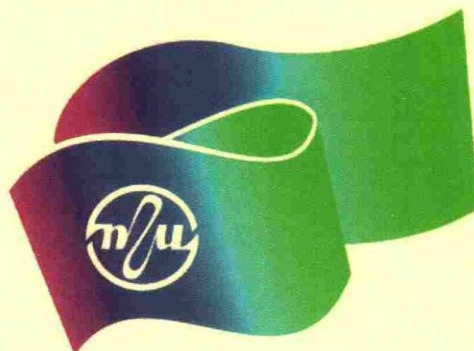


RUSSIAN ACADEMY OF SCIENCES

KOLA SCIENCE CENTRE



50 Polar
Geophysical
Institute
1960 - 2010

PGI
GEOPHYSICAL DATA

2010

JANUARY

FEBRUARY

MARCH

POLAR GEOHPYSICAL INSTITUTE
MURMANSK, APATITY, RUSSIA

PGI

GEOPHYSICAL DATA

V. VOROBJEV, editor

V. Burnaeva, N. Golubtsova and L. Kogay make-up editors

This bulletin presents the preliminary ground-based optical, geomagnetic and cosmic ray data obtained by Polar Geophysical Institute in the first quarter of 2010. All-sky camera observations are published only for the quarters when observations were carried out. All data are available by request.

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DATA DESCRIPTION

Magnetic data

The magnetograms (H, D, and Z) are plotted as magnetic variations recorded in Loparskaya and Lovozero stations by the three component Bobrov type magnetometer with a sampling frequency of 10 samples per seconds. The instrument has a range ± 2620 nT and a resolution of 5 pT. Magnetic observations are gathered every second and registered in the digital form as the 10-sec averaged data. Digits in the plots at the left hand side denote the scale of the records in nT/div. Timing is provided by the GPS.

Magnetic quiet values for H, D and Z components are shown by dotted line as a daily averaged magnetic activity level for three magnetically quiet days of each month. Quiet days are brand by the symbol Q in tables of geomagnetic K-indices.

Geomagnetic K-indices

The hourly K-indices indicate the level of geomagnetic field disturbance. The maximum deflection of two components H and D from the magnetic quiet value during one hour interval have been recalculated to the value of the local hourly K-index. The following scale has been used:

K-indices	Deflection in nT
0	0-15
1	15-30
2	30-60
3	60-120
4	120-210
5	210-360
6	360-600
7	600-990
8	990-1500
9	1500 and more

Cosmic ray data

The 18-NM-64-neutron monitor has been operating in Apatity since 1969. A plot of pressure corrected hourly data (count accumulated during one hour interval) is presented in units of percent with respect to the monthly mean intensity. Mean values are:

January	461 091
February	459 505
March	460 696

The hourly data are sent to WDC-B2 (Moscow) and WDC-C (Japan).

Please visit <http://pgia.ru>

All-sky camera observations

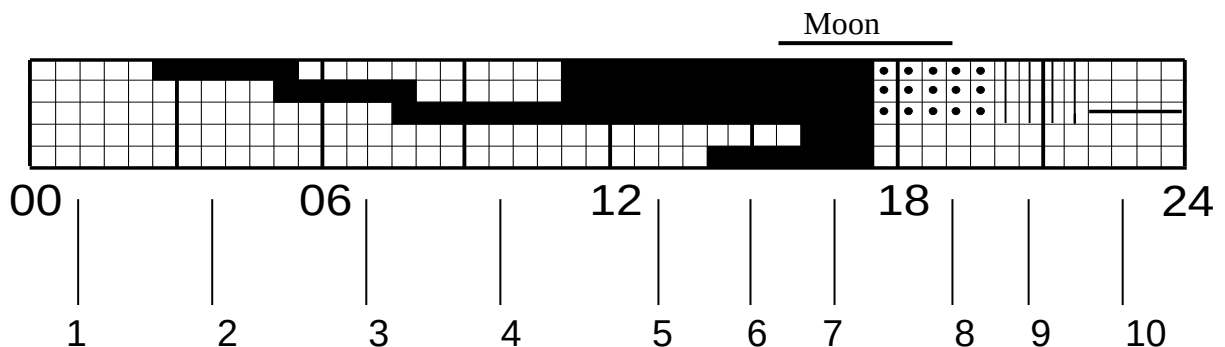
Calendar

Calendar shows the intervals of digital all-sky camera observations in Lovozero and Loparskaya, which are available during dark periods from 1400 to 0600 UT.

Ascaplots

All-sky camera observations are presented in this bulletin in the form of the standard five lines ascaplot. A detailed description of askaplots interpretation was published in: Annals of International Geophysical Year. V. XX. Part 1. P. 1-5. 1962.

Example of an ascaplot and the legend are given below. Top three lines give information on the existence of aurorae in north, zenith and south ranges of the sky, respectively. The fourth and fifth lines in the standard five lines ascaplot give the zenith range auroral intensity. We do not use all-sky camera observations to form a correct estimate of the auroral intensity.



- 1- no aurora
- 2- aurora present in north range
- 3- weak aurora present in zenith range
- 4- aurora present in south range
- 5- aurorae present in north, zenith and south ranges
- 6- medium aurora in zenith, aurorae present in north and south ranges
- 7- strong aurora in zenith, aurorae present in north and south ranges
- 8- partial cloudiness
- 9- total cloudiness
- 10- no operation

Keograms

Black white keograms show the auroral display along the geomagnetic meridian of station. Here we present a few selected auroral events observed at Lovozero and/or Loparskaya in night-time interval from 17 00 UT to 01 00 UT. Zenith angles are given along the vertical axis. Magnetic north is at the top of the figure.

Attention:

Magnetometer in Tumanny is not in operation from February 10, 2010

Coordinates of stations

Stations	Code	Geographic		Corr. Geomagnetic	
		Lat	Long	Lat	Long
<i>Loparskaya</i>	LOP	68.63° N	33.25° E	64.94° N	113.6° E
<i>Lovozero</i>	LOZ	67.97° N	35.02° E	64.17° N	115.3° E
<i>Apatity</i>	APT	67.58° N	33.31° E	63.86° N	113.6° E

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<http://pgia.ru>

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GEOMAGNETIC K-INDICES, LOVOZERO
January, 2010
Lower limit of K=9 is 1500 nT

Day	Time, UT								
	03	06	09	12	15	18	21	24	
1	0 0 0	0 0 1	1 1 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
2	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	Q
3	0 0 0	0 0 0	0 0 0	1 1 1	2 2 1	0 0 0	0 0 0	0 0 0	
4	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
5	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	Q
6	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
7	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	1 0 0	
8	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	
9	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	Q
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11	1 1 1	1 1 1	1 2 1	2 1 1	1 1 1	1 1 1	3 3 2	2 2 2	
12	2 2 1	2 2 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	2 2 2	
13	4 3 2	2 2 2	2 2 2	1 1 1	1 1 1	2 2 2	2 2 2	3 3 3	
14	2 2 2	2 2 2	2 2 1	1 1 1	2 1 2	1 1 1	3 3 2	2 2 1	
15	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 2 1	1 2 3	3 2 1	
16	1 1 1	1 1 1	1 1 1	1 1 1	0 1 1	1 0 1	1 1 1	1 1 1	
17	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 0	1 1 1	1 1 0	
18	1 0 0	0 0 0	0 1 1	0 0 0	0 0 0	0 2 2	2 0 0	0 0 0	
19	1 1 0	0 0 0	0 0 1	1 0 0	0 0 0	0 1 0	1 1 1	1 1 1	
20	1 1 1	1 1 1	1 1 1	0 0 0	1 0 1	3 5 4	4 4 4	4 5 6	
21	2 2 2	2 0 0	1 1 1	2 2 1	1 1 1	1 1 1	1 1 1	2 2 1	
22	1 1 1	1 1 1	2 2 2	2 2 1	1 1 1	2 2 2	2 2 2	2 2 2	
23	2 3 2	2 1 1	1 1 1	1 1 1	0 0 0	1 1 0	1 1 1	3 3 2	
24	1 1 2	1 1 0	0 0 0	1 1 0	0 1 1	1 0 1	2 1 2	2 2 1	
25	0 1 1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 2 2	
26	2 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 1 2	2 1 1	
27	0 0 0	1 1 1	1 1 1	1 1 1	0 0 0	0 0 1	1 1 2	2 2 1	
28	1 1 1	1 1 1	1 1 1	0 0 0	0 0 0	0 1 1	2 3 2	1 1 1	
29	1 1 1	1 1 1	1 1 1	1 1 1	1 0 0	0 0 0	0 0 1	1 1 1	
30	1 1 1	2 1 1	1 0 0	0 0 0	0 0 0	1 2 2	2 2 1	1 1 2	
31	2 2 1	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 1 1	2 2 2	

GEOMAGNETIC K-INDICES, LOVOZERO
February, 2010
Lower limit of K=9 is 1500 nT

Day	Time, UT								
	03	06	09	12	15	18	21	24	
1	0 1 1	0 0 0	0 1 1	1 1 1	2 2 2	2 1 2	2 2 0	3 3 1	
2	2 3 3	2 1 0	0 0 1	0 1 0	0 0 0	0 1 1	1 1 1	1 4 5	
3	4 2 2	0 0 0	0 1 1	2 1 1	1 1 2	3 1 1	2 2 1	1 1 1	
4	3 2 2	2 1 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	2 1 0	
5	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	0 0 0	Q
6	0 0 0	0 0 0	0 0 0	0 0 1	1 2 3	3 5 2	2 2 2	1 3 2	
7	1 0 0	0 1 1	0 0 0	0 0 0	0 0 0	0 0 0	0 0 2	2 3 3	
8	3 3 2	1 1 1	1 0 0	0 0 1	0 0 0	0 0 0	0 0 0	0 0 0	
9	0 0 0	0 0 0	0 0 0	0 1 1	0 0 0	0 0 0	0 0 1	1 0 0	
10	0 0 1	0 0 0	0 0 1	0 0 0	1 1 0	0 0 0	1 0 2	1 0 0	
11	0 1 1	0 0 0	0 1 0	1 2 1	1 1 1	1 1 1	1 1 1	1 1 1	
12	0 0 0	0 2 2	1 1 1	1 1 1	1 1 2	2 2 2	1 1 1	1 0 0	
13	0 0 1	0 0 0	0 0 0	0 1 1	1 1 0	1 1 3	3 2 3	1 0 0	
14	0 0 0	0 0 0	0 0 0	0 1 1	1 1 0	0 0 0	0 0 0	0 2 3	
15	5 5 3	2 2 1	1 0 1	1 1 1	2 2 2	4 4 4	3 4 5	5 5 5	
16	4 3 2	1 1 0	1 0 1	1 1 0	0 0 0	0 0 1	0 1 4	4 5 6	
17	5 4 3	2 1 0	0 0 1	1 1 1	0 0 0	0 0 0	0 0 0	4 5 3	
18	0 0 0	0 0 0	0 0 0	1 1 0	0 2 1	1 0 3	3 2 1	0 0 0	
19	0 0 0	0 0 0	0 0 0	0 1 1	1 1 1	1 0 1	0 1 0	1 0 1	
20	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	Q
21	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	
22	0 0 1	1 0 0	0 0 1	1 1 1	1 0 0	0 0 0	1 1 3	4 4 3	
23	2 2 1	1 1 0	0 0 0	0 0 0	0 0 0	0 0 0	1 1 0	0 0 0	
24	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 3 2	2 1 1	
25	1 2 2	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 1	3 3 1	
26	2 2 1	0 0 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 0 0	
27	0 0 0	0 0 0	0 1 1	1 1 1	1 1 0	0 0 0	1 1 1	0 0 0	
28	0 0 0	0 0 0	0 1 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	Q

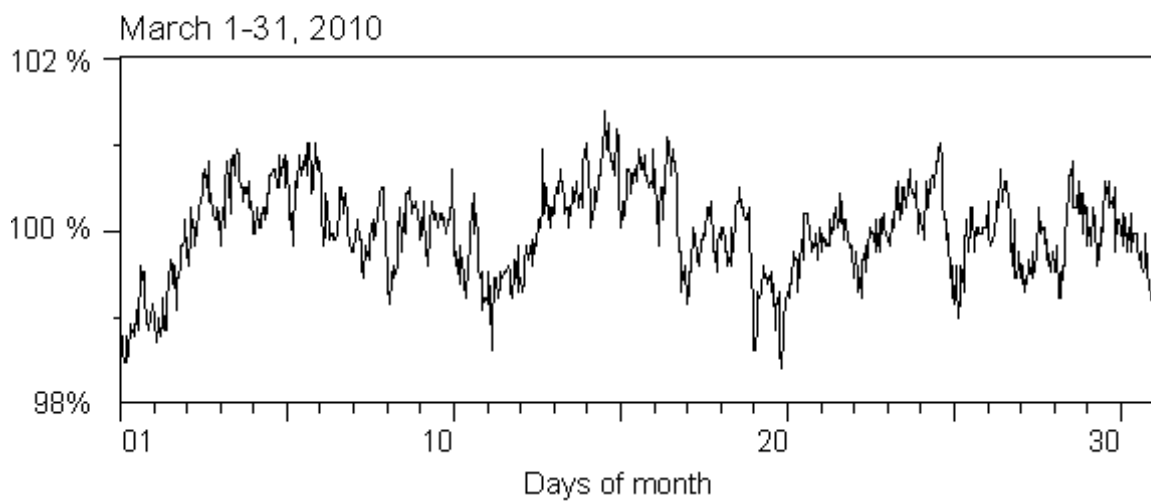
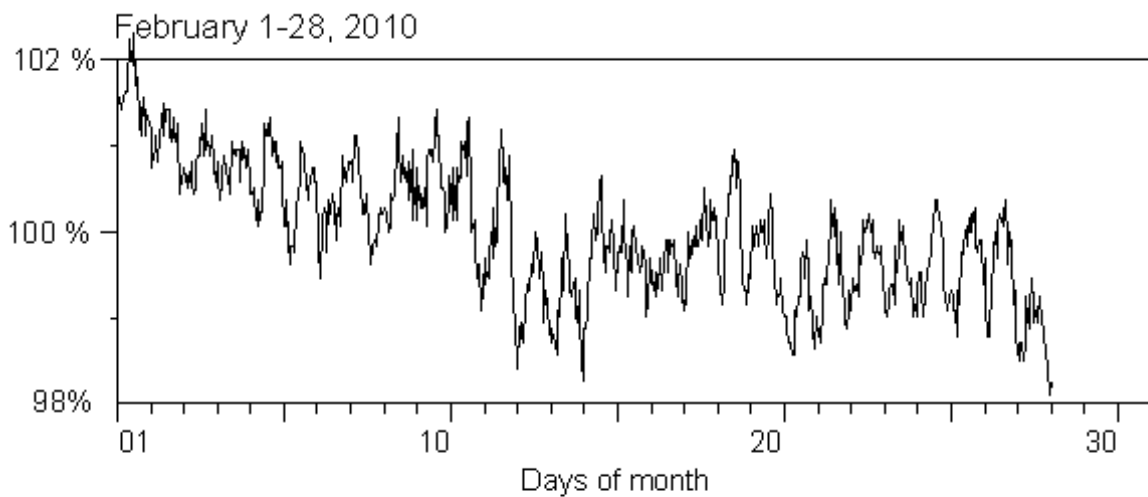
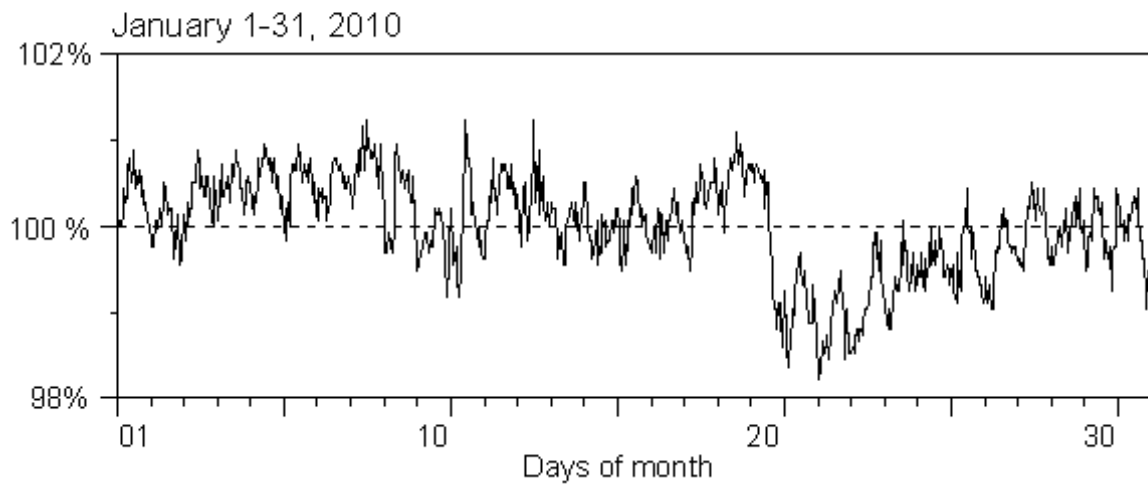
GEOMAGNETIC K-INDICES, LOVOZERO

March, 2010

Lower limit of K=9 is 1500 nT

Day	Time, UT								
	03	06	09	12	15	18	21	24	
1	0 0 0	0 0 0	0 0 1	1 1 1	1 1 1	1 0 1	1 0 0	0 1 1	
2	0 0 0	0 0 0	0 0 0	1 1 2	2 2 3	2 0 0	0 0 0	2 2 2	
3	1 1 0	0 0 0	0 0 1	0 1 1	1 2 2	1 2 3	3 2 3	2 4 4	
4	1 0 0	1 1 1	0 1 0	0 0 1	1 2 2	2 1 0	0 0 1	1 0 0	
5	0 0 0	0 0 0	0 0 1	1 1 1	2 1 0	0 0 1	2 0 0	0 0 1	
6	3 3 1	0 0 0	0 1 1	0 0 0	0 0 0	0 0 1	0 0 0	0 1 3	
7	2 3 1	1 0 0	0 1 0	1 1 1	1 1 0	0 0 0	0 0 0	0 0 0	
8	0 0 0	0 0 0	0 1 0	1 1 0	0 0 0	0 0 1	1 2 0	0 0 0	
9	0 0 0	0 0 0	0 0 0	0 1 1	1 1 1	0 0 1	0 0 0	0 0 0	Q
10	0 1 0	0 0 0	0 0 0	1 1 2	2 2 1	3 4 3	2 3 3	5 5 3	
11	4 3 2	1 1 1	0 1 1	2 2 1	1 1 0	0 0 1	2 2 1	0 0 0	
12	3 3 2	1 1 1	2 1 1	1 1 2	2 2 2	3 0 0	2 1 3	3 2 2	
13	2 1 1	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	1 0 2	1 0 1	
14	2 3 1	0 0 0	0 1 1	1 1 2	2 2 2	0 0 0	0 1 2	4 4 1	
15	0 0 0	0 0 0	0 0 1	1 1 1	0 0 0	0 0 1	1 3 2	0 0 0	
16	0 0 0	0 0 0	1 1 1	1 1 1	1 1 0	0 0 0	0 0 0	1 2 2	
17	1 1 0	1 0 1	1 1 1	1 1 1	1 0 0	0 0 0	0 0 1	0 4 4	
18	3 3 3	2 0 0	1 1 0	0 0 0	1 0 0	0 0 0	1 2 1	1 1 1	
19	0 0 0	0 0 1	1 1 1	1 1 1	1 1 0	1 0 0	0 0 2	2 1 1	
20	0 0 1	1 1 0	1 1 1	1 1 1	1 1 1	1 1 1	2 1 0	0 0 0	
21	0 0 0	0 1 1	1 1 0	1 1 1	1 0 0	0 0 0	0 0 0	0 0 0	
22	0 0 0	0 0 1	1 1 0	0 1 1	1 0 0	0 0 0	0 0 0	0 0 0	Q
23	0 0 0	0 0 0	1 0 0	1 1 1	1 1 0	0 0 0	1 0 0	0 0 0	
24	0 0 0	0 0 0	0 1 0	1 1 1	2 2 2	2 1 2	1 1 1	0 2 2	
25	0 0 0	0 0 0	0 0 0	1 1 2	2 2 2	1 1 2	3 3 1	1 1 0	
26	0 0 0	0 0 0	0 1 0	1 1 1	1 0 1	0 0 0	0 0 0	0 0 1	Q
27	1 0 1	1 1 0	0 0 1	1 1 1	1 1 1	0 0 0	0 1 1	0 0 0	
28	0 1 0	0 1 1	1 1 2	1 1 2	2 1 0	1 2 1	0 0 0	0 0 0	
29	0 0 1	1 1 1	1 1 1	1 1 2	2 1 1	1 1 1	1 1 1	1 1 4	
30	4 0 1	1 1 1	1 1 1	- - -	- 1 1	1 1 1	2 3 3	2 2 2	
31	1 2 1	1 1 1	1 1 0	1 1 1	1 1 1	1 2 2	1 1 0	2 3 3	

Apatity neutron monitor



TV OBSERVATIONS

January - March 2010

CALENDAR OF TV OBSERVATIONS

February 18 - 19

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—											—		

February 19 - 20

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—												—	

February 20 - 21

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—													

February 21 - 22

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—											—		

February 22 - 23

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—											—		

February 23 - 24

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—											—		

February 24 - 25

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—											—		

February 25 - 26

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—											—		

February 26 - 27

UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ			—	—												

March 01 - 02

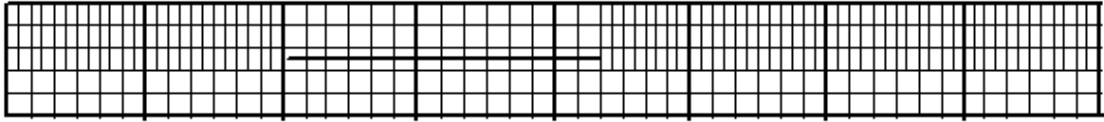
UT	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05
LOZ																

March 06 - 07

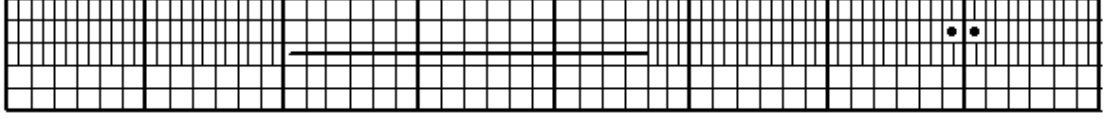
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LOZ				—									—			

