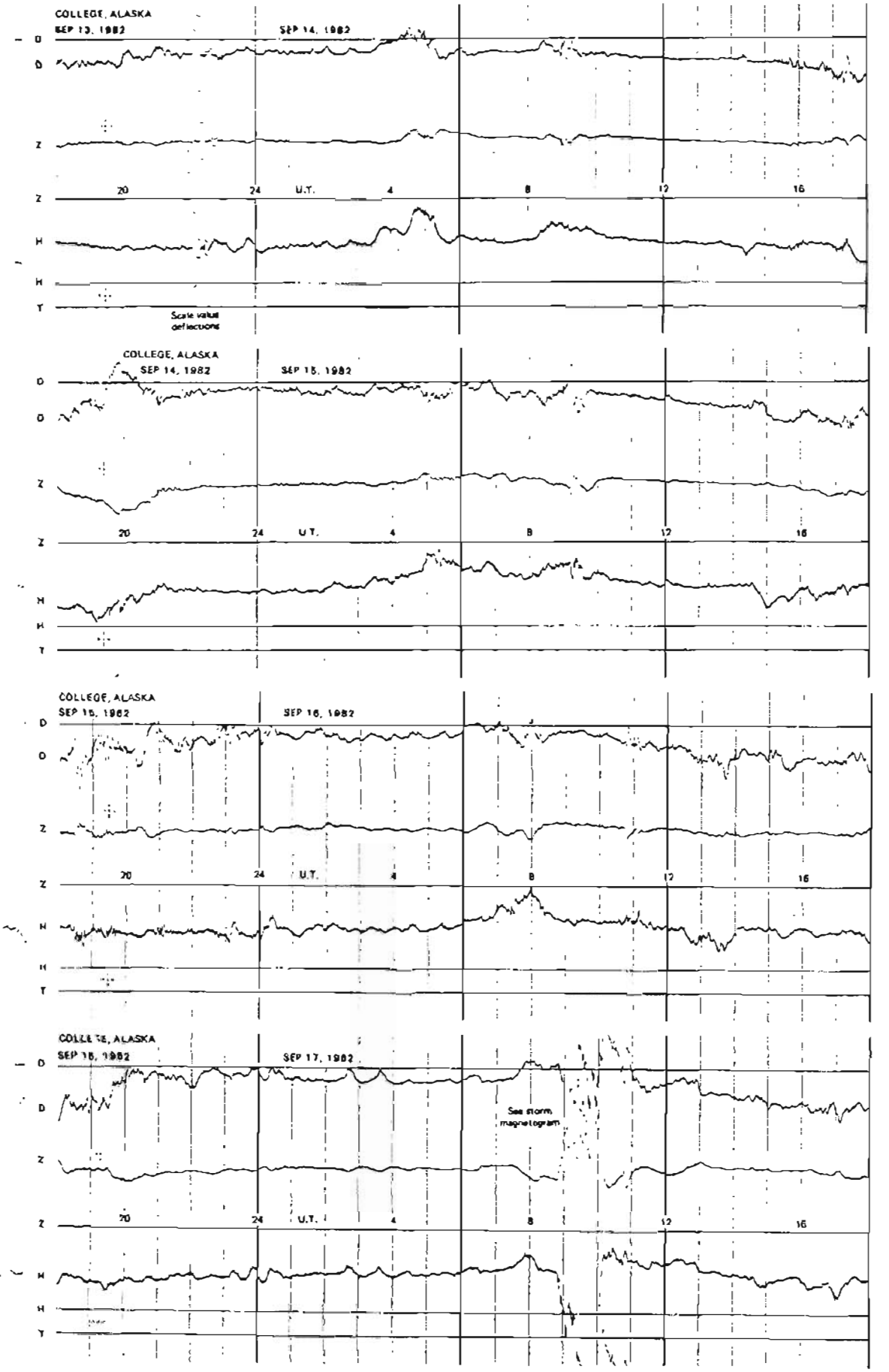
# NORMAL MAGNETOGRAMS



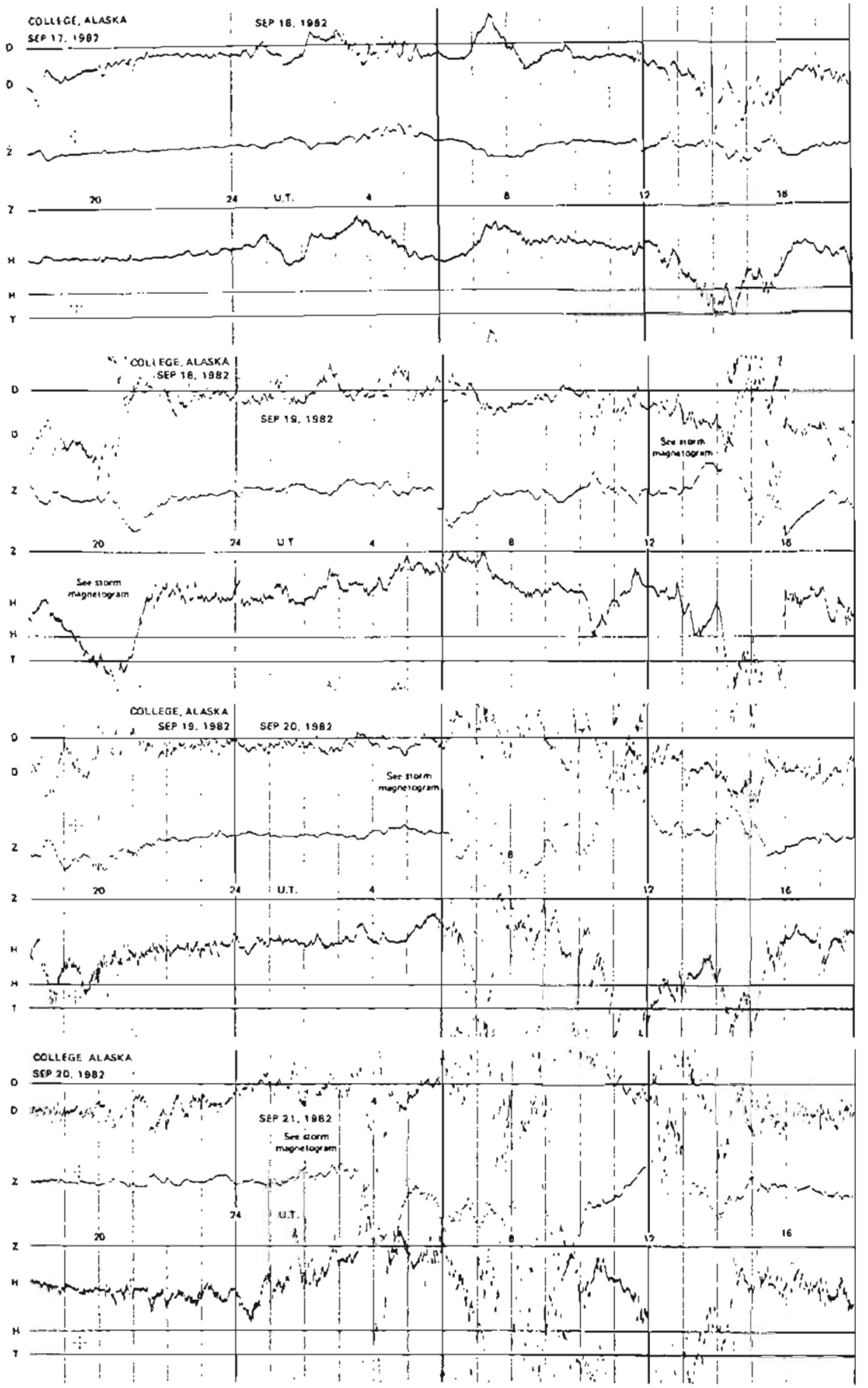