Lovozero ascaplots

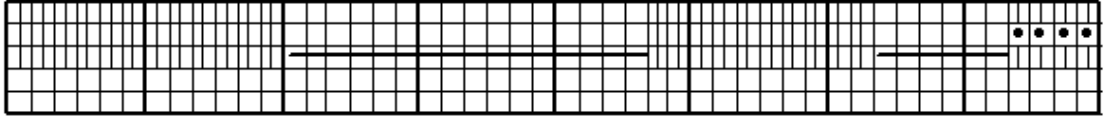
Jan. 01, 2010



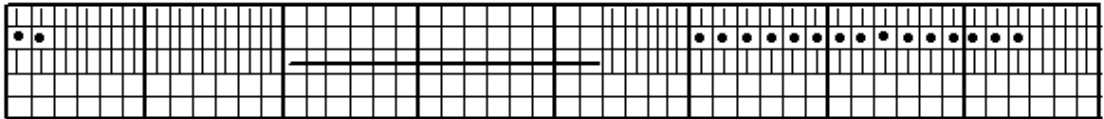
Jan. 02, 2010



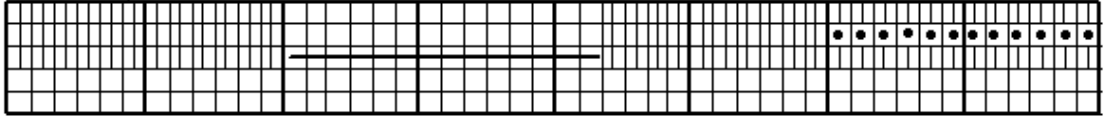
Jan. 03, 2010



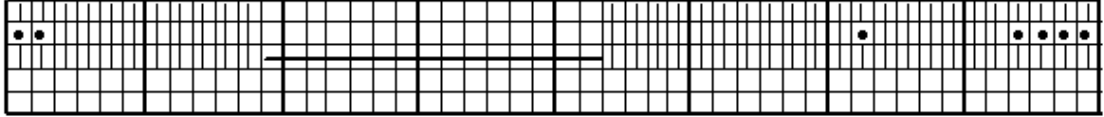
Jan. 04, 2010



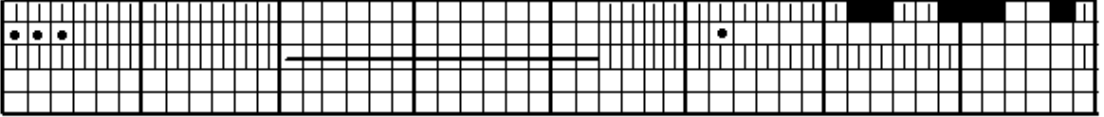
Jan. 05, 2010



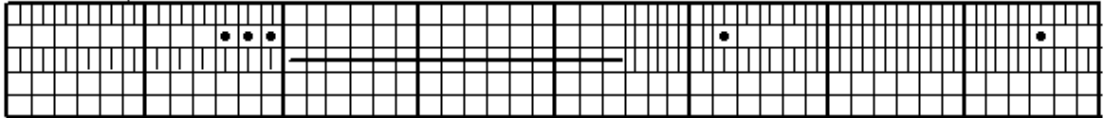
Jan. 06, 2010



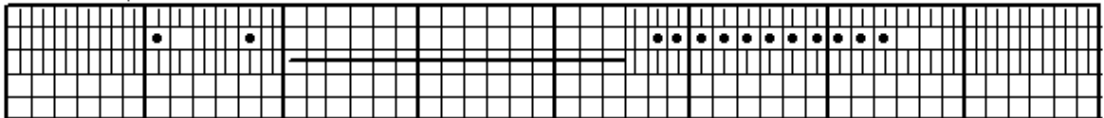
Jan. 07, 2010



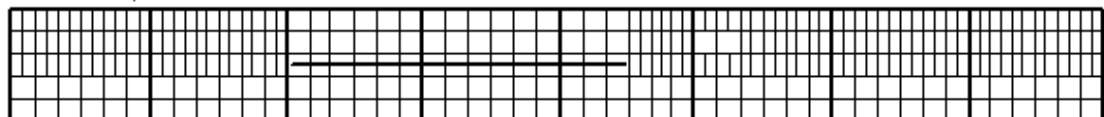
Jan. 08, 2010



Jan. 09, 2010



Jan. 10, 2010

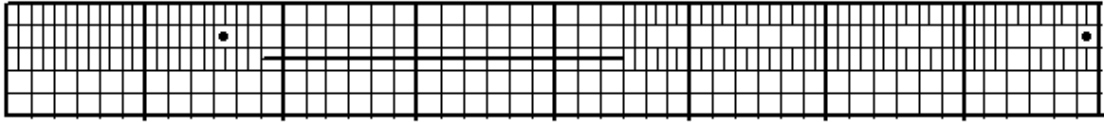


00 06 12 18 24

Universal Time

Lovozero ascaplots

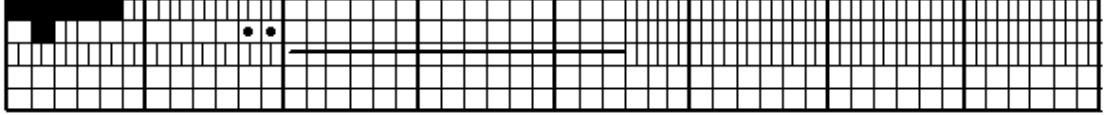
Jan. 11, 2010



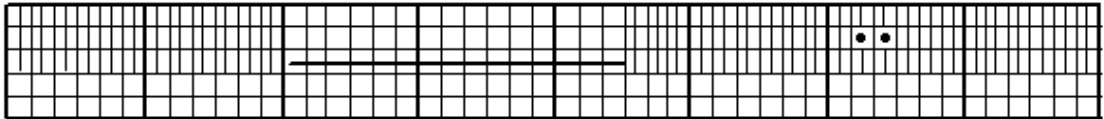
Jan. 12, 2010



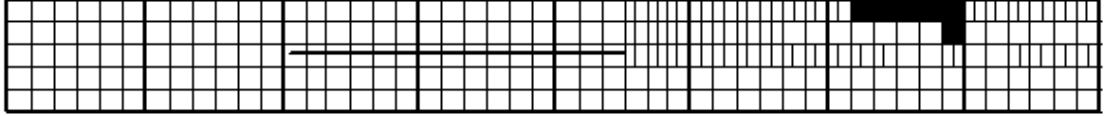
Jan. 13, 2010



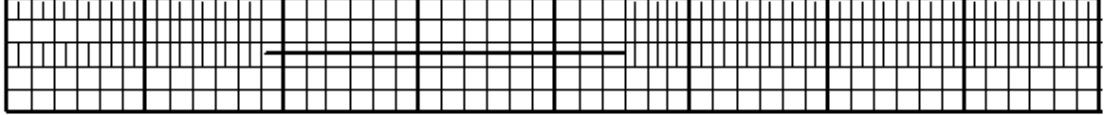
Jan. 14, 2010



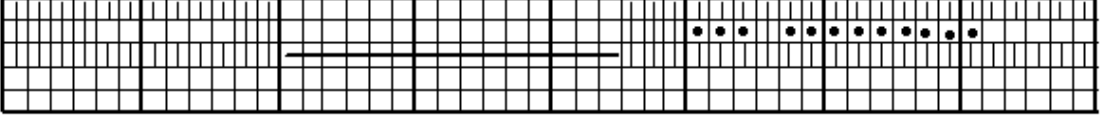
Jan. 15, 2010



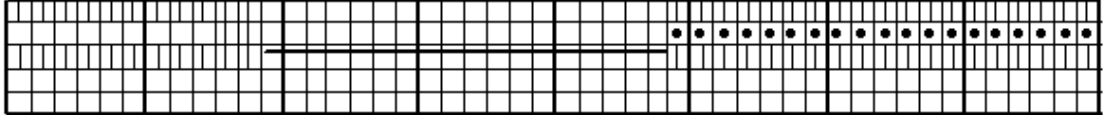
Jan. 16, 2010



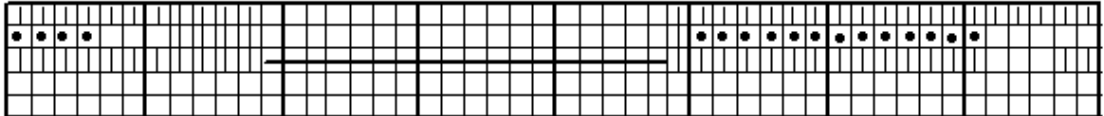
Jan. 17, 2010



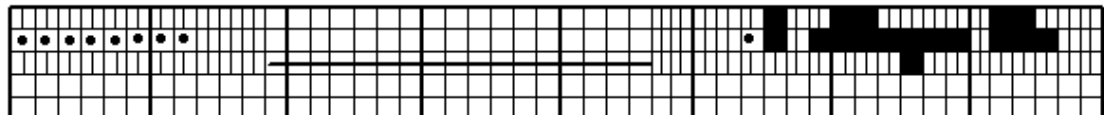
Jan. 18, 2010



Jan. 19, 2010



Jan. 20, 2010

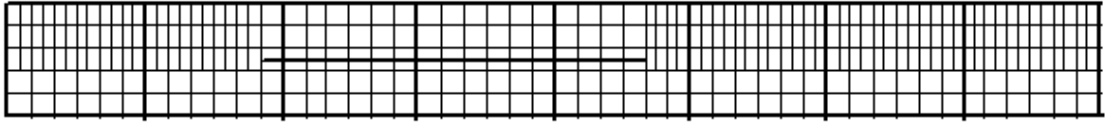


00 06 12 18 24

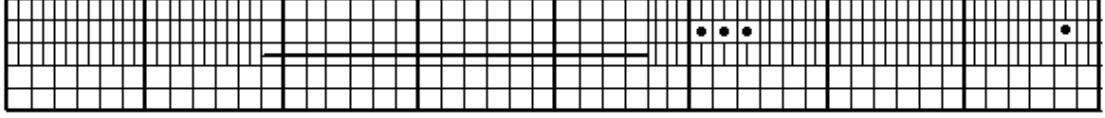
Universal Time

Lovozero ascaplots

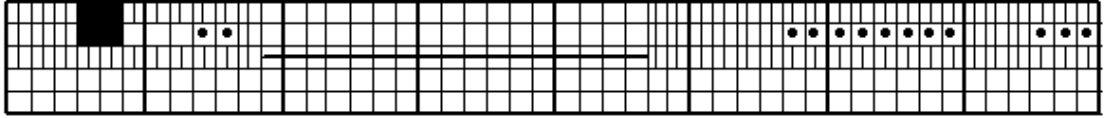
Jan. 21, 2010



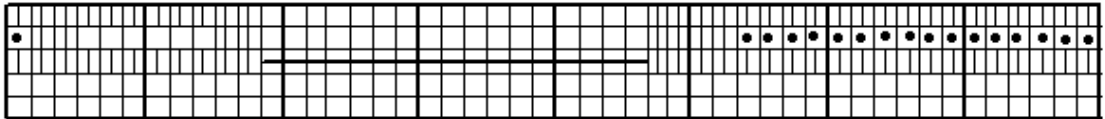
Jan. 22, 2010



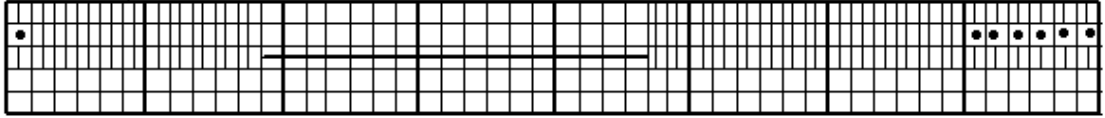
Jan. 23, 2010



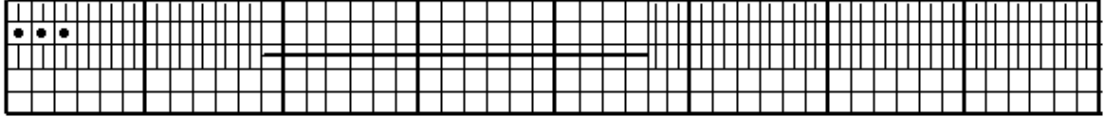
Jan. 24, 2010



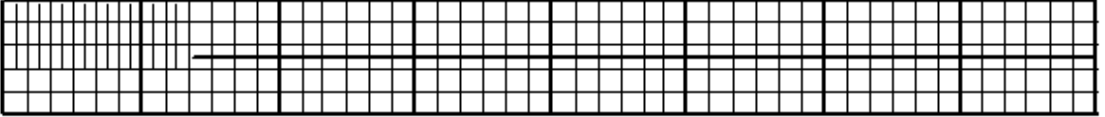
Jan. 25, 2010



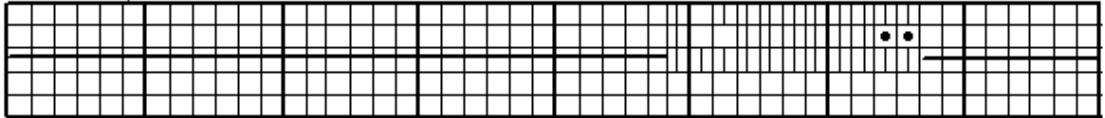
Jan. 26, 2010



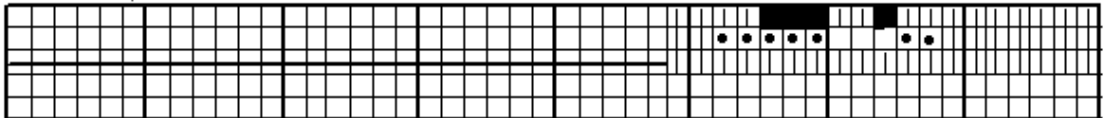
Jan. 27, 2010



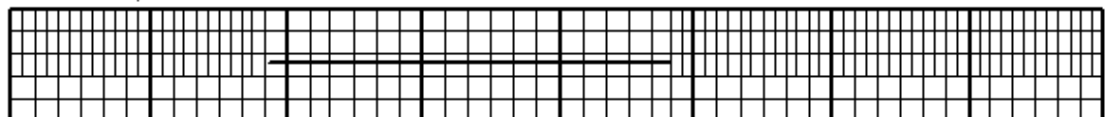
Jan. 31, 2010



Feb. 01, 2010



Feb. 02, 2010

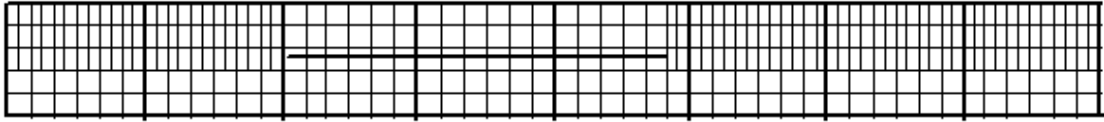


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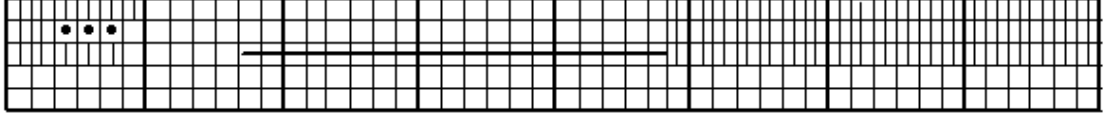
Universal Time

Lovozero ascaplots

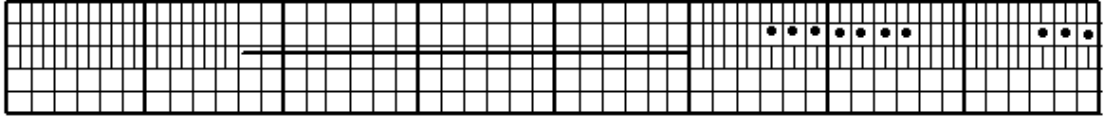
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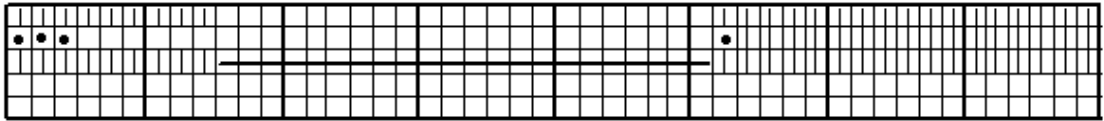
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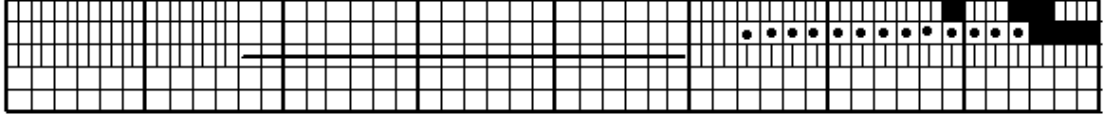
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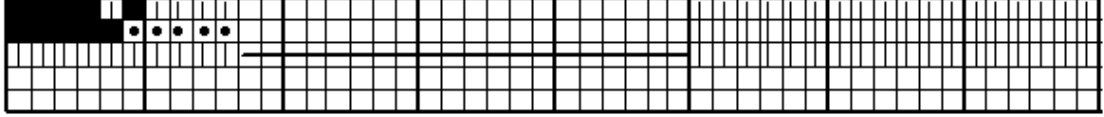
Feb. 06, 2010



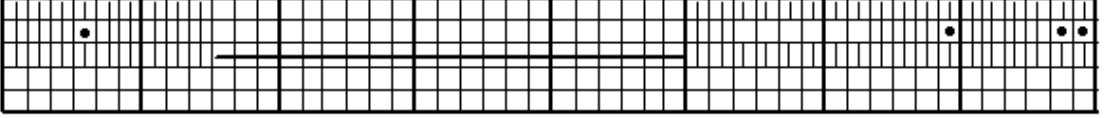
Feb. 07, 2010



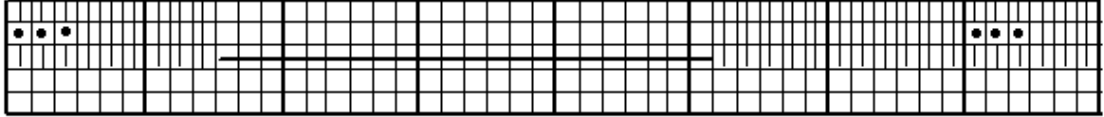
Feb. 08, 2010



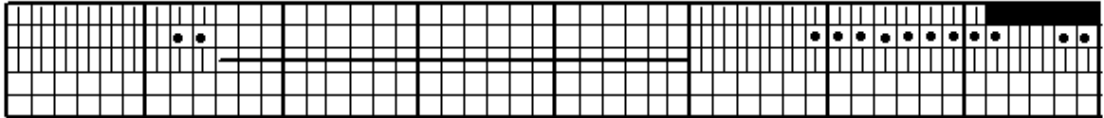
Feb. 09, 2010



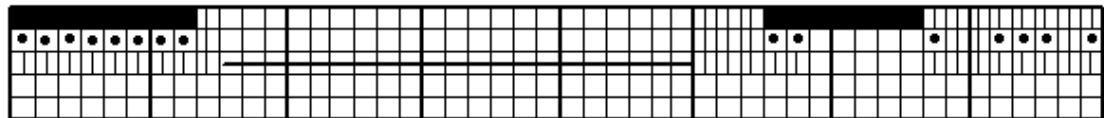
Feb. 10, 2010



Feb. 11, 2010



Feb. 12, 2010



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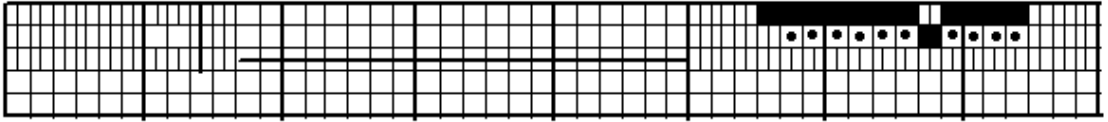
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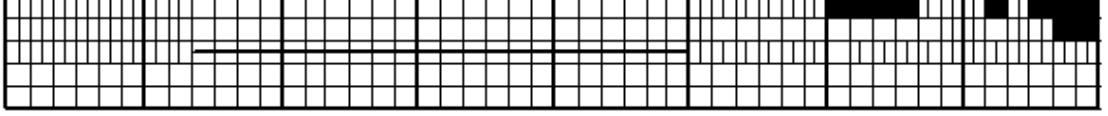
Universal Time

Lovozero ascaplots

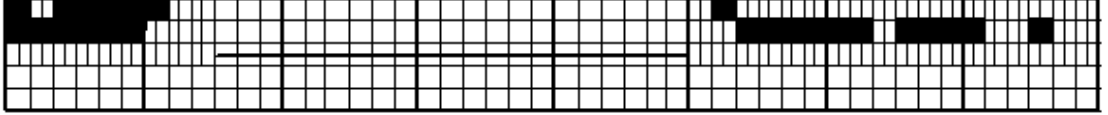
Feb. 13, 2010



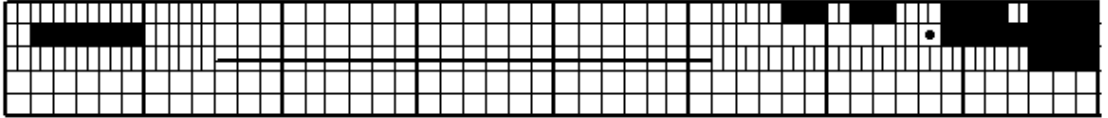
Feb. 14, 2010



Feb. 15, 2010



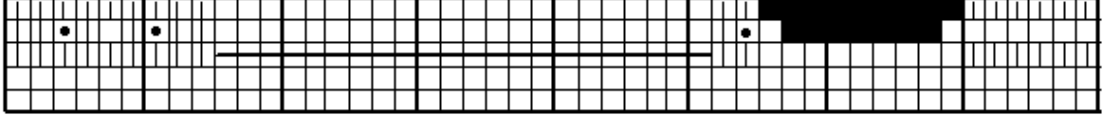
Feb. 16, 2010



Feb. 17, 2010



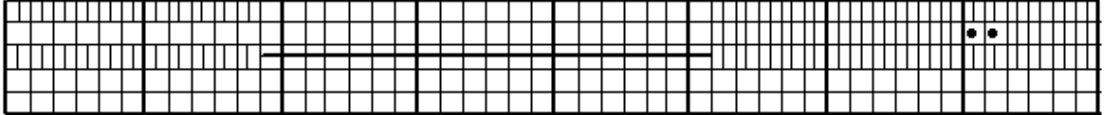
Feb. 18, 2010



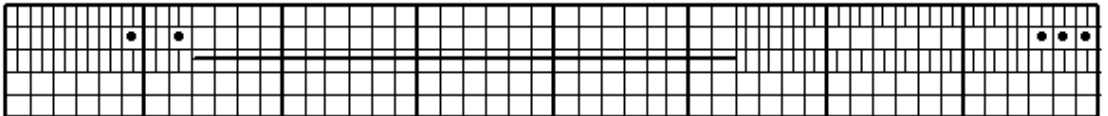
Feb. 19, 2010



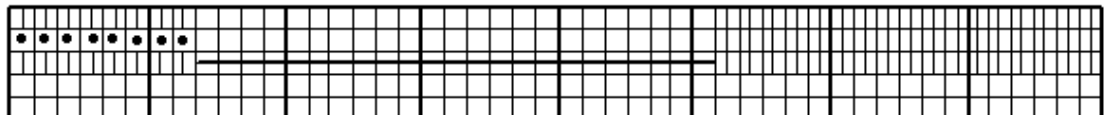
Feb. 20, 2010



Feb. 21, 2010



Feb. 22, 2010

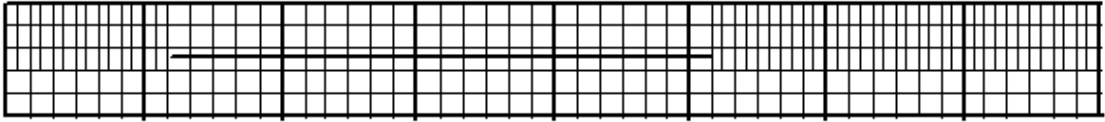


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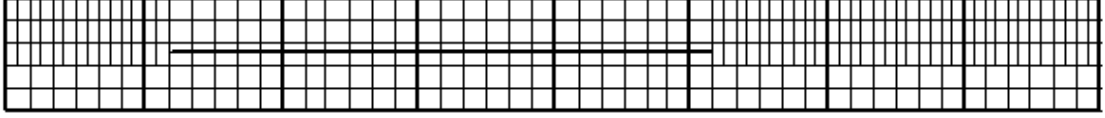
Universal Time

Lovozero ascaplots

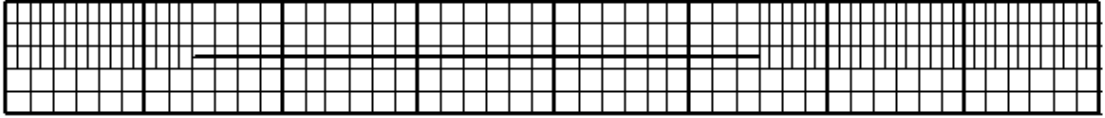
Feb. 23, 2010



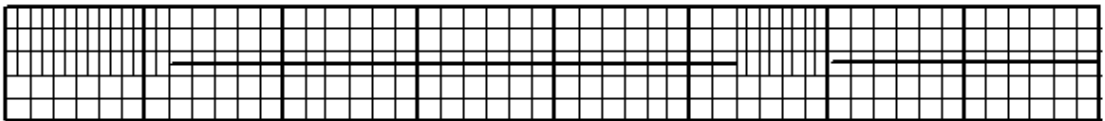
Feb. 24, 2010



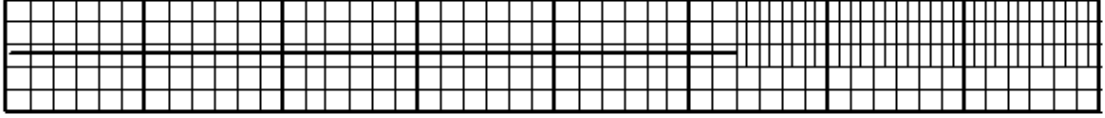
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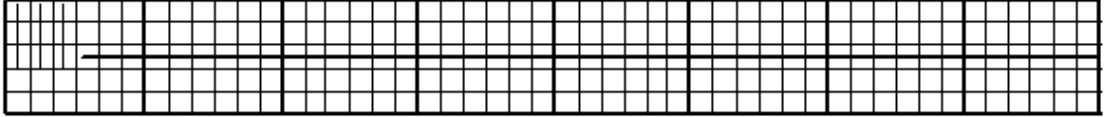
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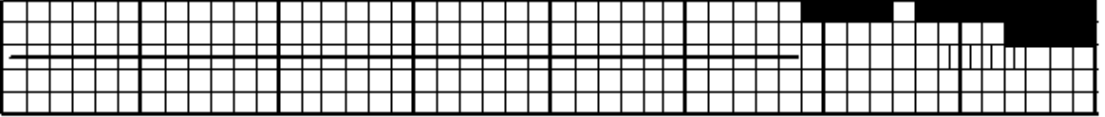
Mar. 01, 2010



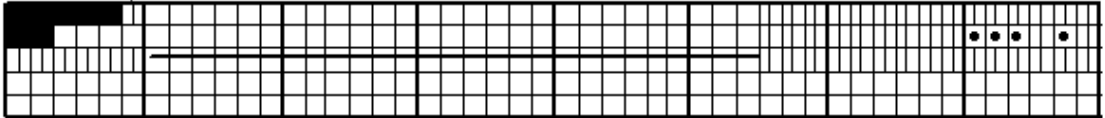
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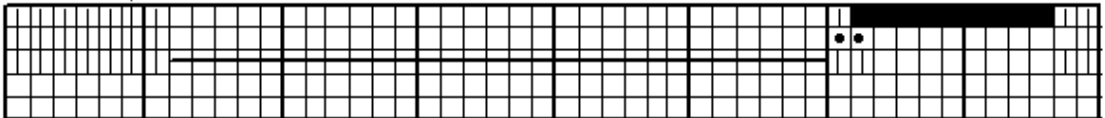
Mar. 06, 2010



Mar. 07, 2010



Mar. 08, 2010



Mar. 09, 2010

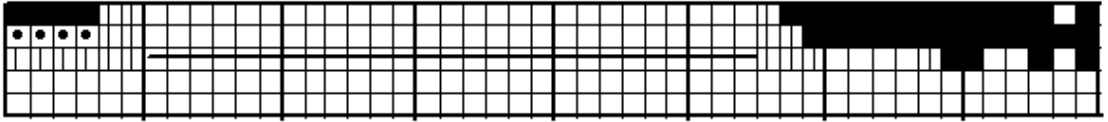


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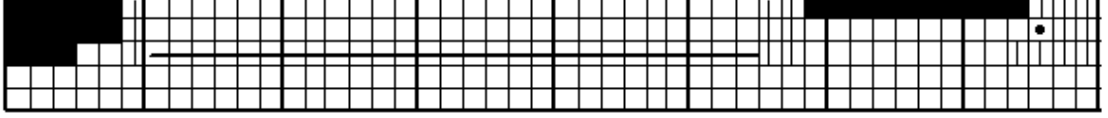
Universal Time

Lovozero ascaplots

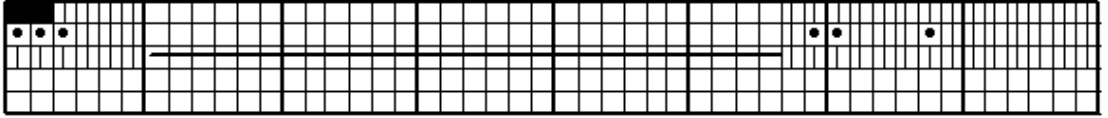
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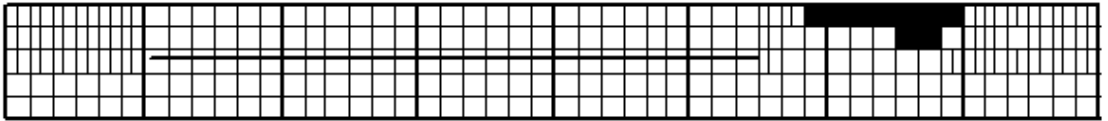
Mar. 11, 2010



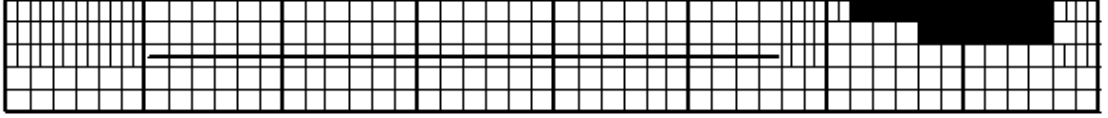
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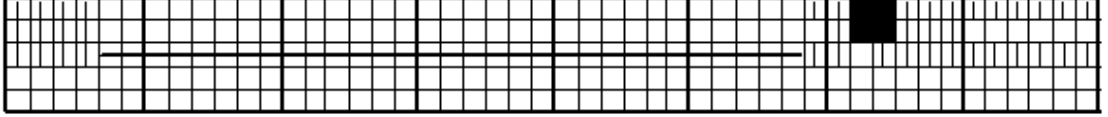
Mar. 13, 2010



Mar. 14, 2010



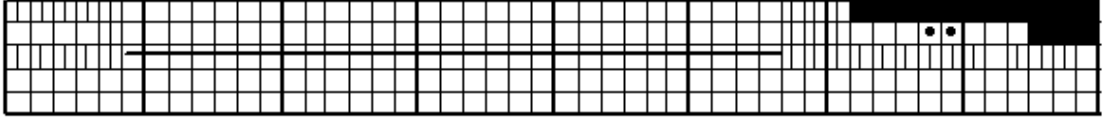
Mar. 15, 2010



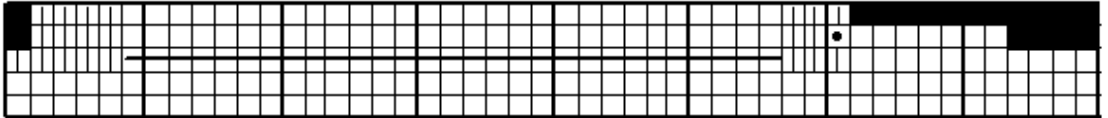
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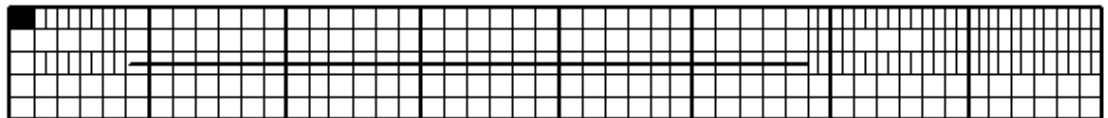
Mar. 17, 2010



Mar. 18, 2010



Mar. 19, 2010



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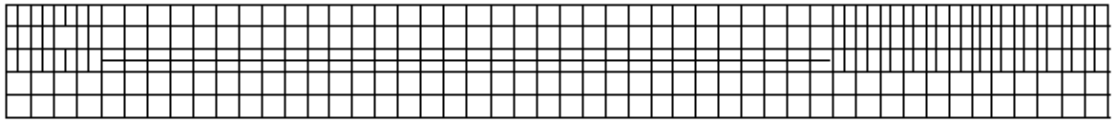
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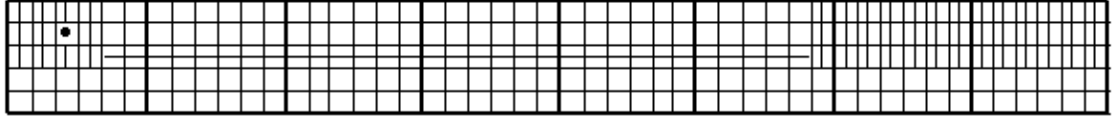
Universal Time

Lovozero ascaplots

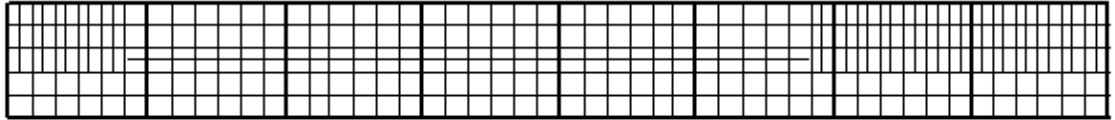
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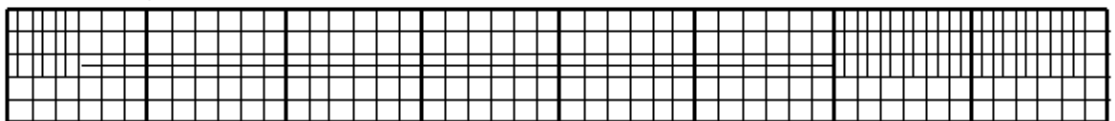
Mar. 21, 2010



Mar. 22, 2010



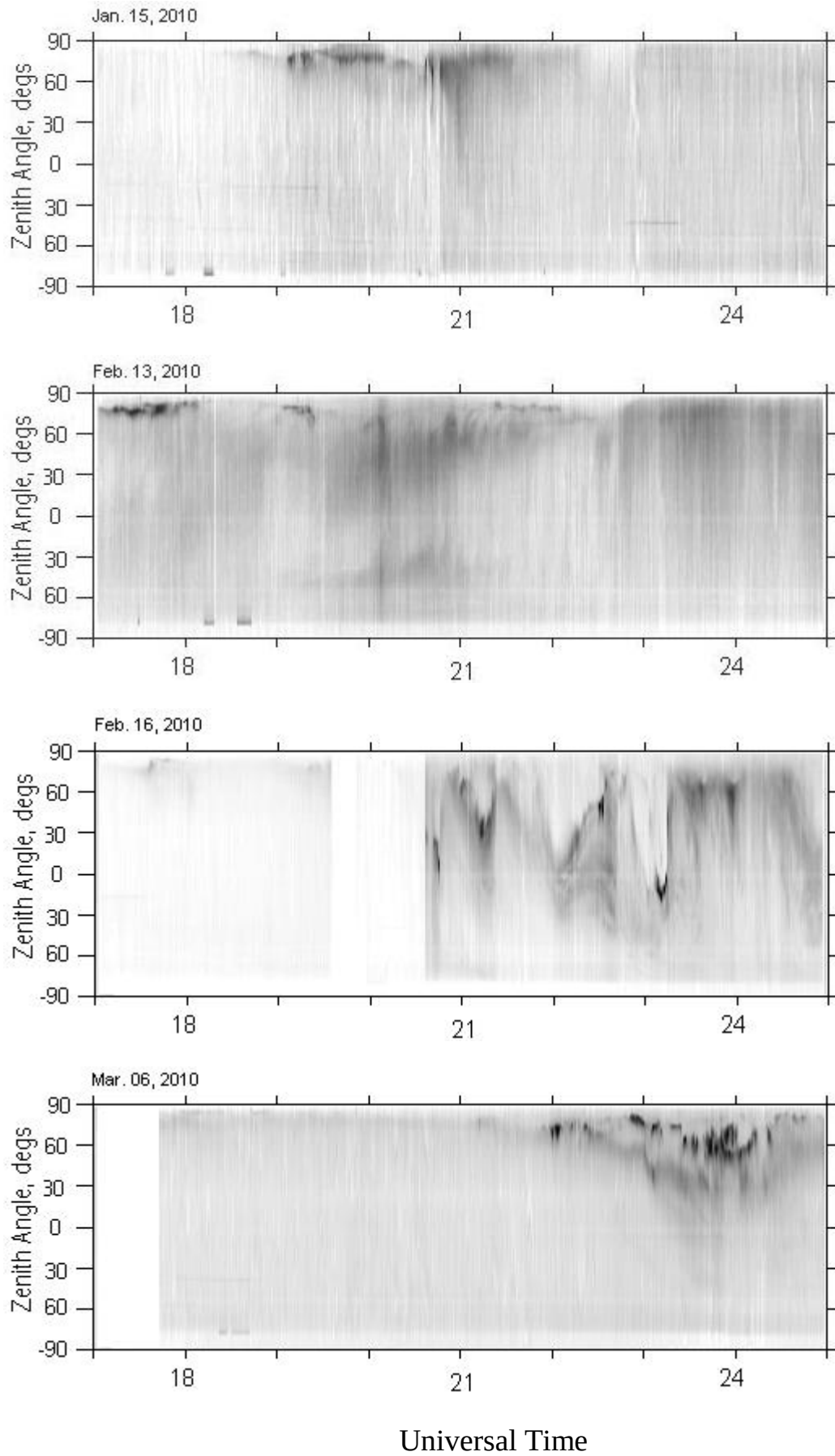
Mar. 23, 2010



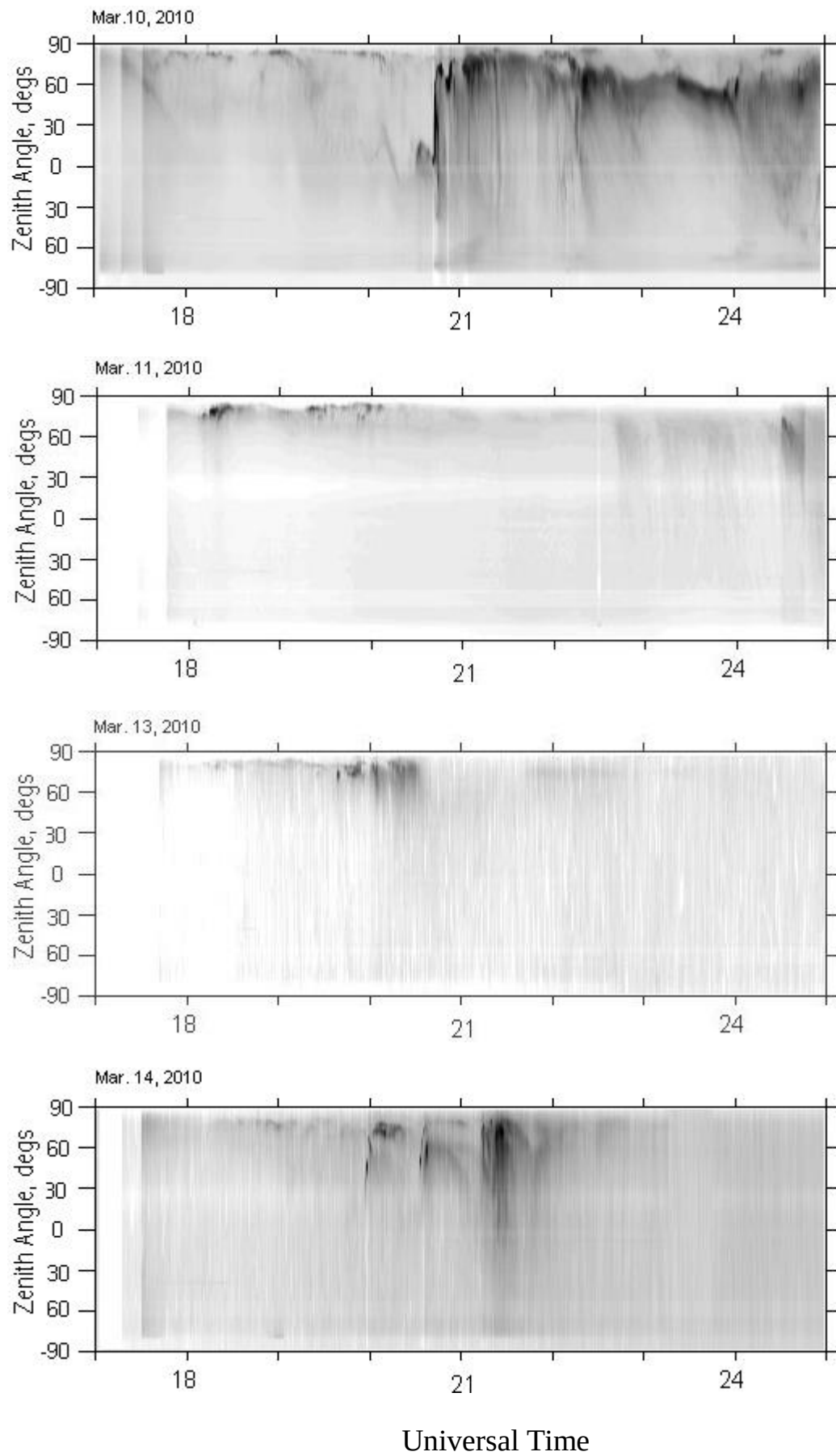
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Universal Time