# NORMAL MAGNETOGRAMS



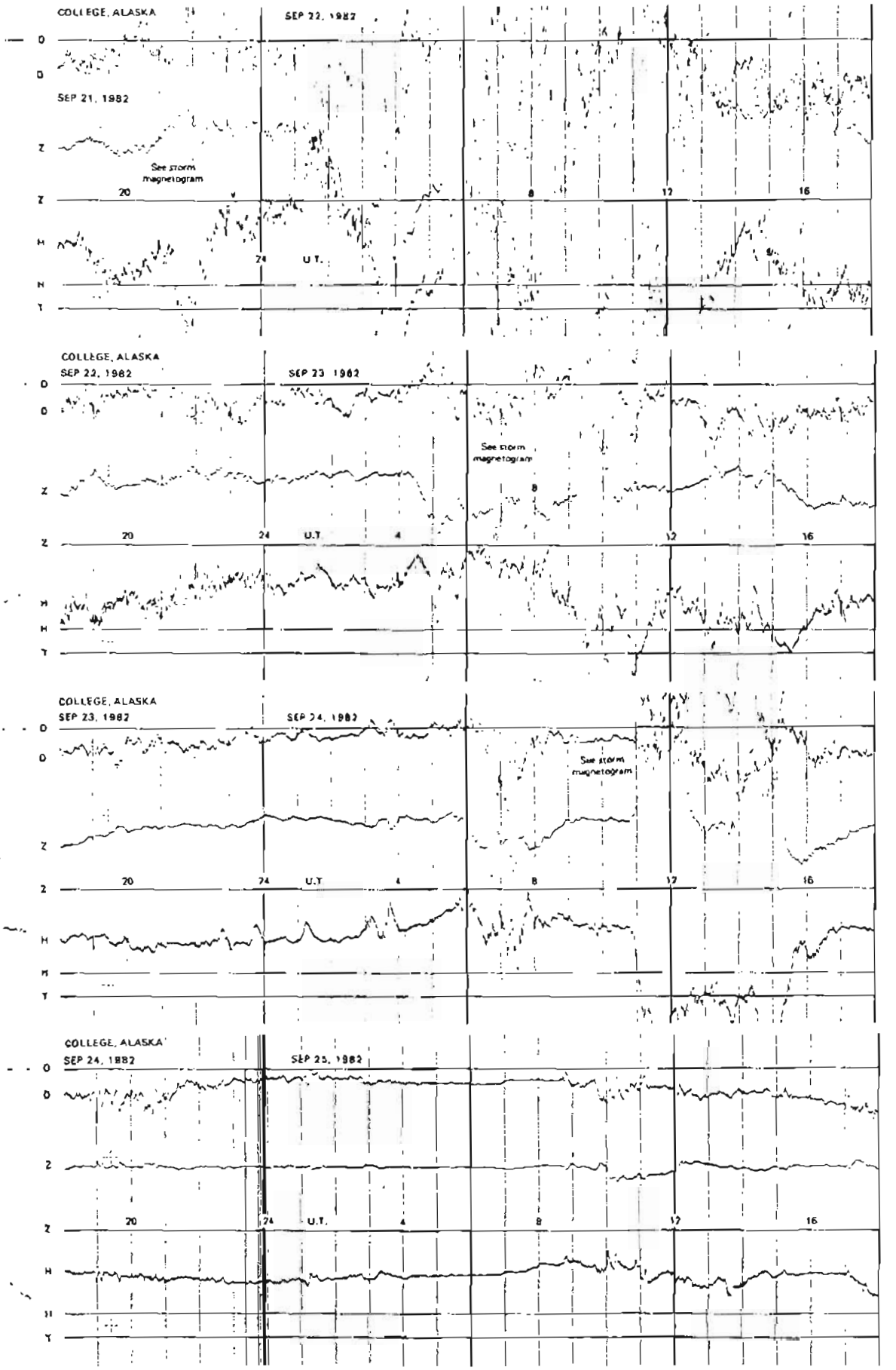
# NORMAL MAGNETOGRAMS



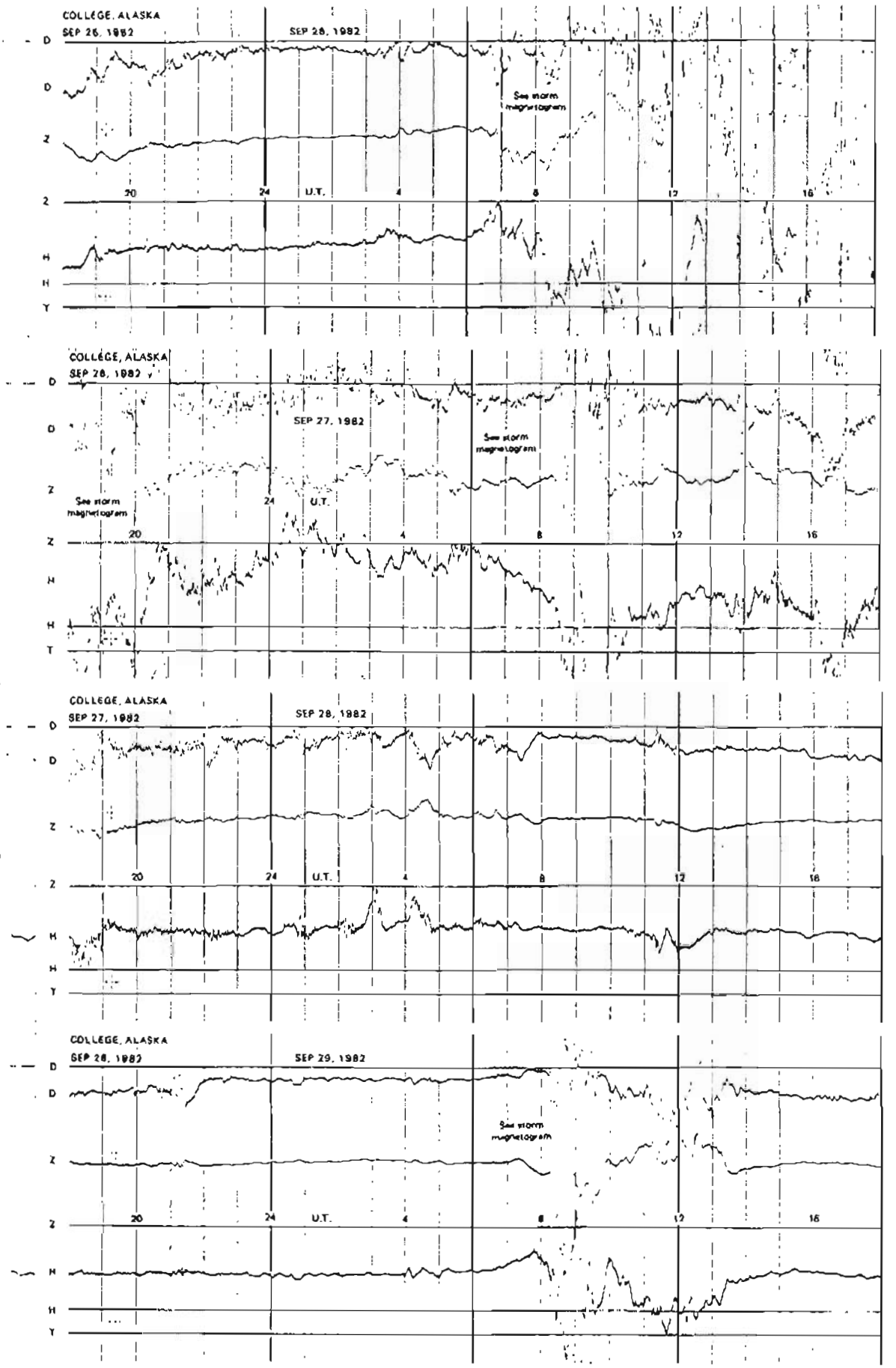
# NORMAL MAGNETOGRAMS