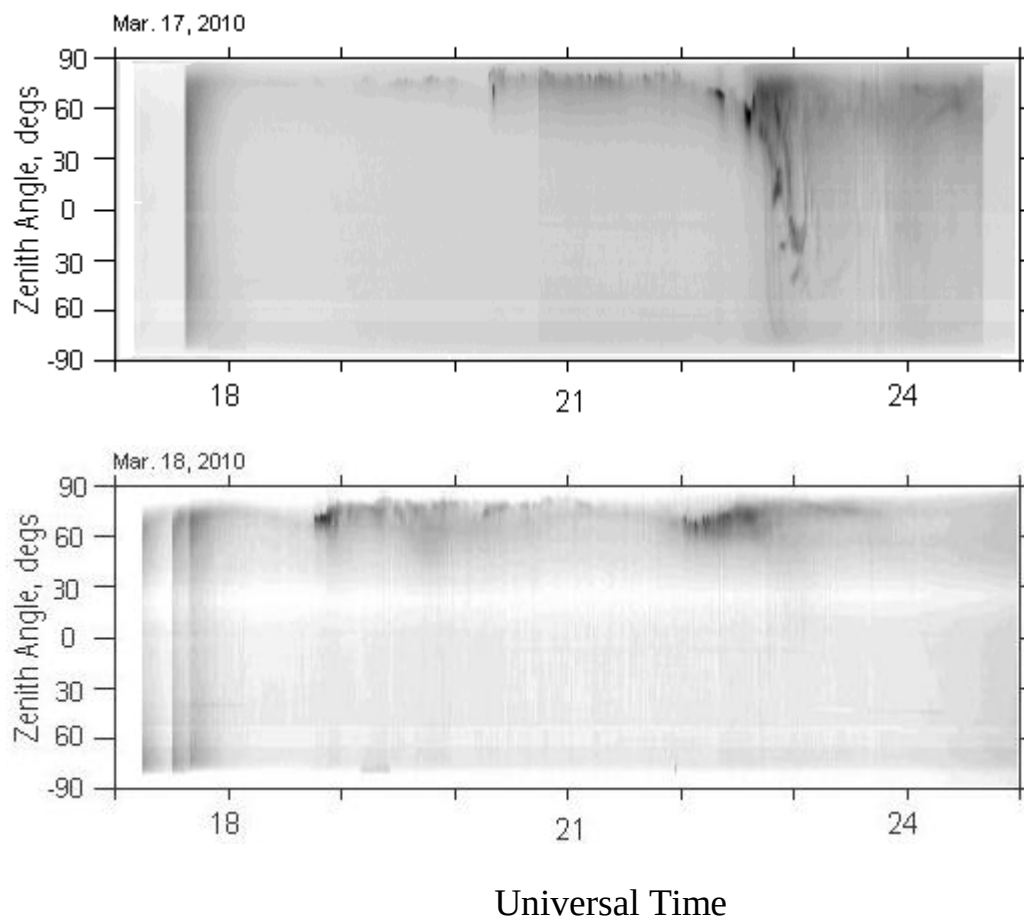
Lovozero TV keograms



Lovozero TV keograms



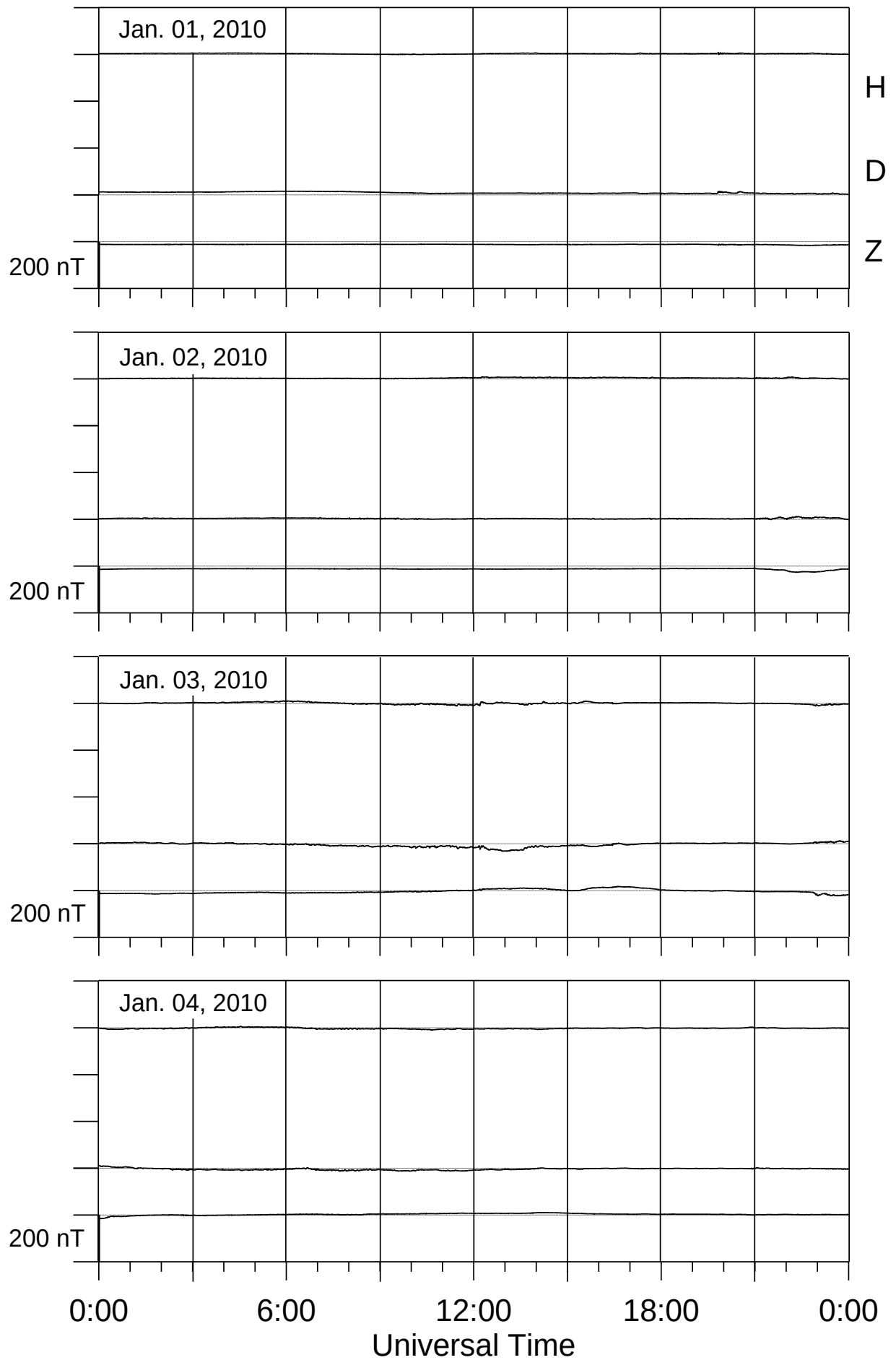
Lovozero TV keograms



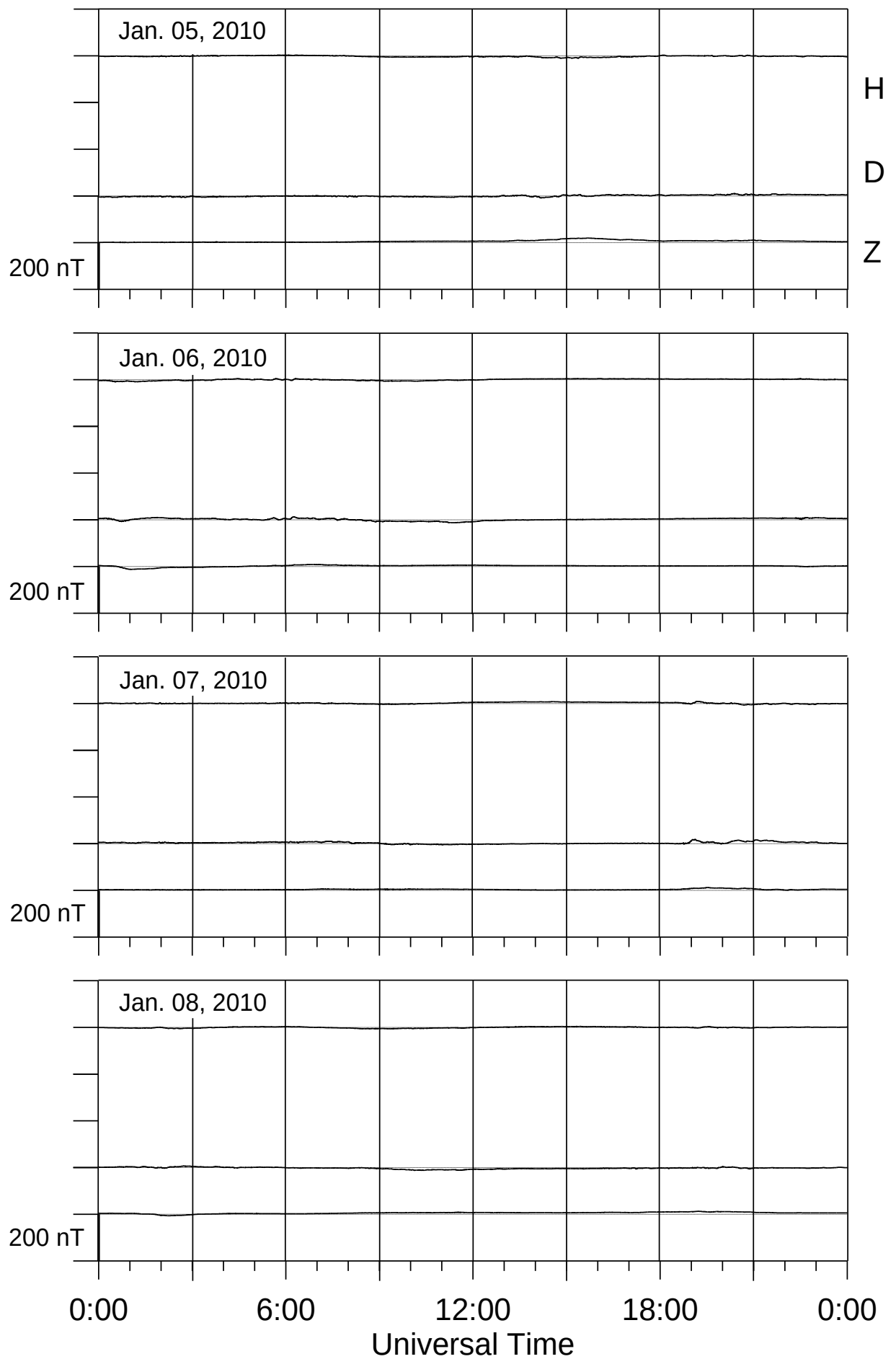
LOVOZERO MAGNETOGRAMS

January - March 2010

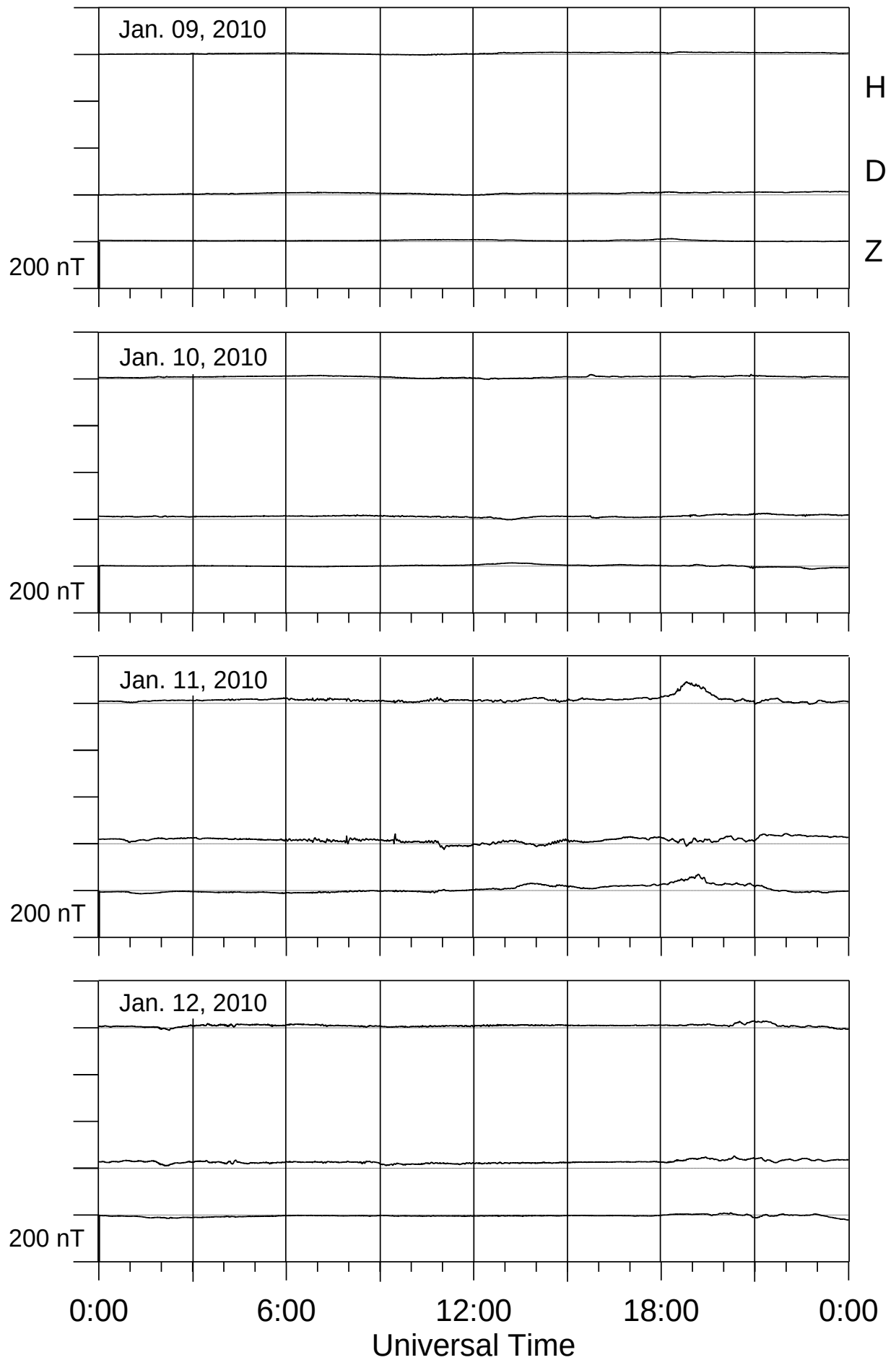
Lovozero magnetometer



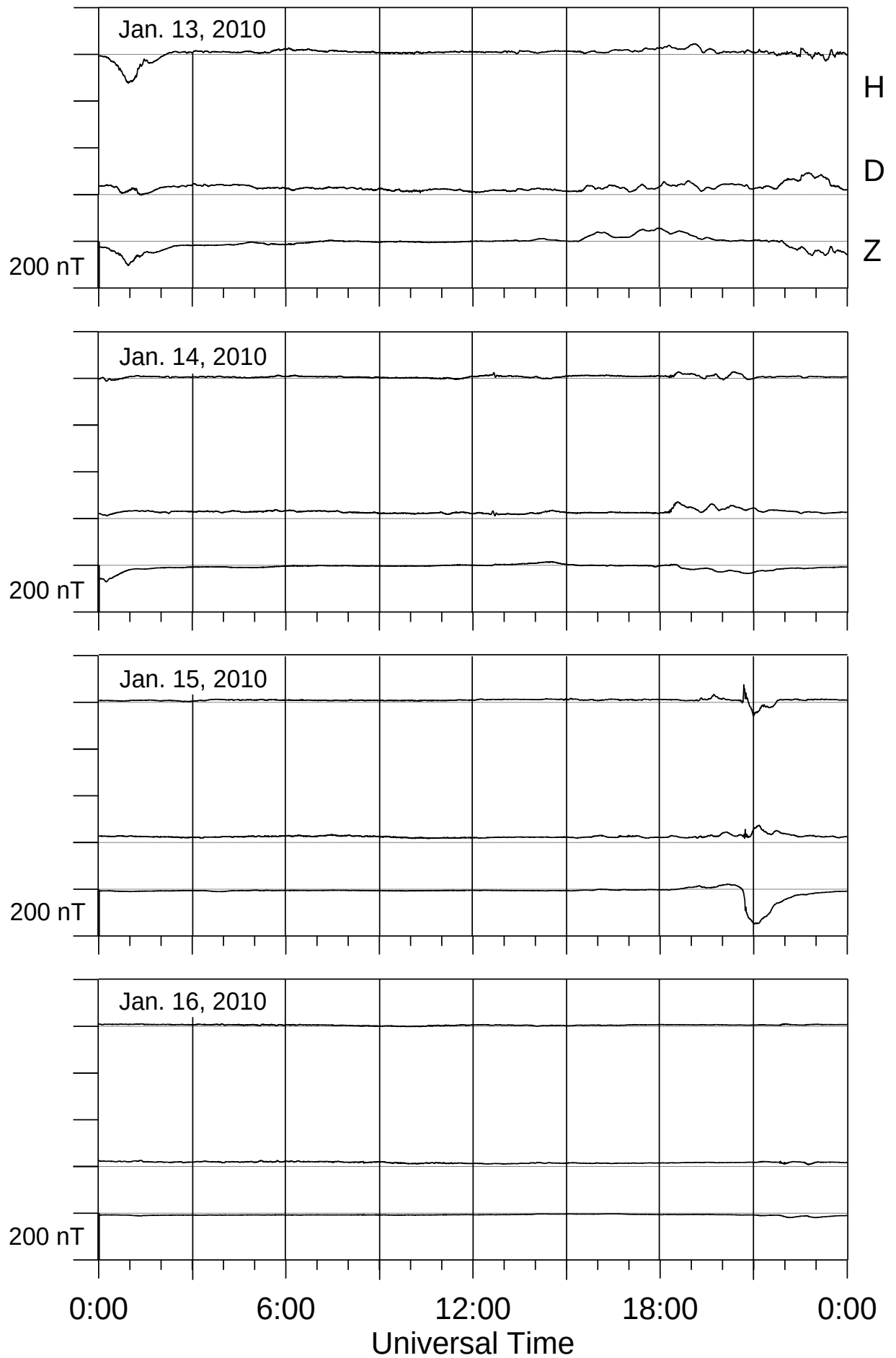
Lovozero magnetometer



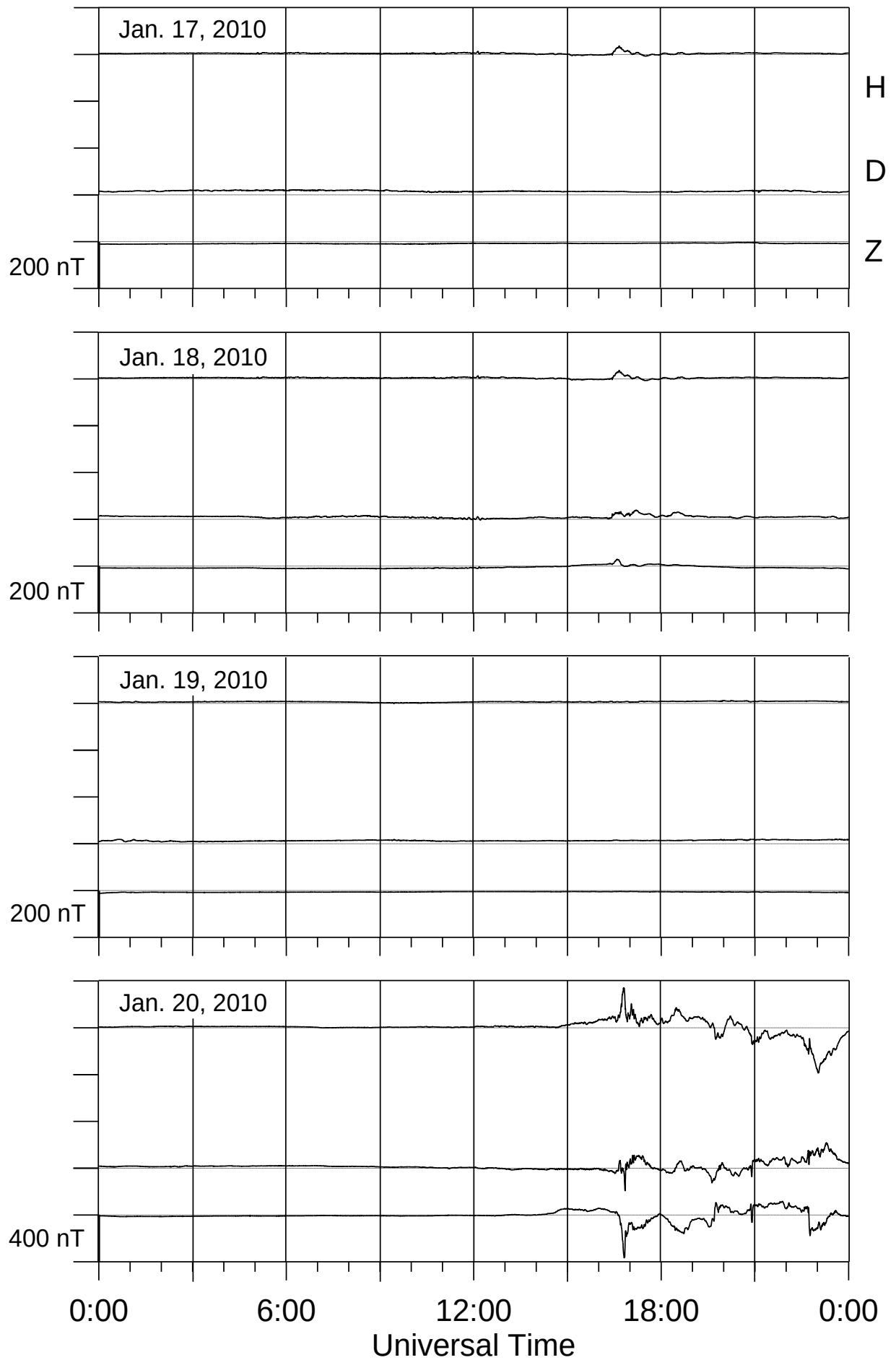
Lovozero magnetometer



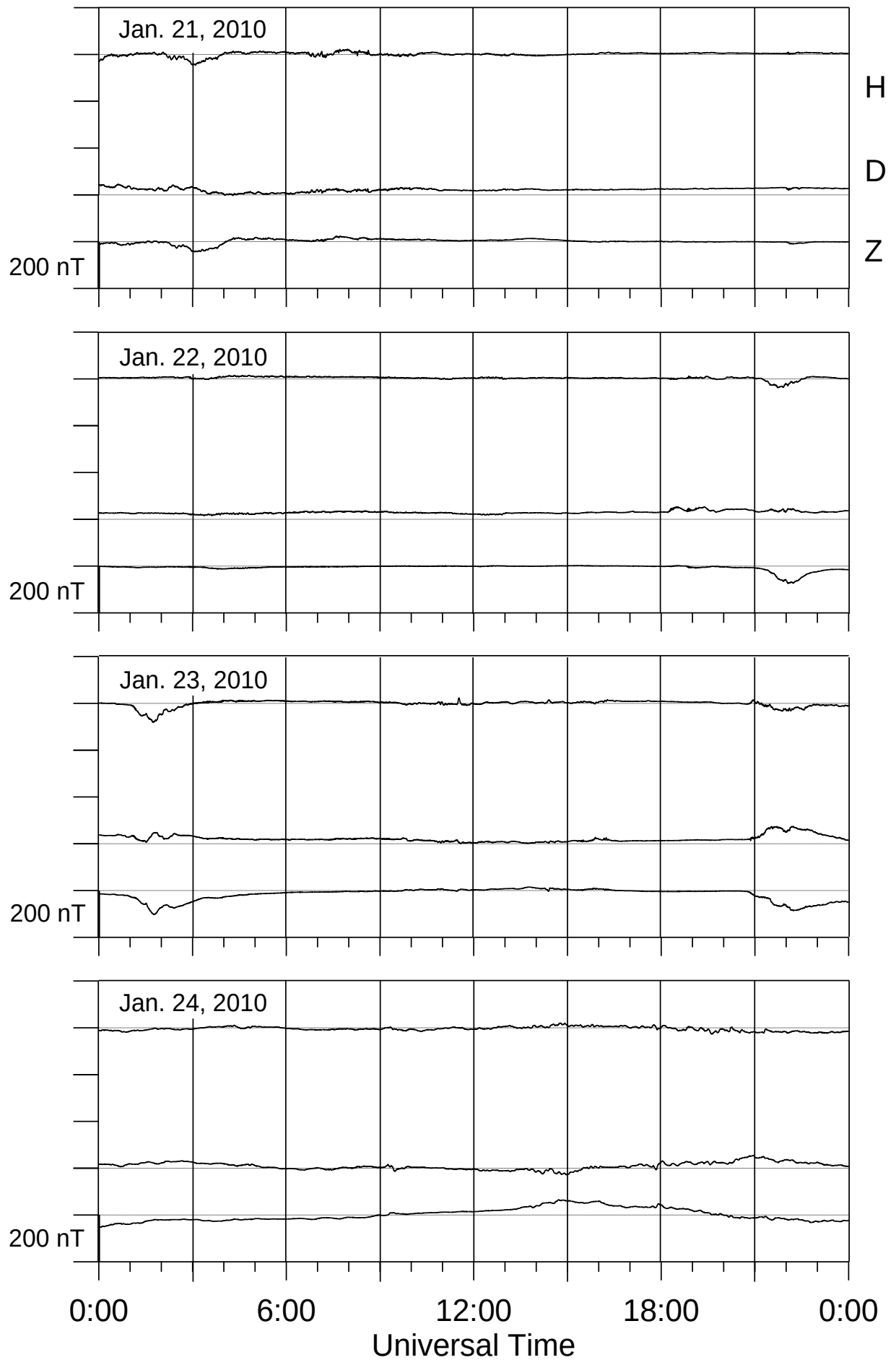