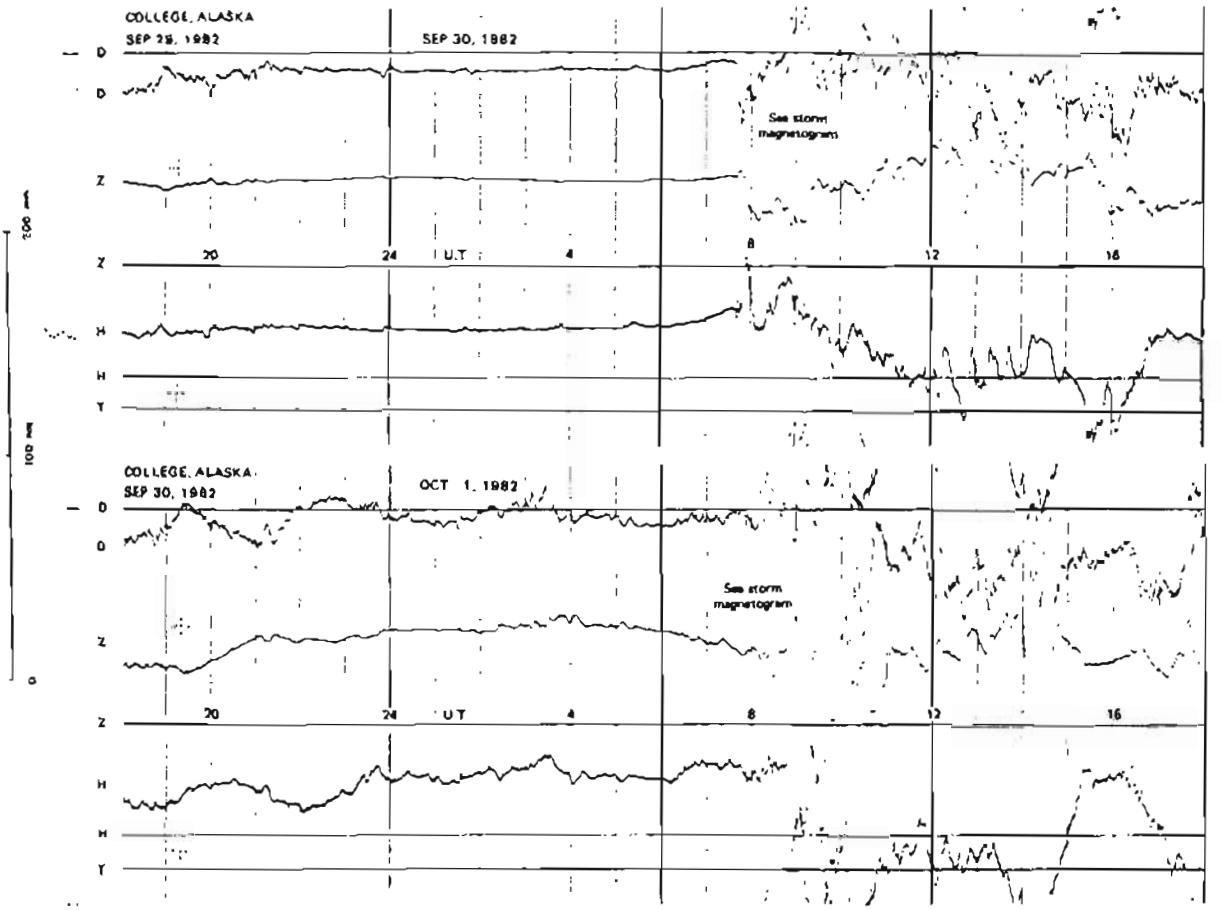
# NORMAL MAGNETOGRAMS



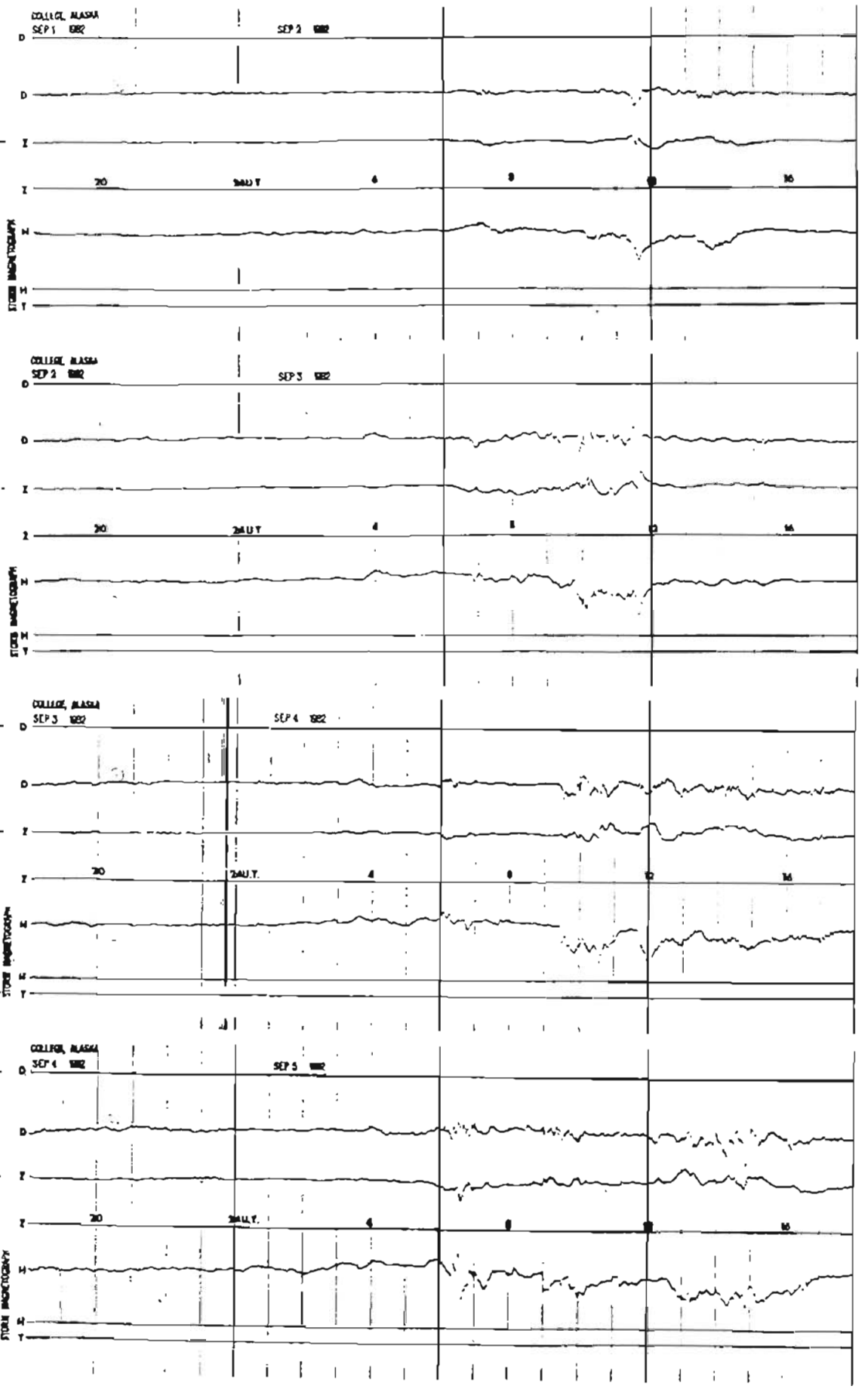
# NORMAL MAGNETOGRAMS



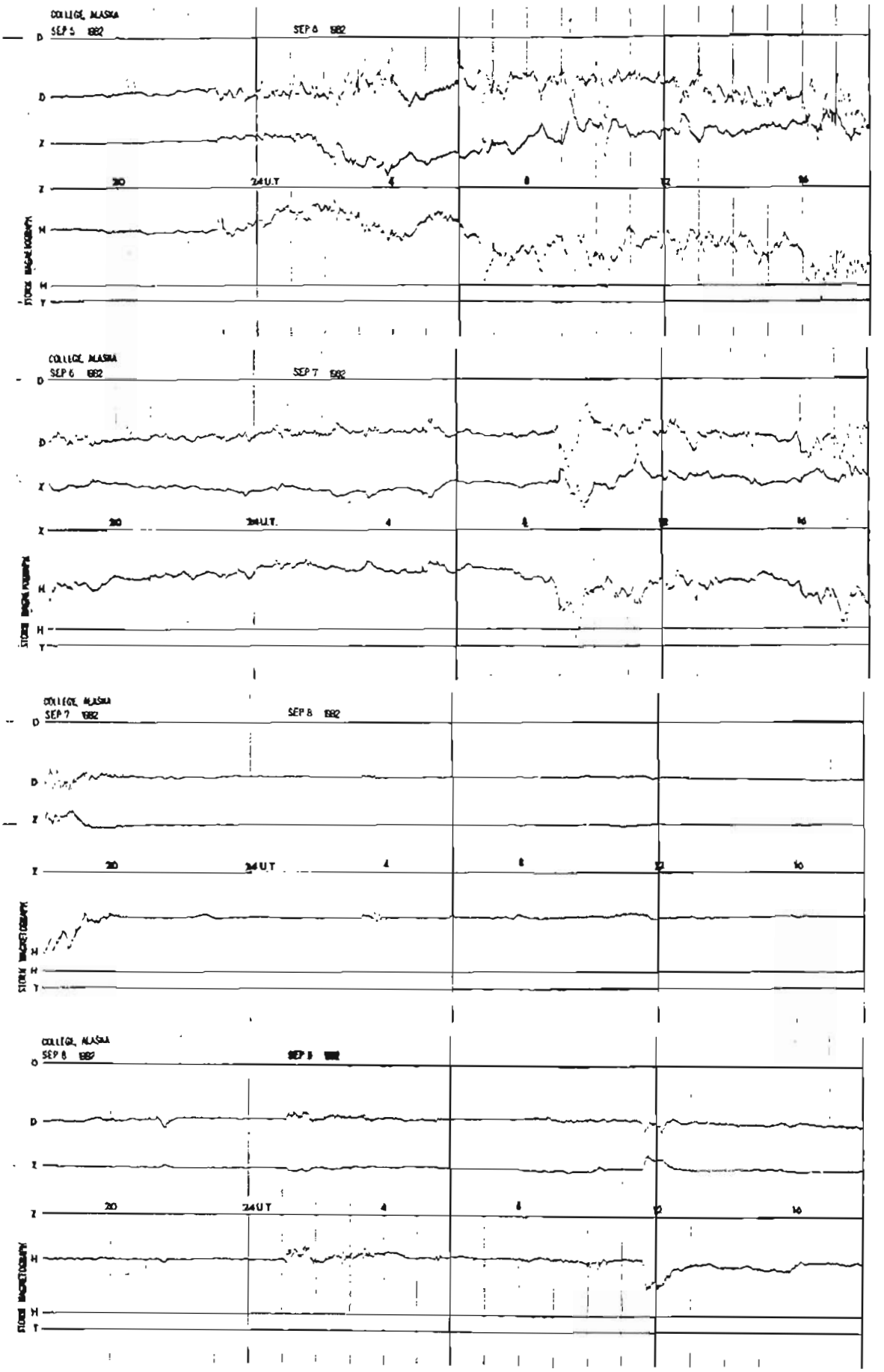
# NORMAL