Lovozero magnetometer



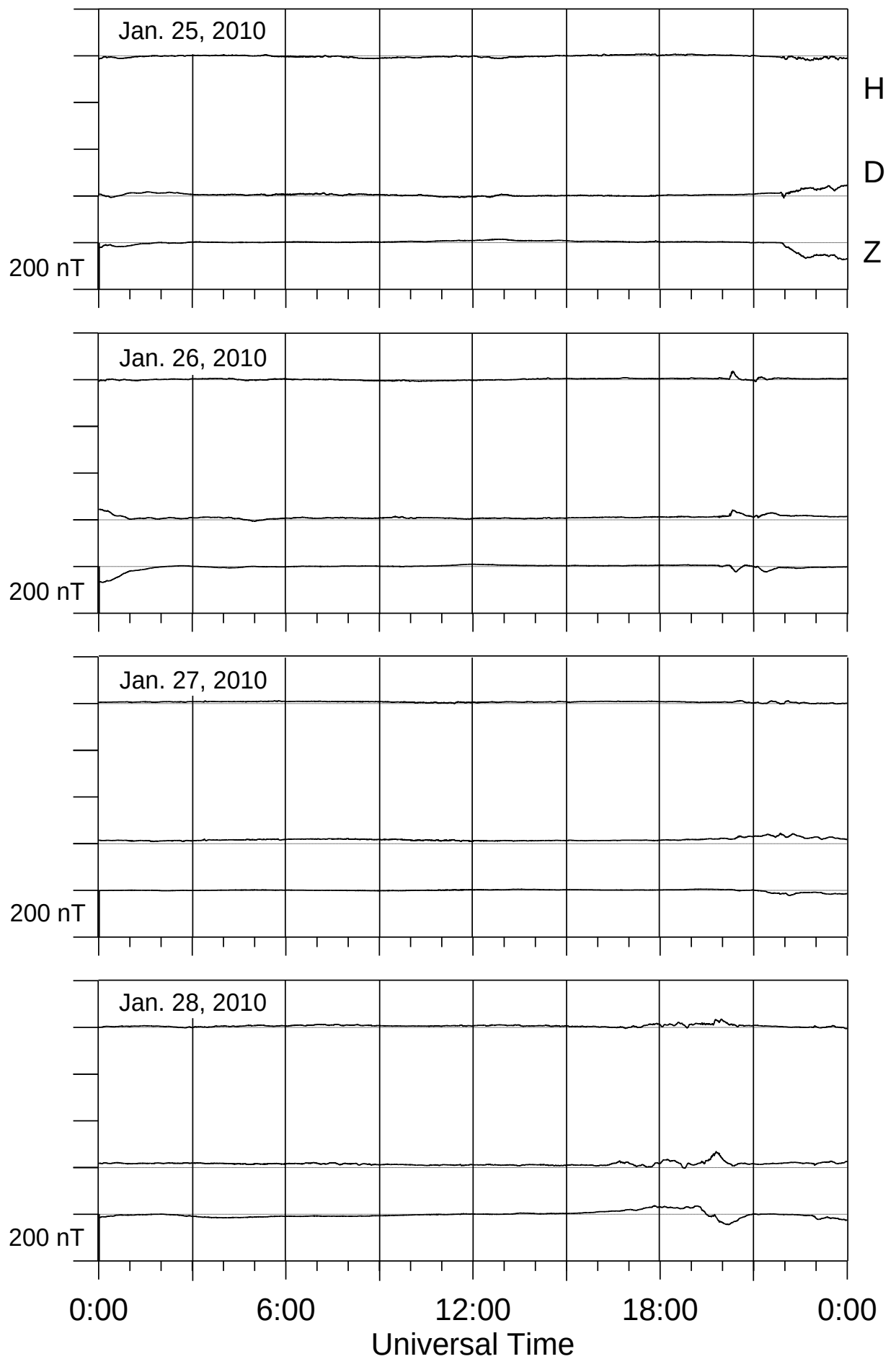
Lovozero magnetometer



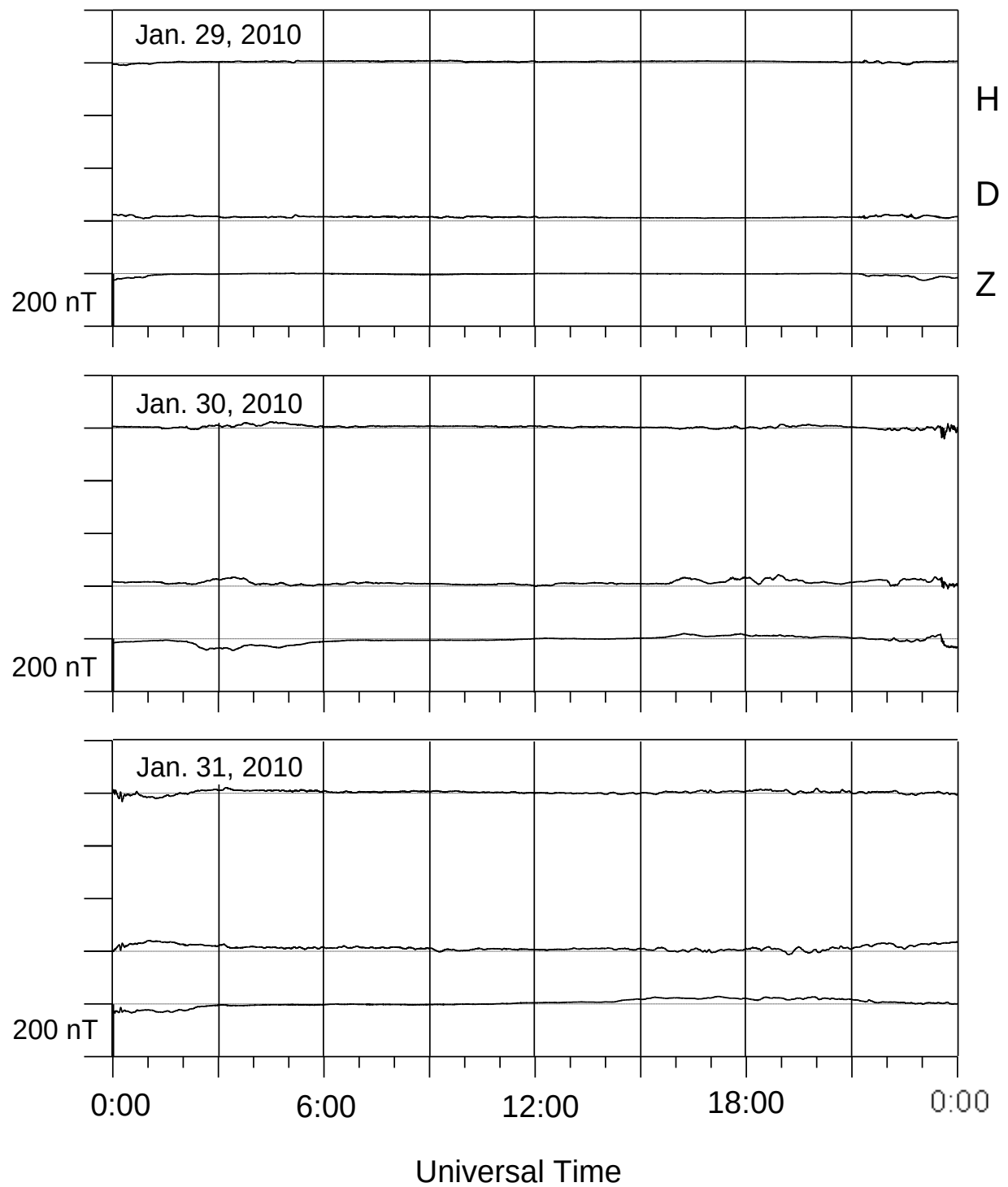
Lovozero magnetometer



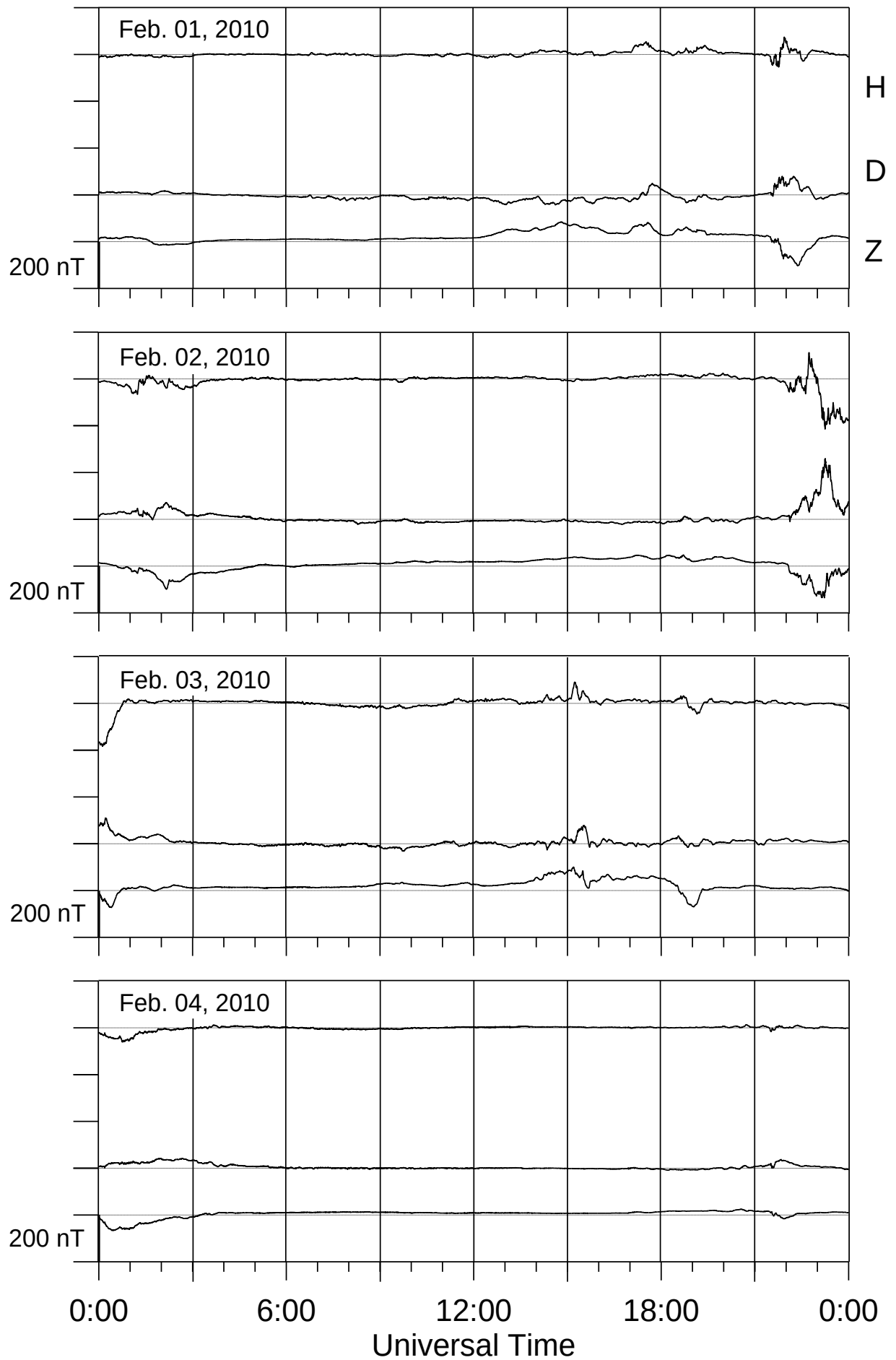
Lovozero magnetometer



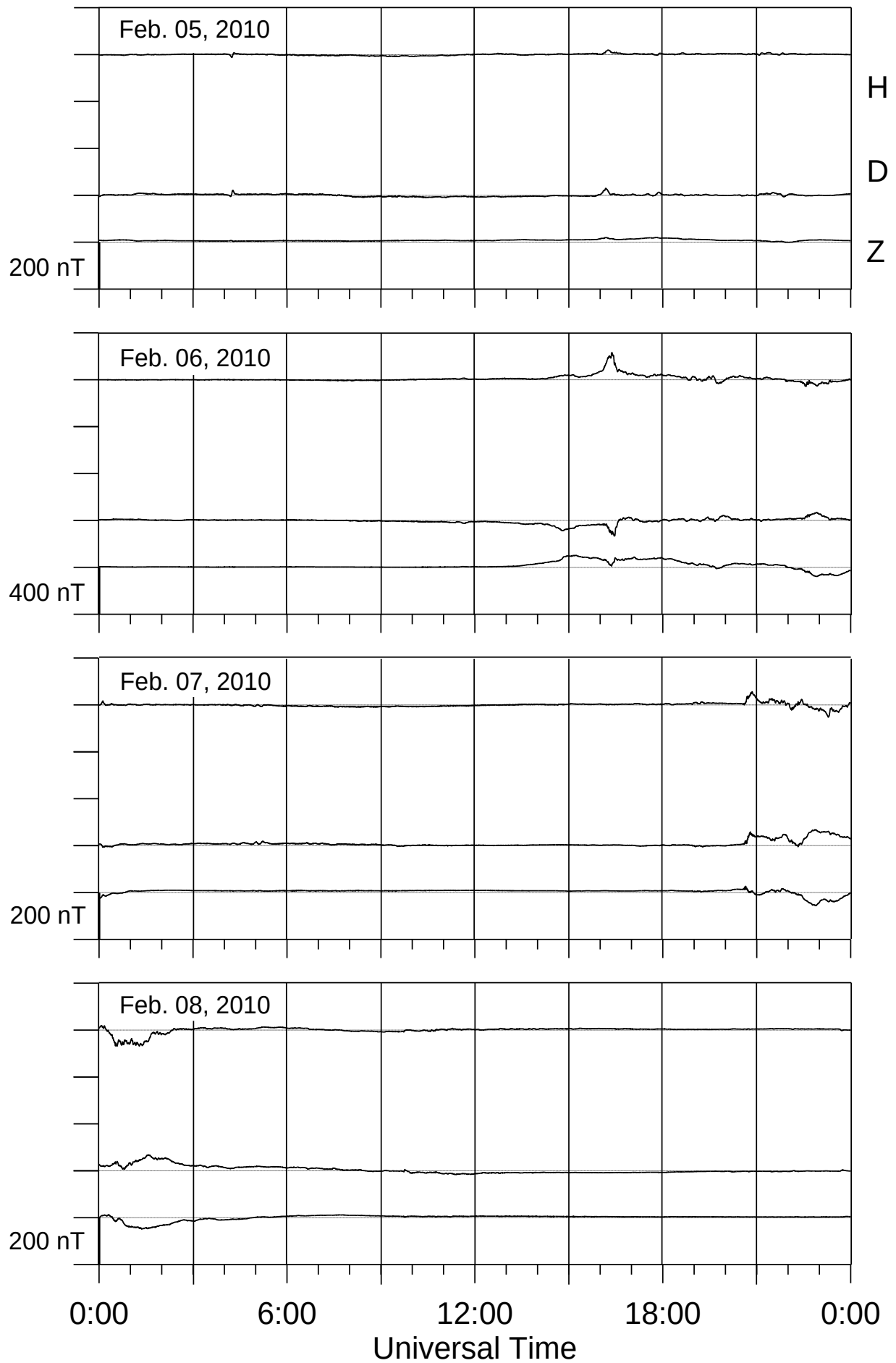
Lovozero magnetometer



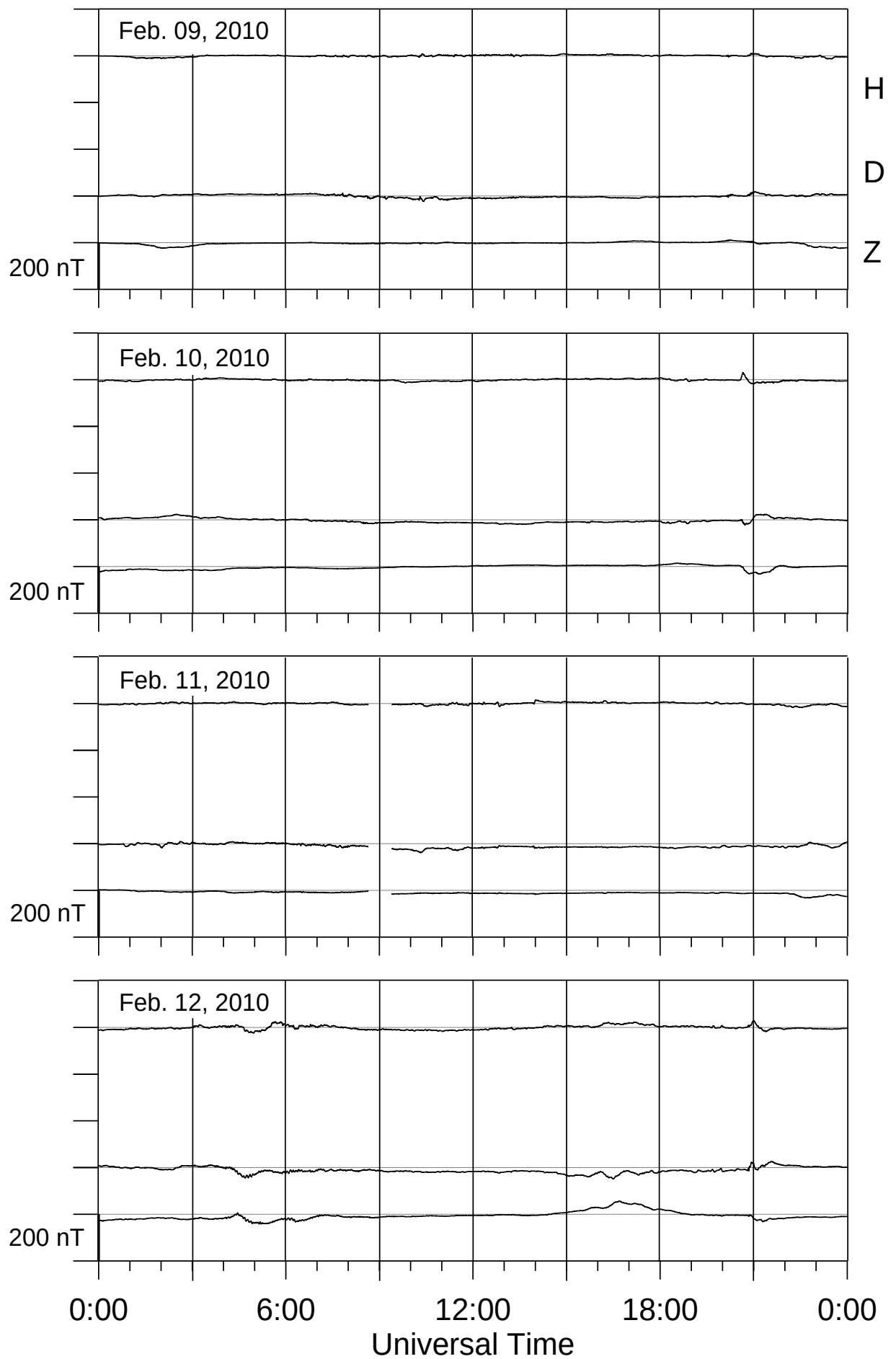
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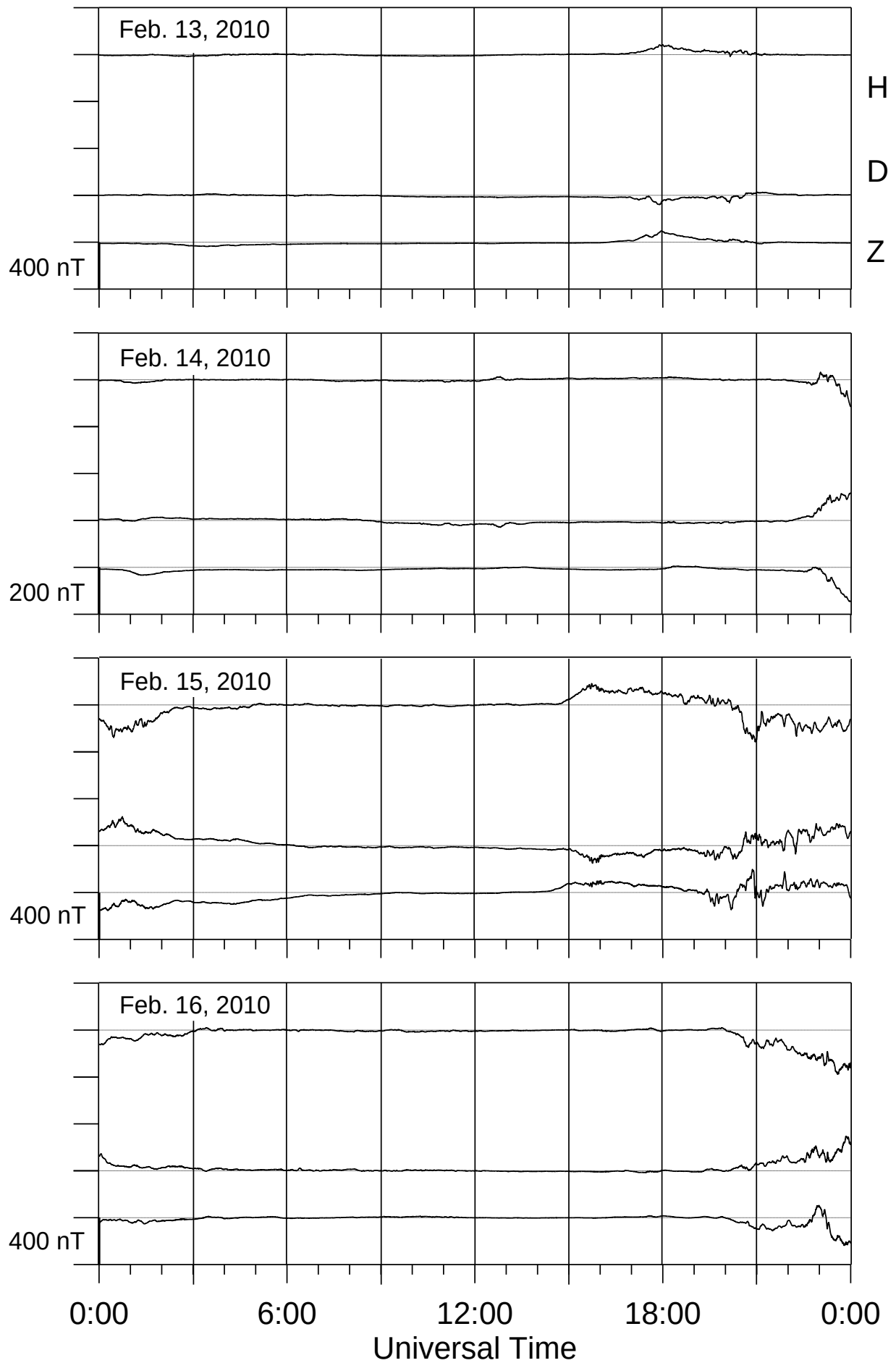
Lovozero magnetometer



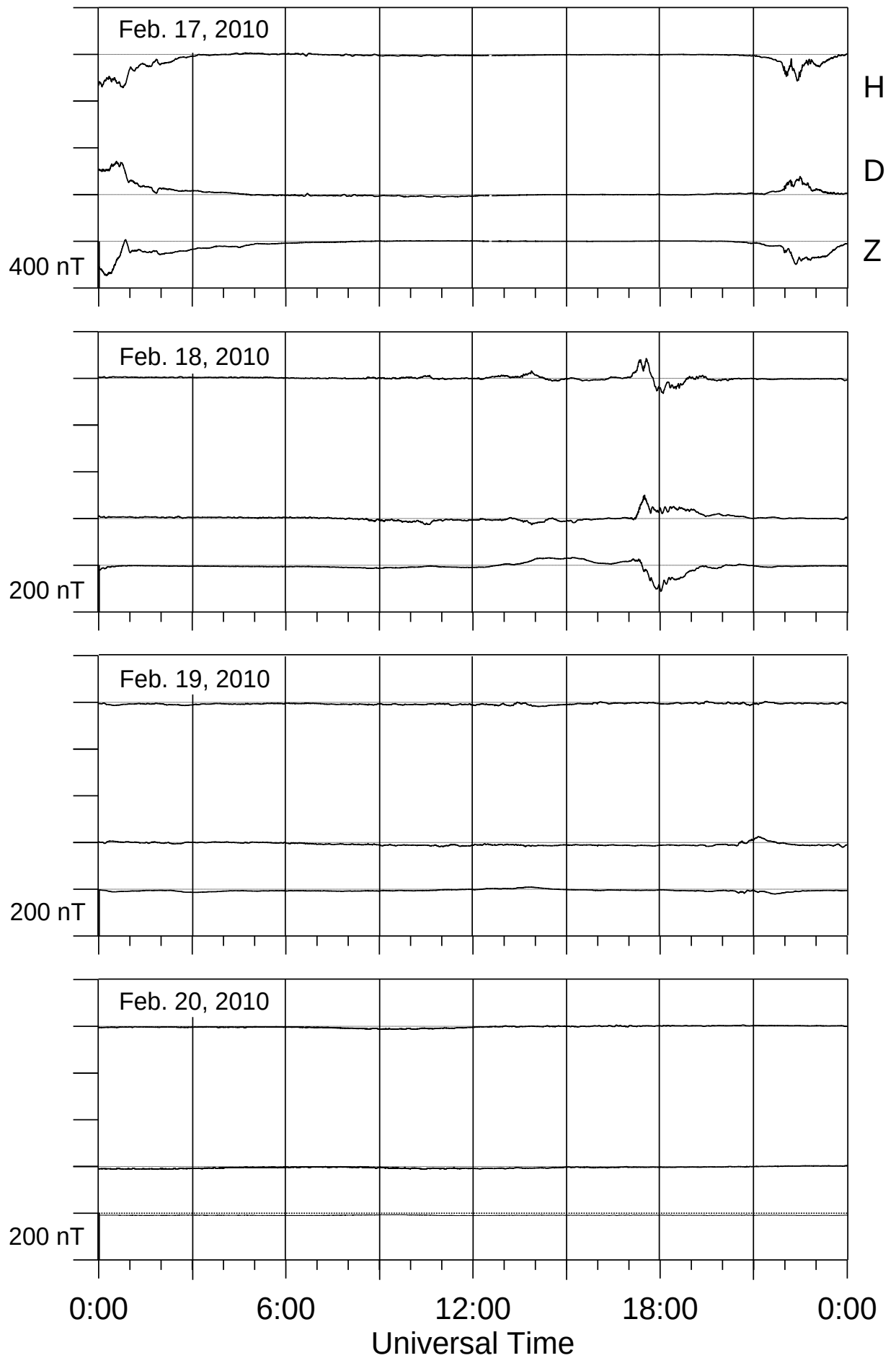
Lovozero magnetometer



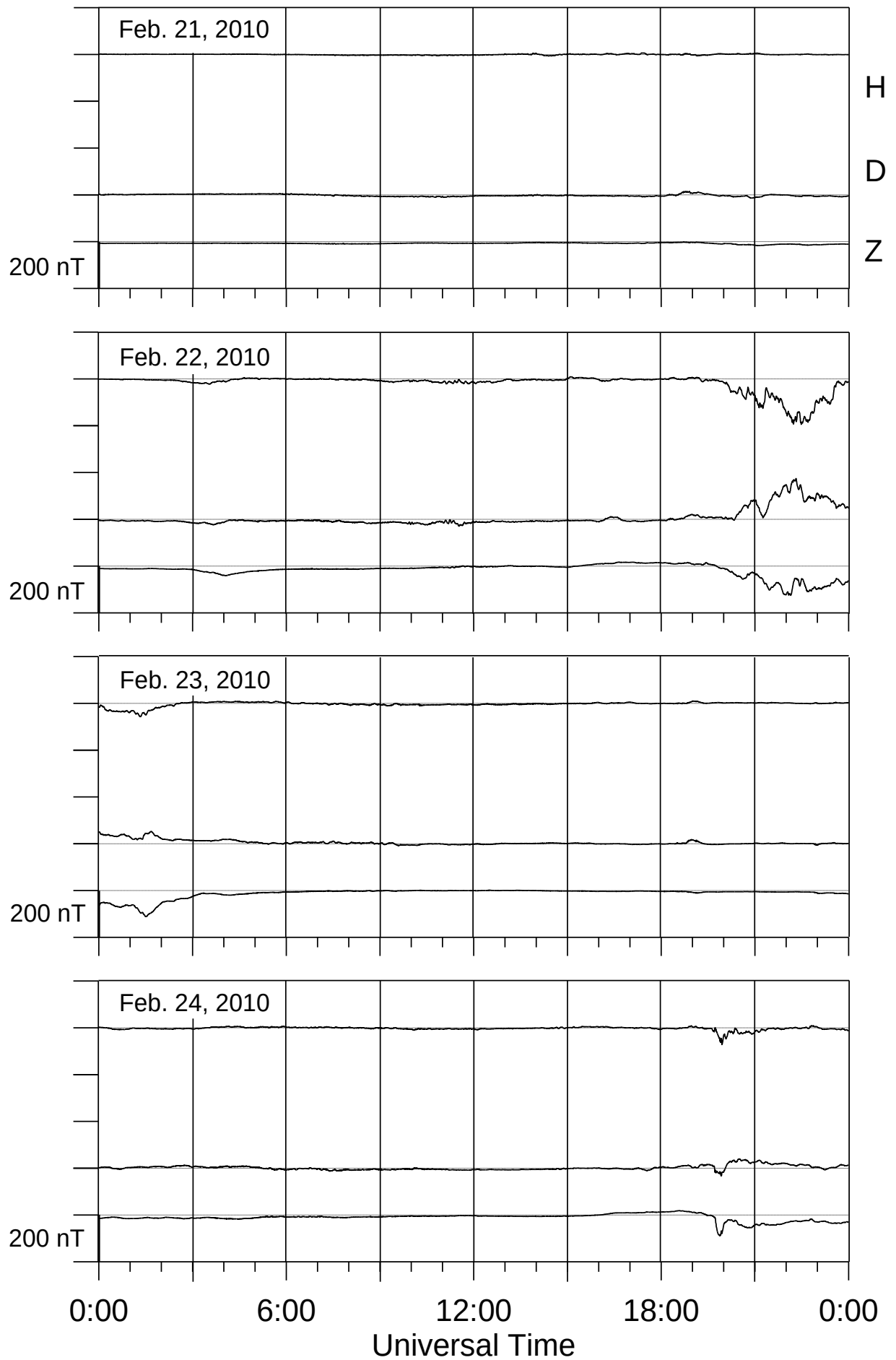
Lovozero magnetometer



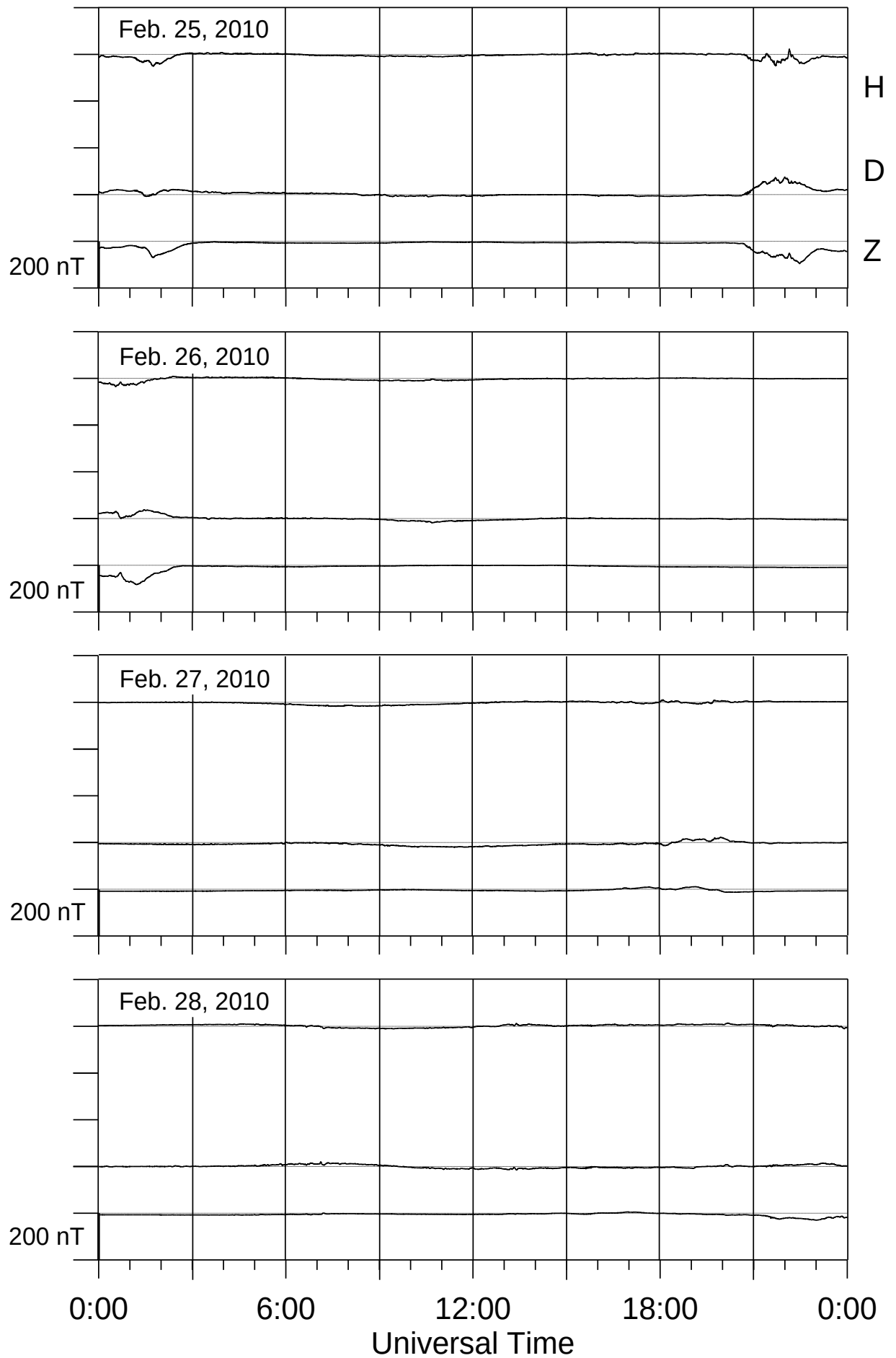
Lovozero magnetometer



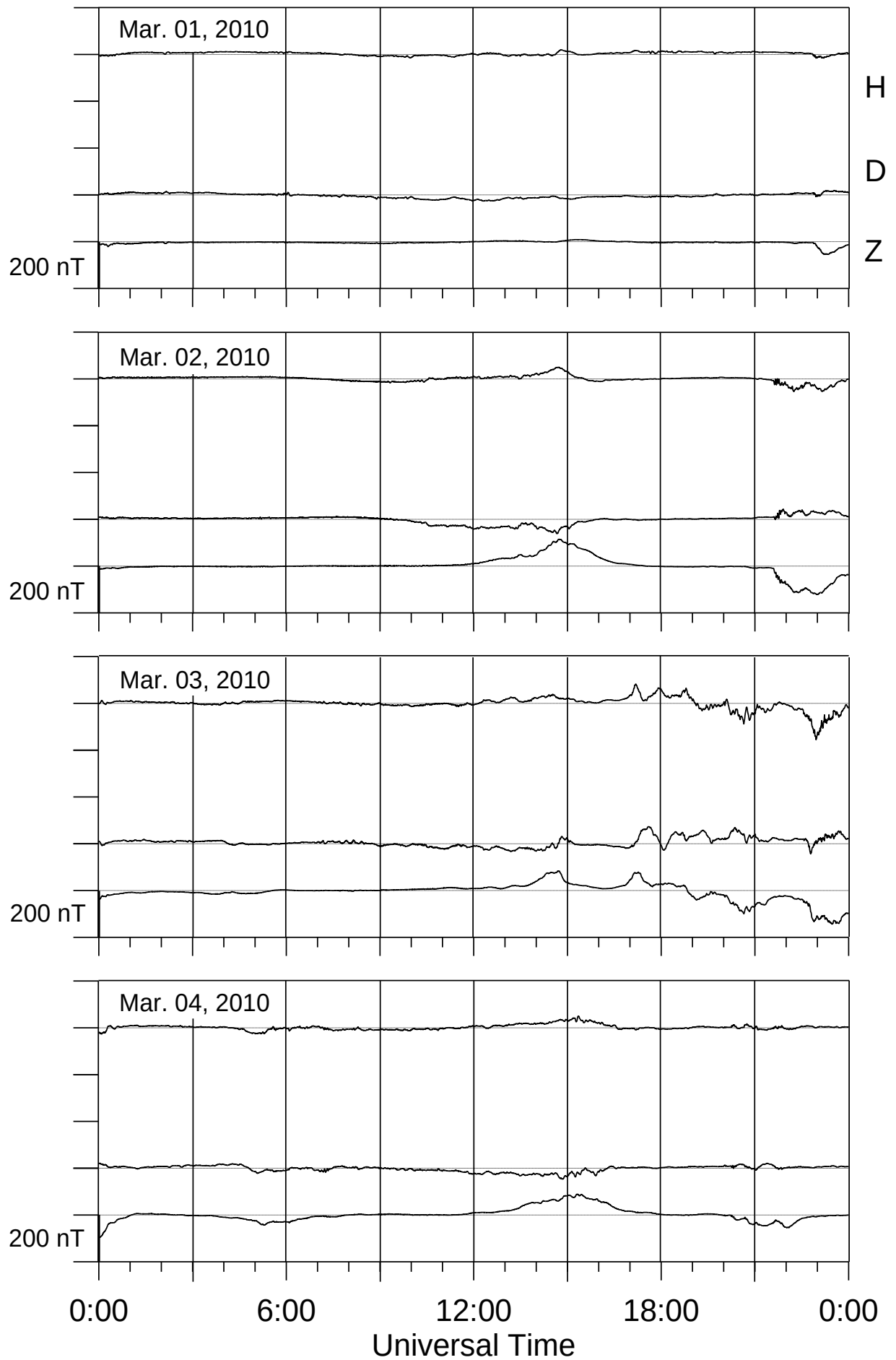
Lovozero magnetometer



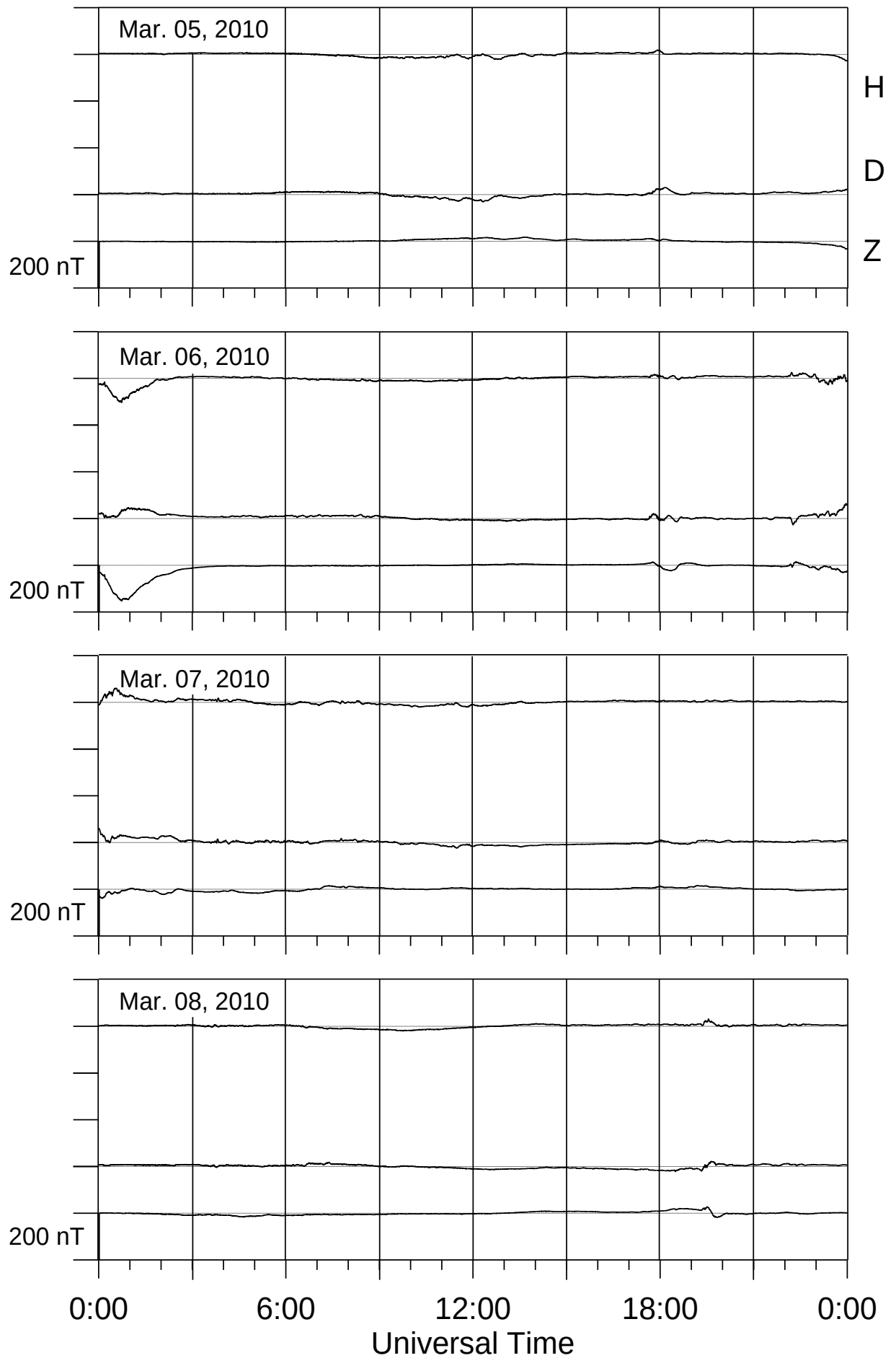
Lovozero magnetometer



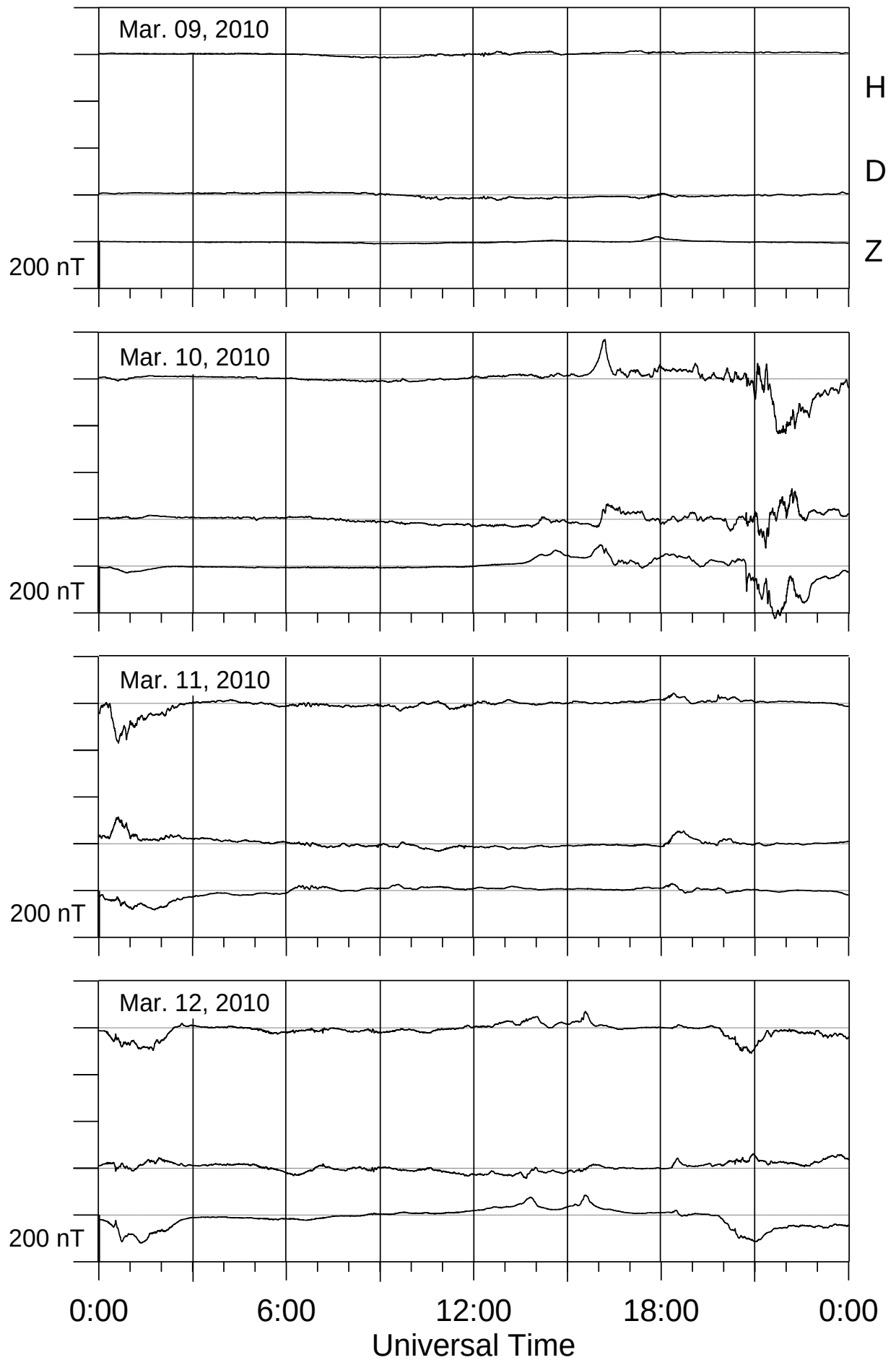
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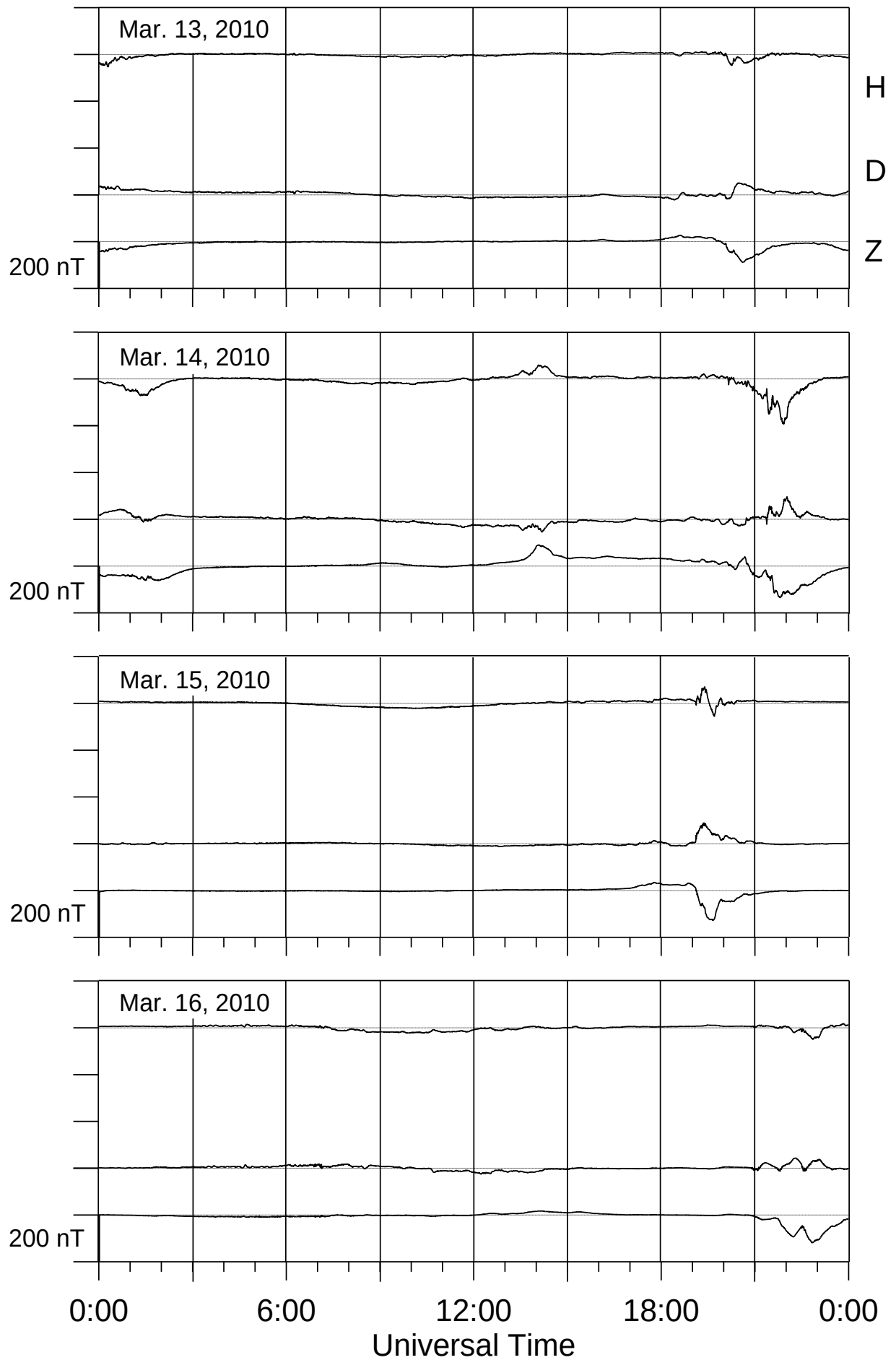
Lovozero magnetometer