MAGNETOGRAMS



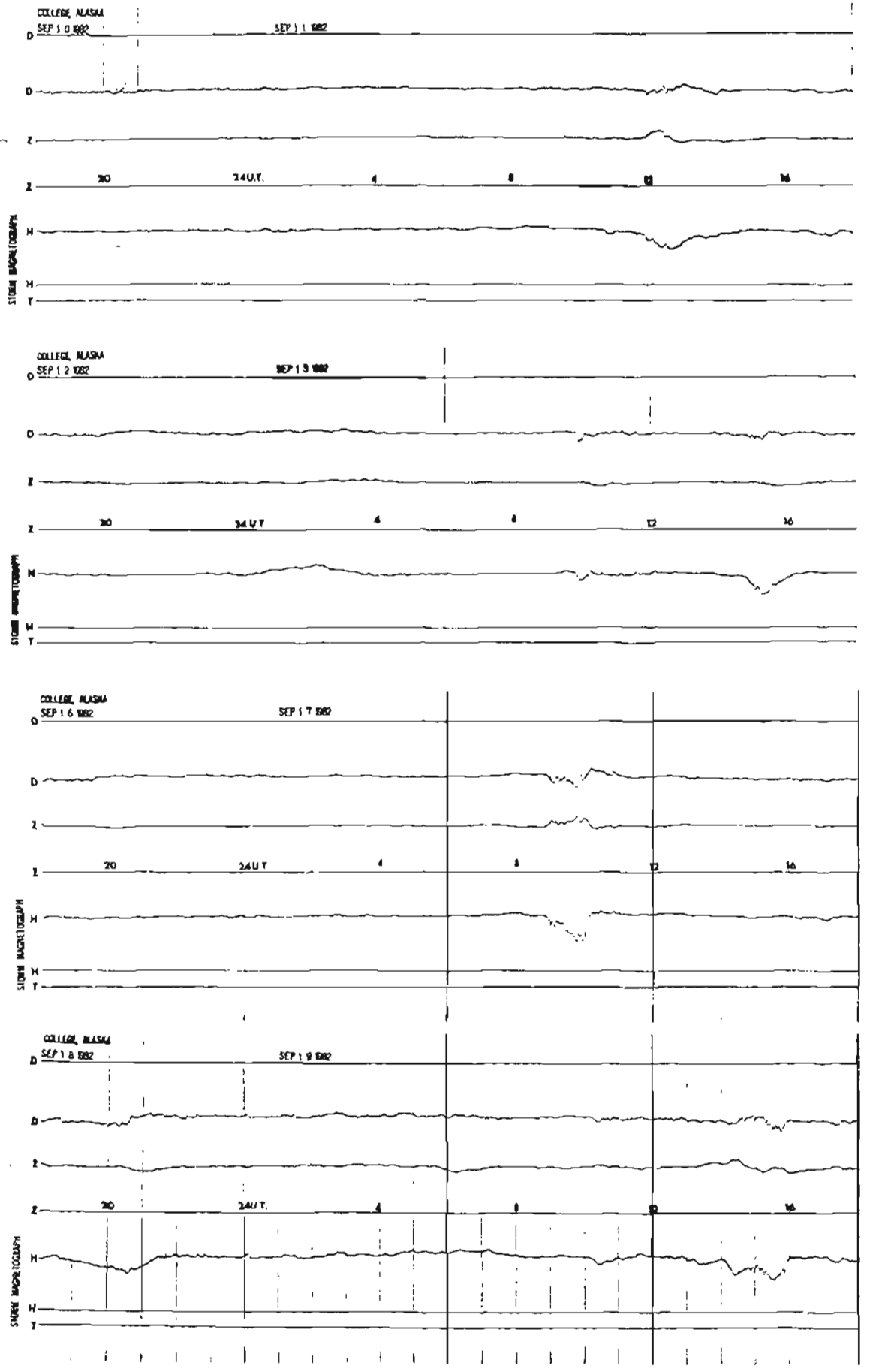
# STORM MAGNETOGRAMS