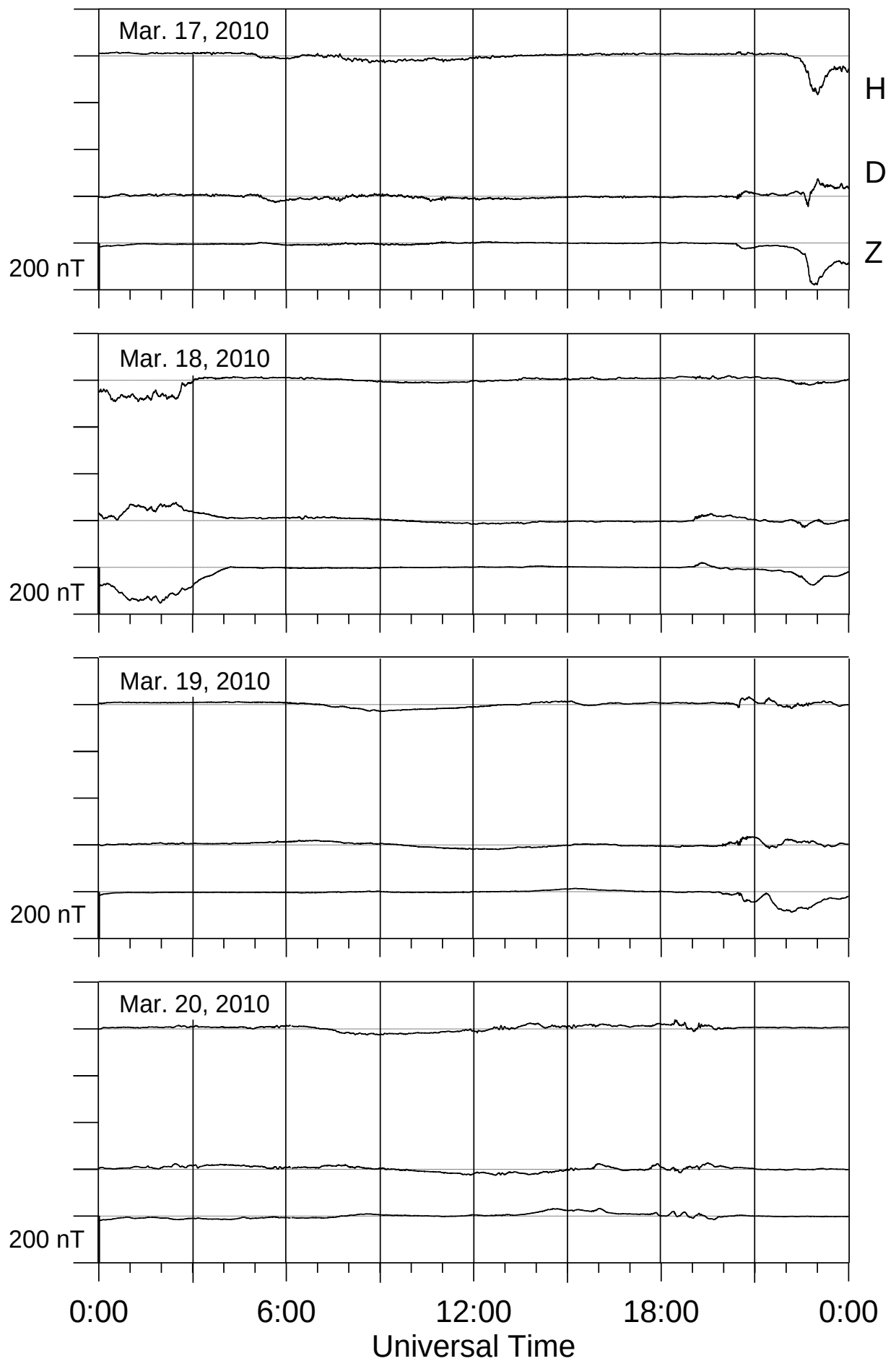
Lovozero magnetometer



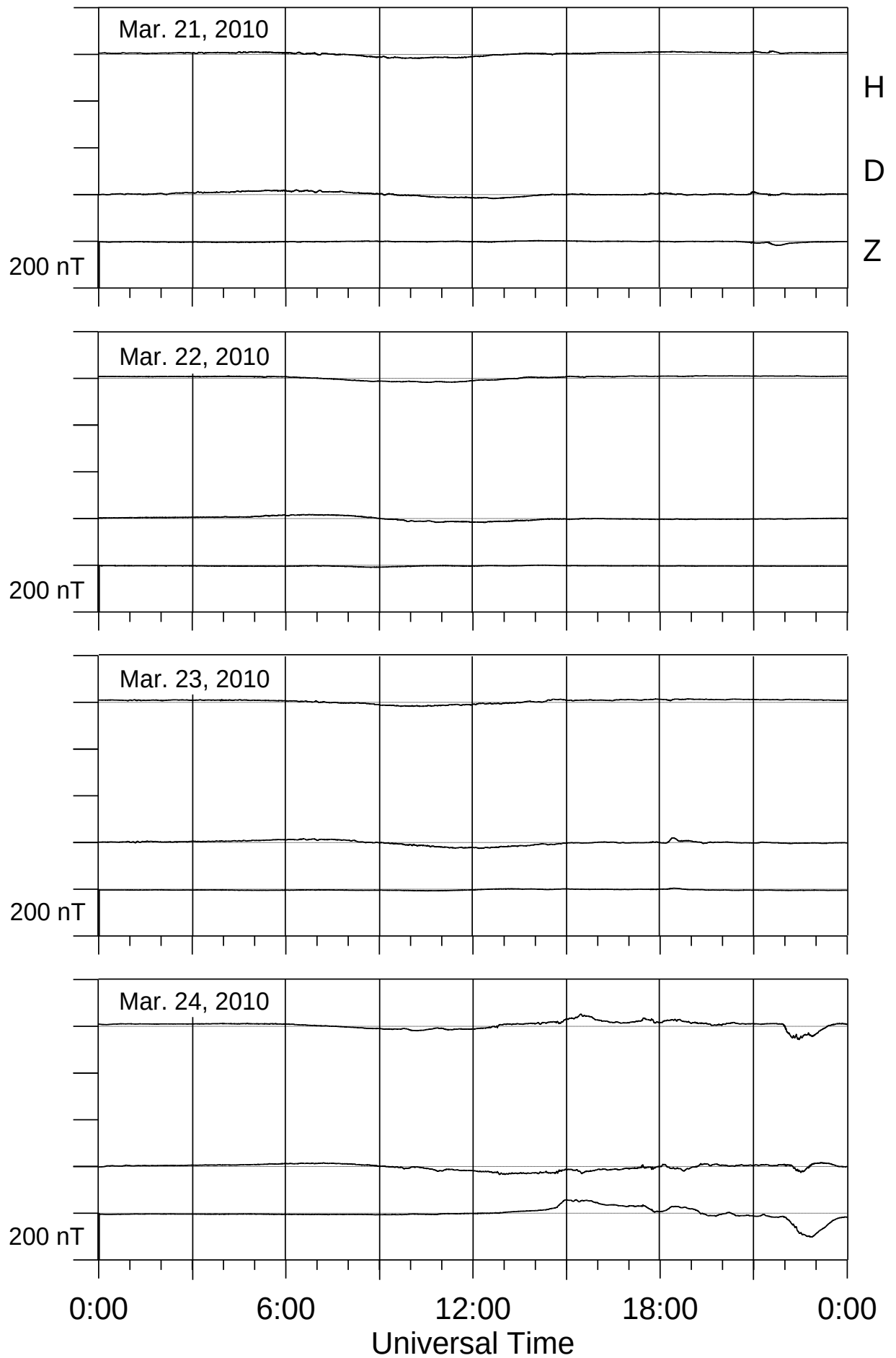
Lovozero magnetometer



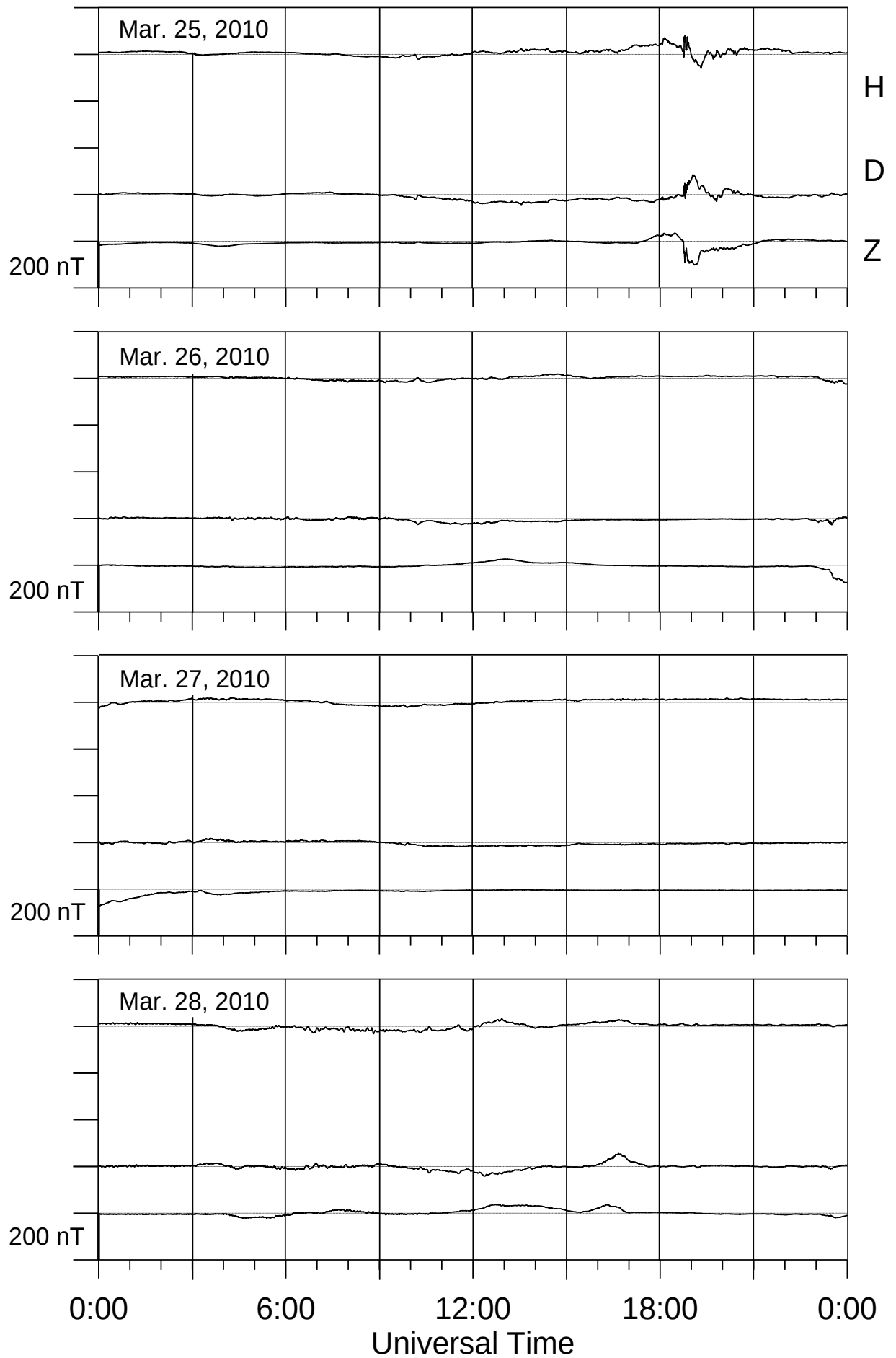
Lovozero magnetometer



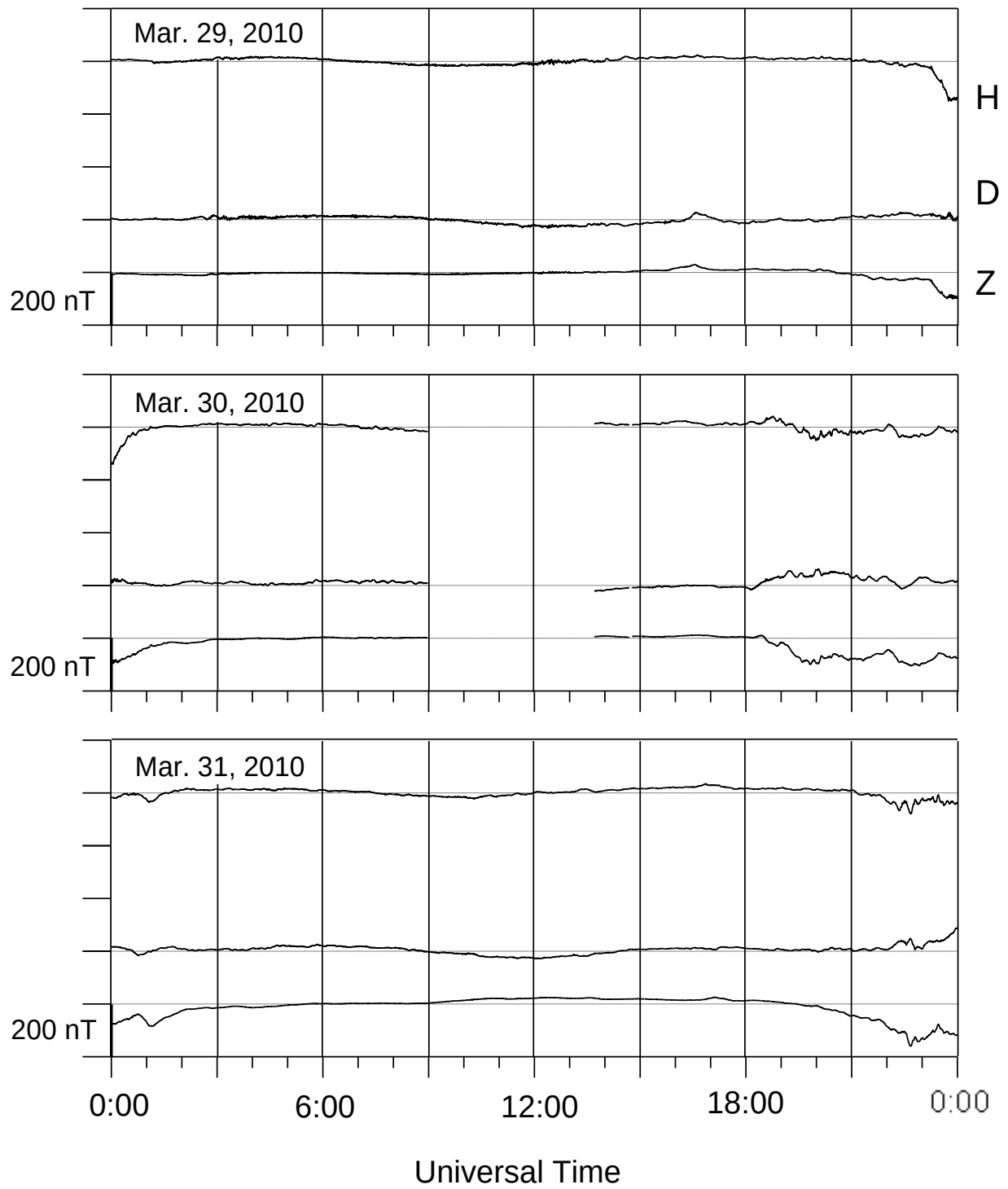
Lovozero magnetometer



Lovozero magnetometer



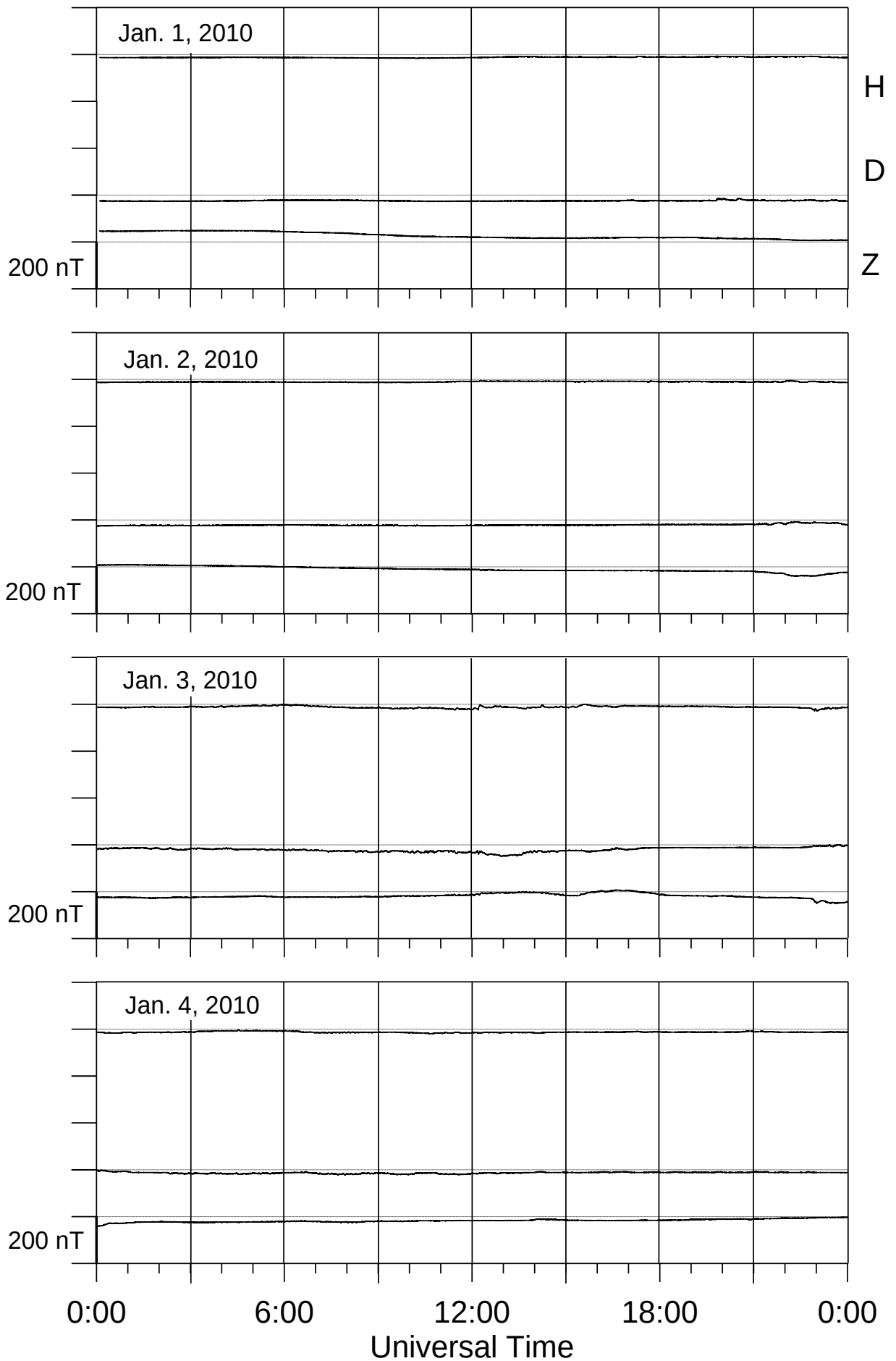
Lovozero magnetometer



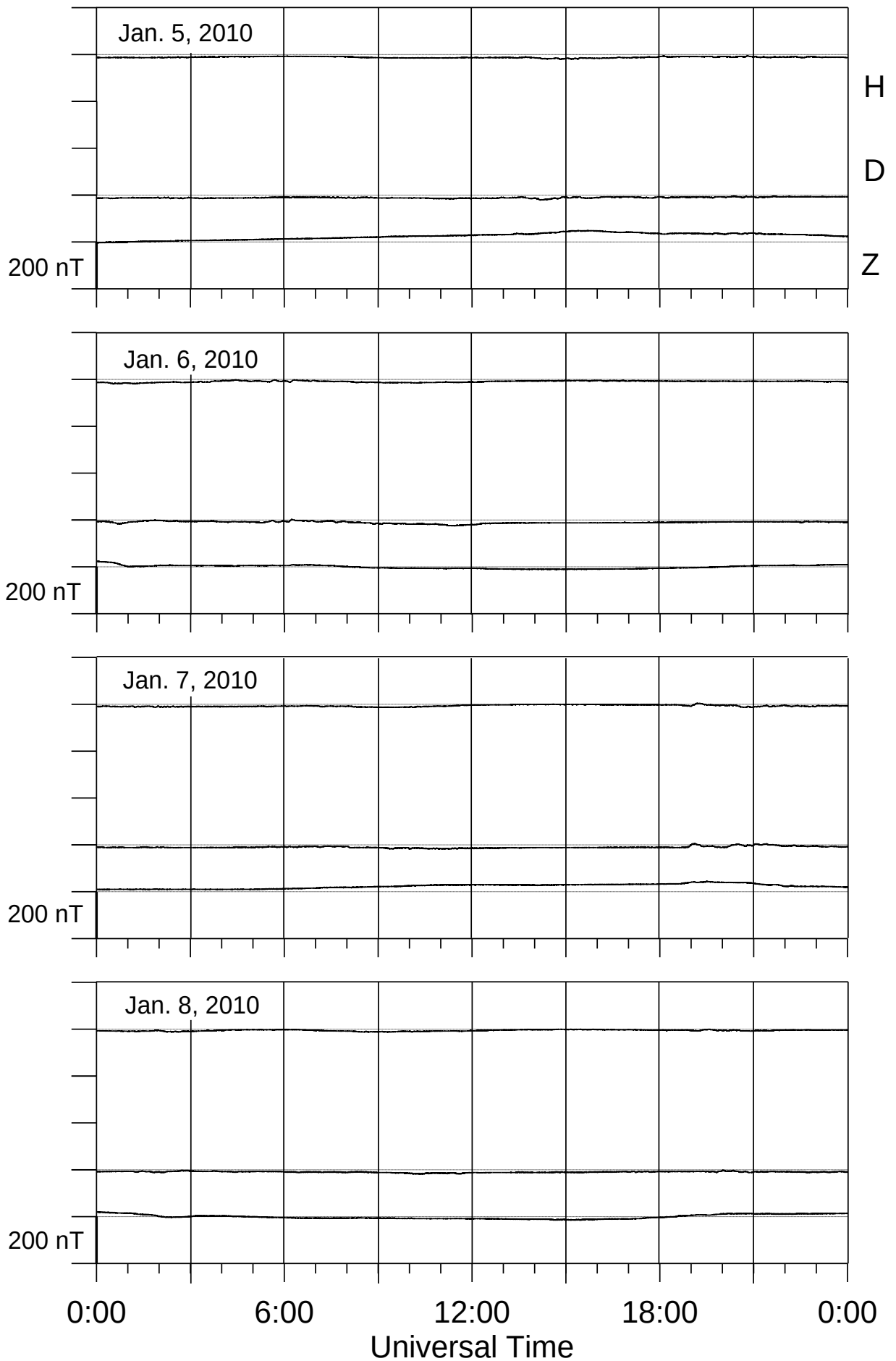
LOPARSKAYA MAGNETOGRAMS

January - March 2010