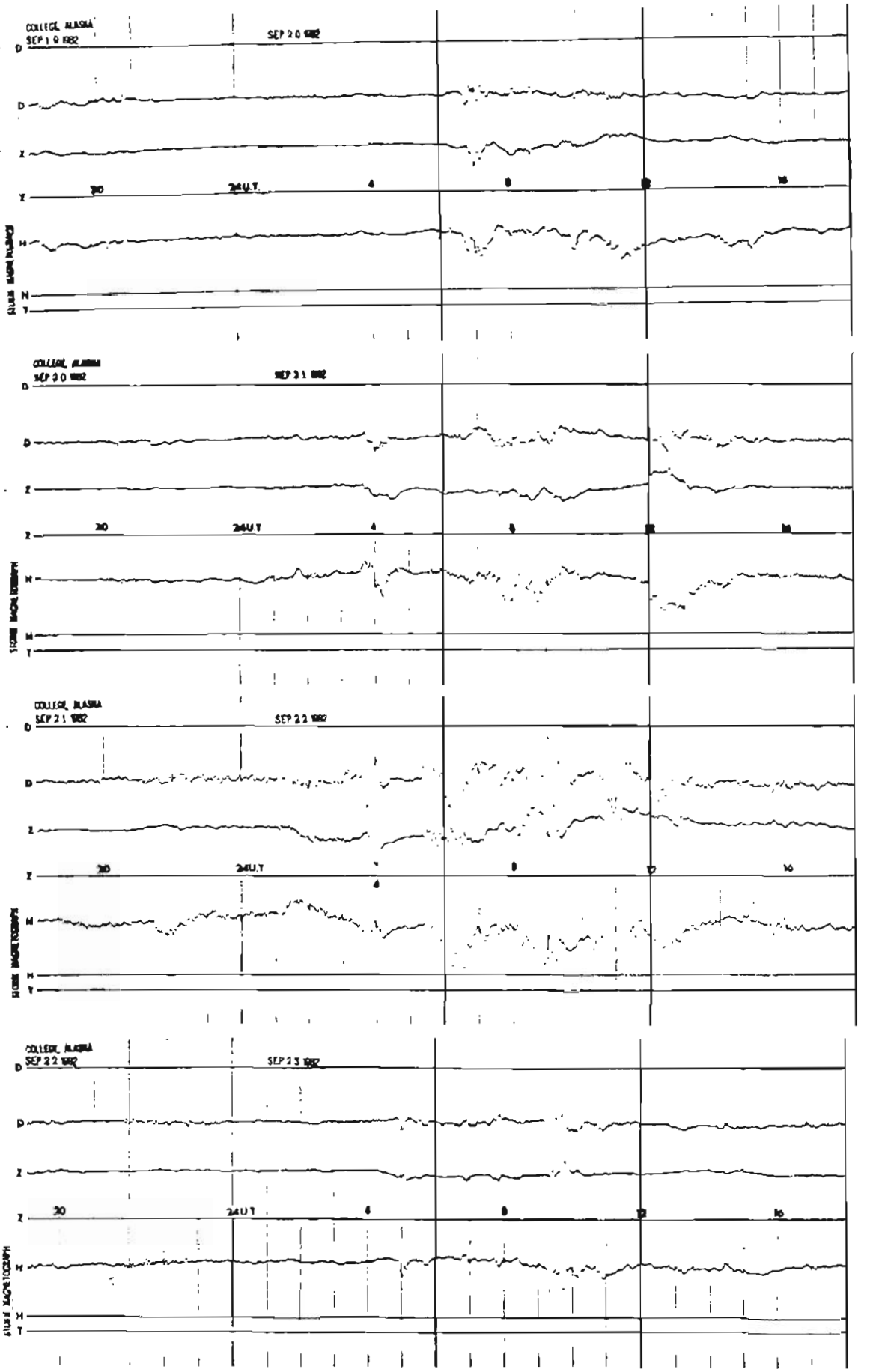
# STORM MAGNETOGRAMS



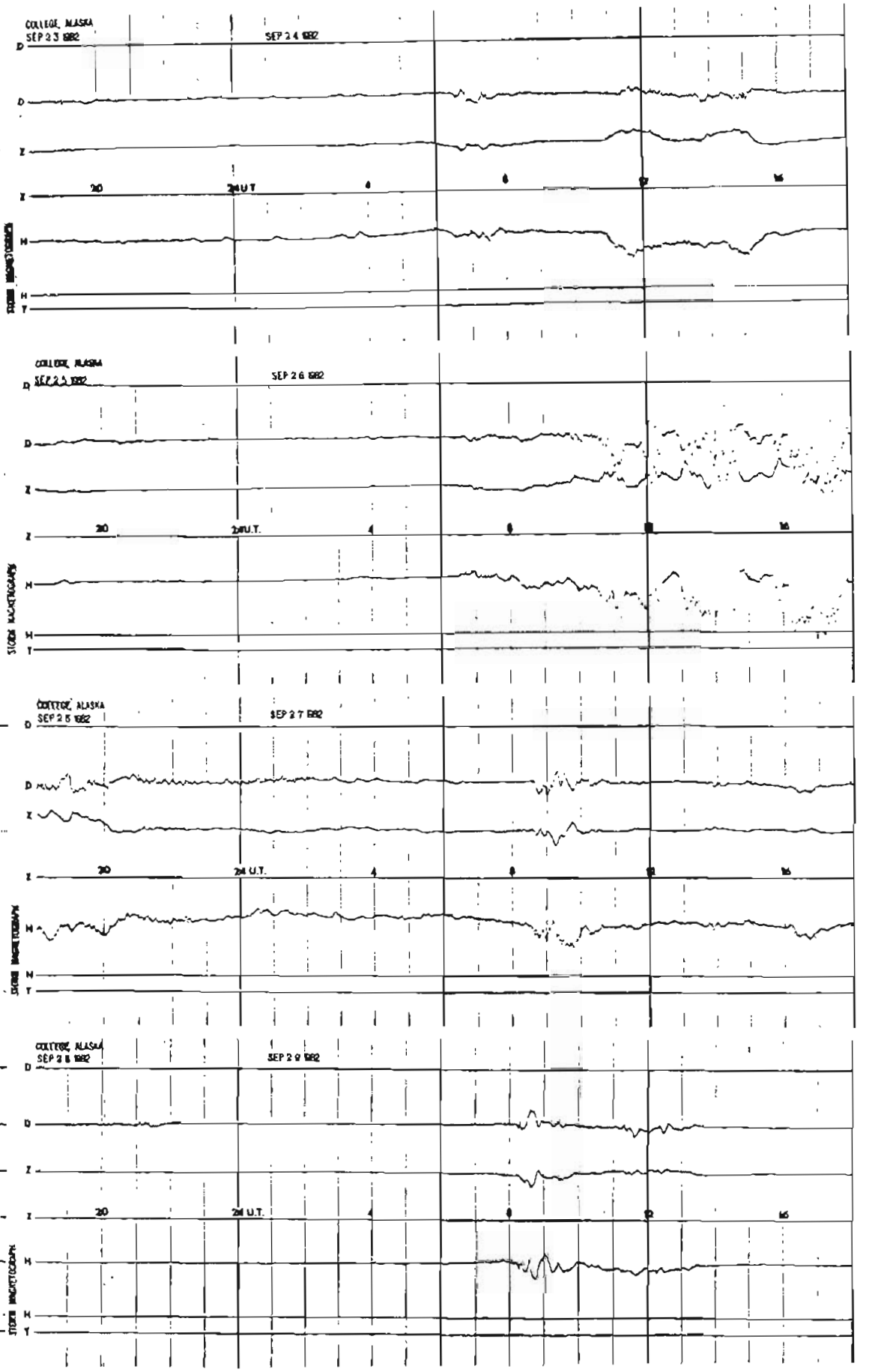
# STORM MAGNETOGRAMS



# STORM MAGNETOGRAMS



# STORM MAGNETOGRAMS



# STORM MAGNETOGRAMS