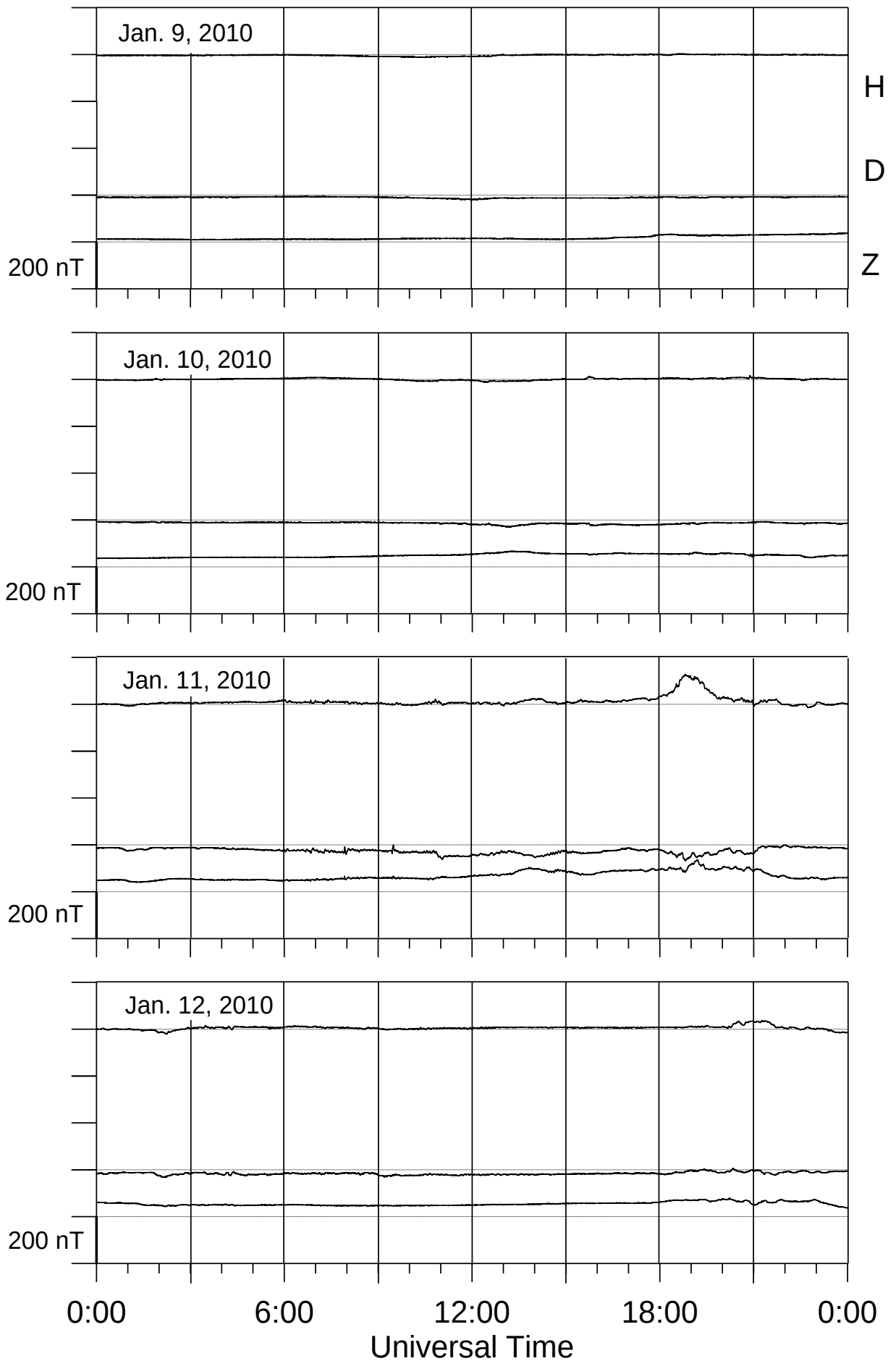
Loparskaya magnetometer



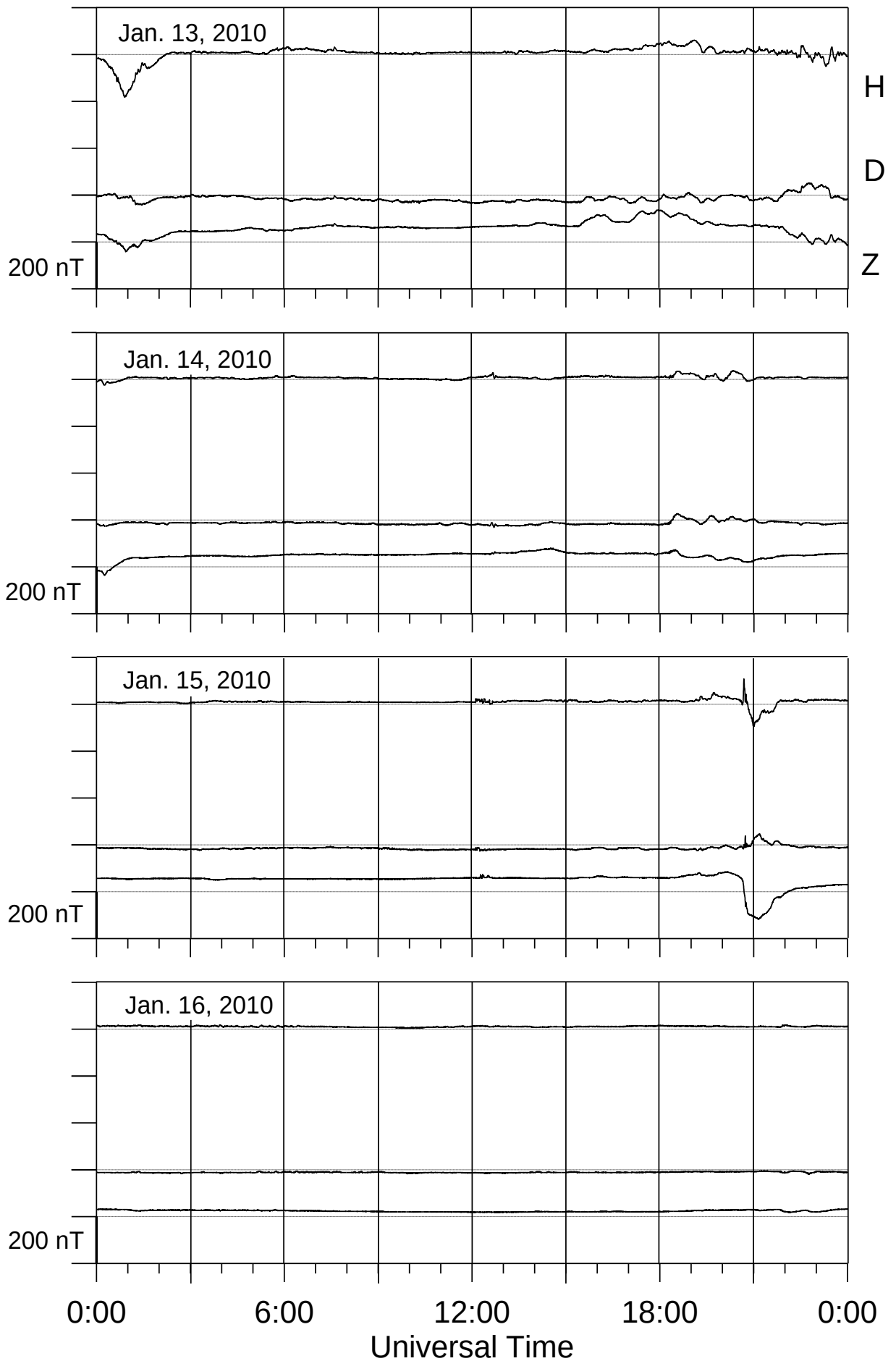
Loparskaya magnetometer



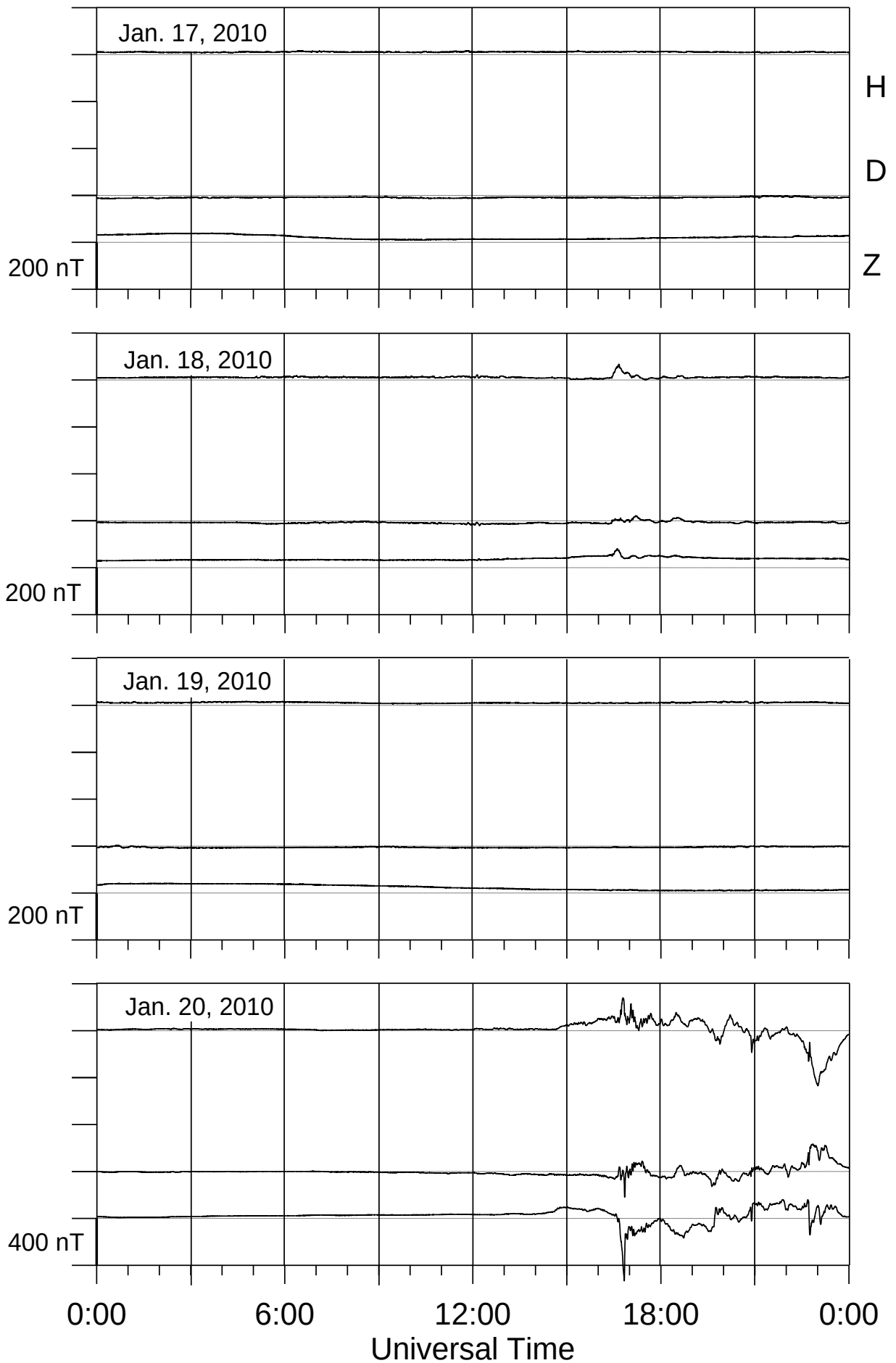
Loparskaya magnetometer



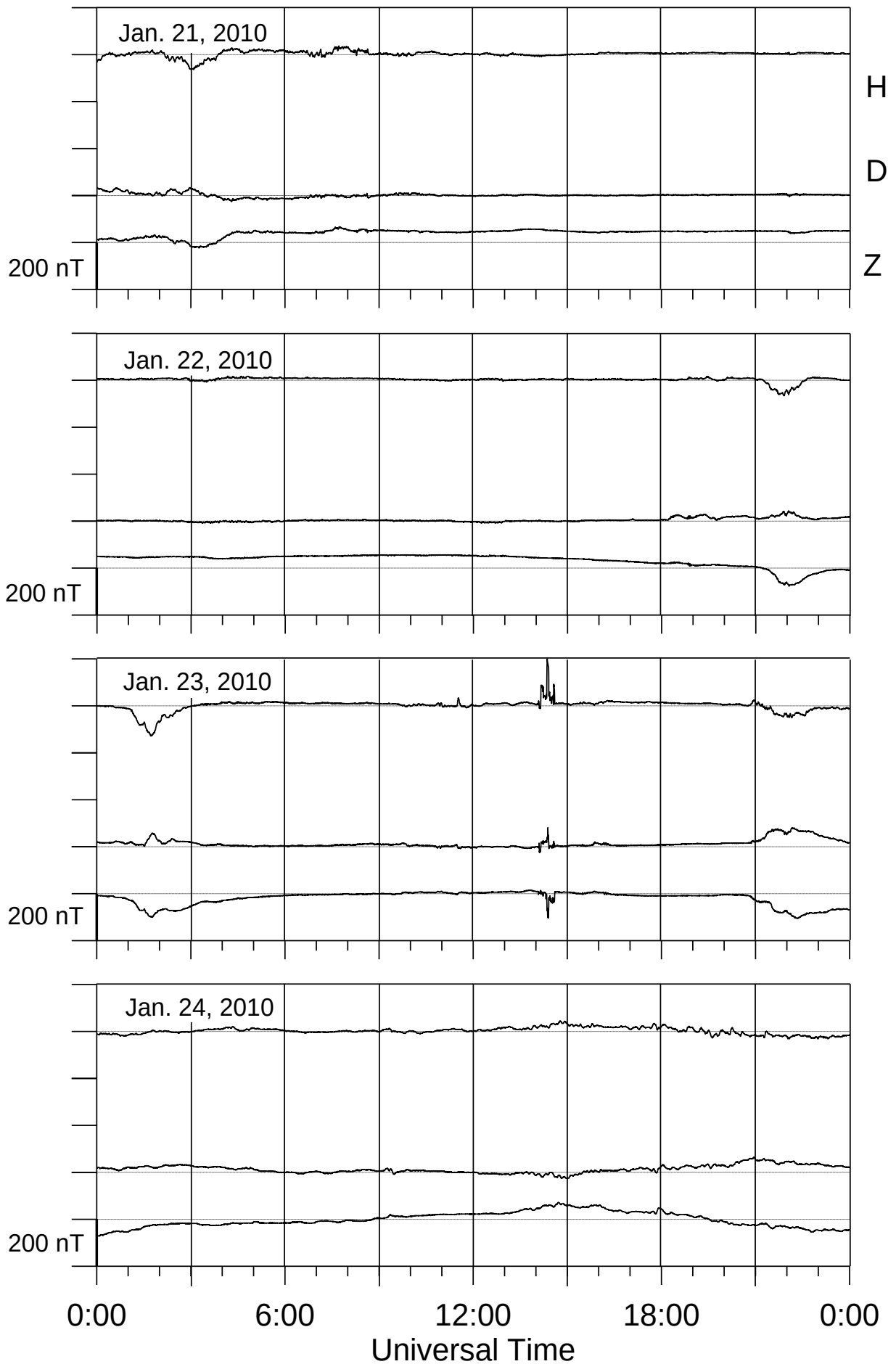
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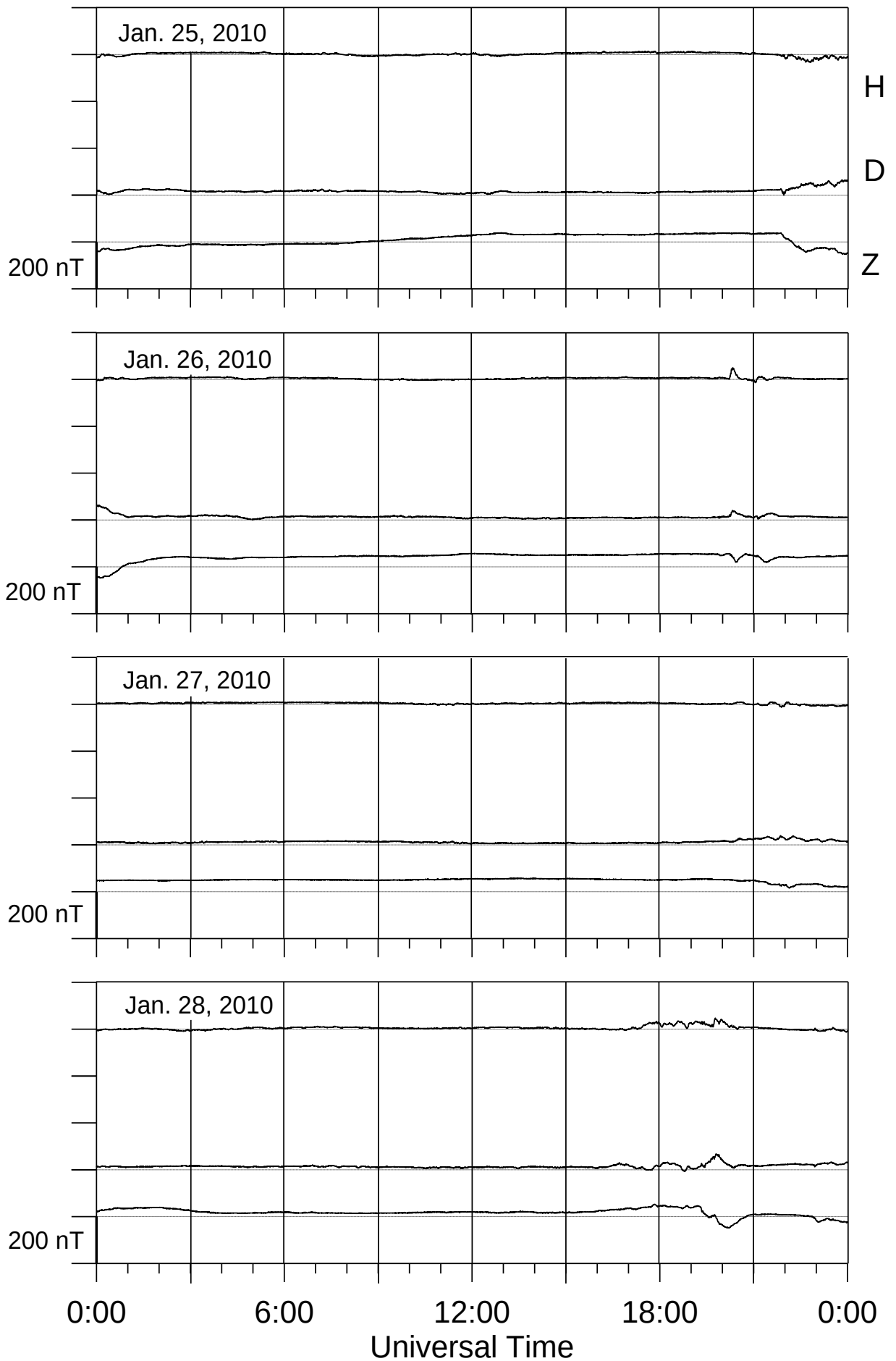
Loparskaya magnetometer



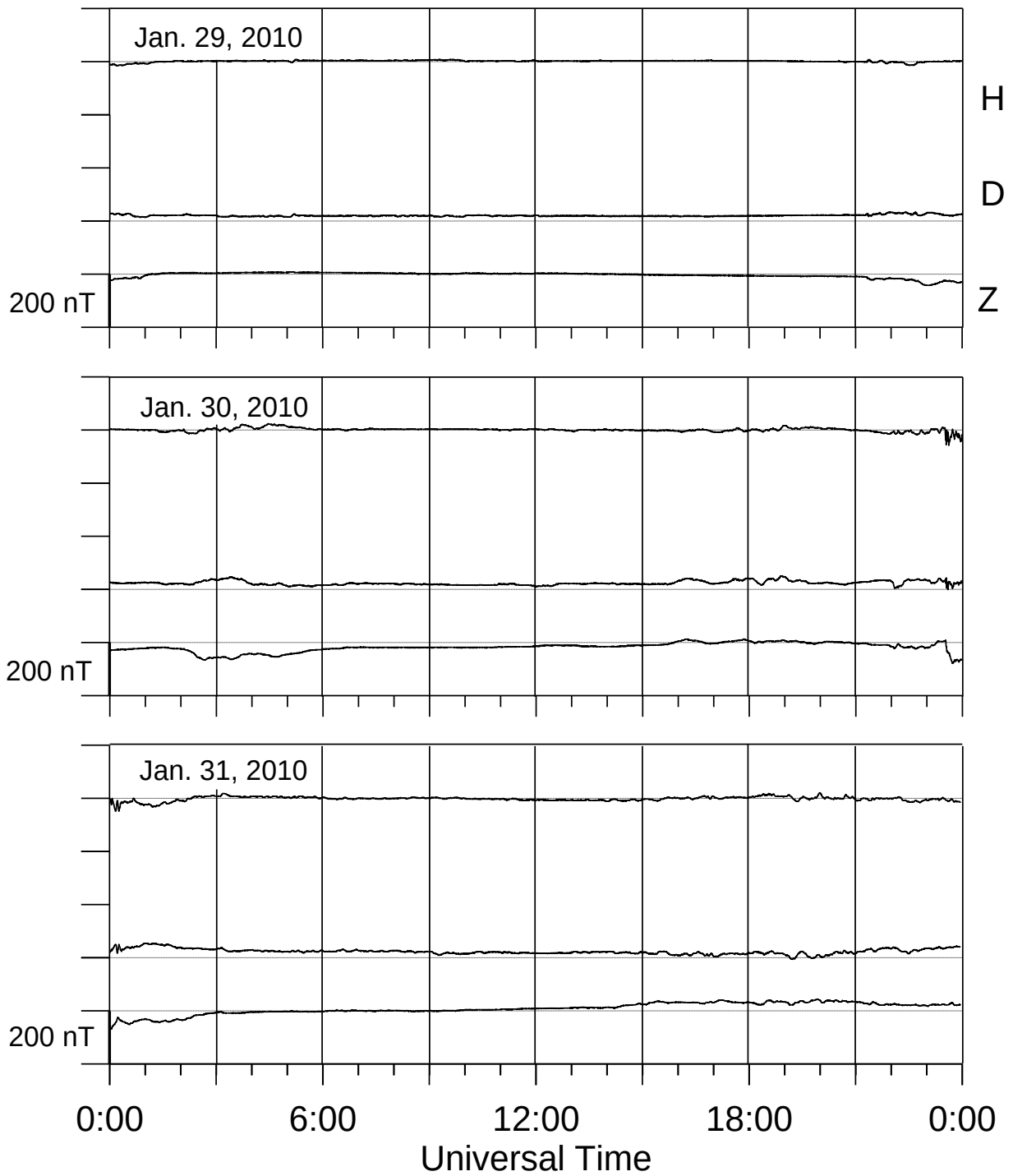
Loparskaya magnetometer



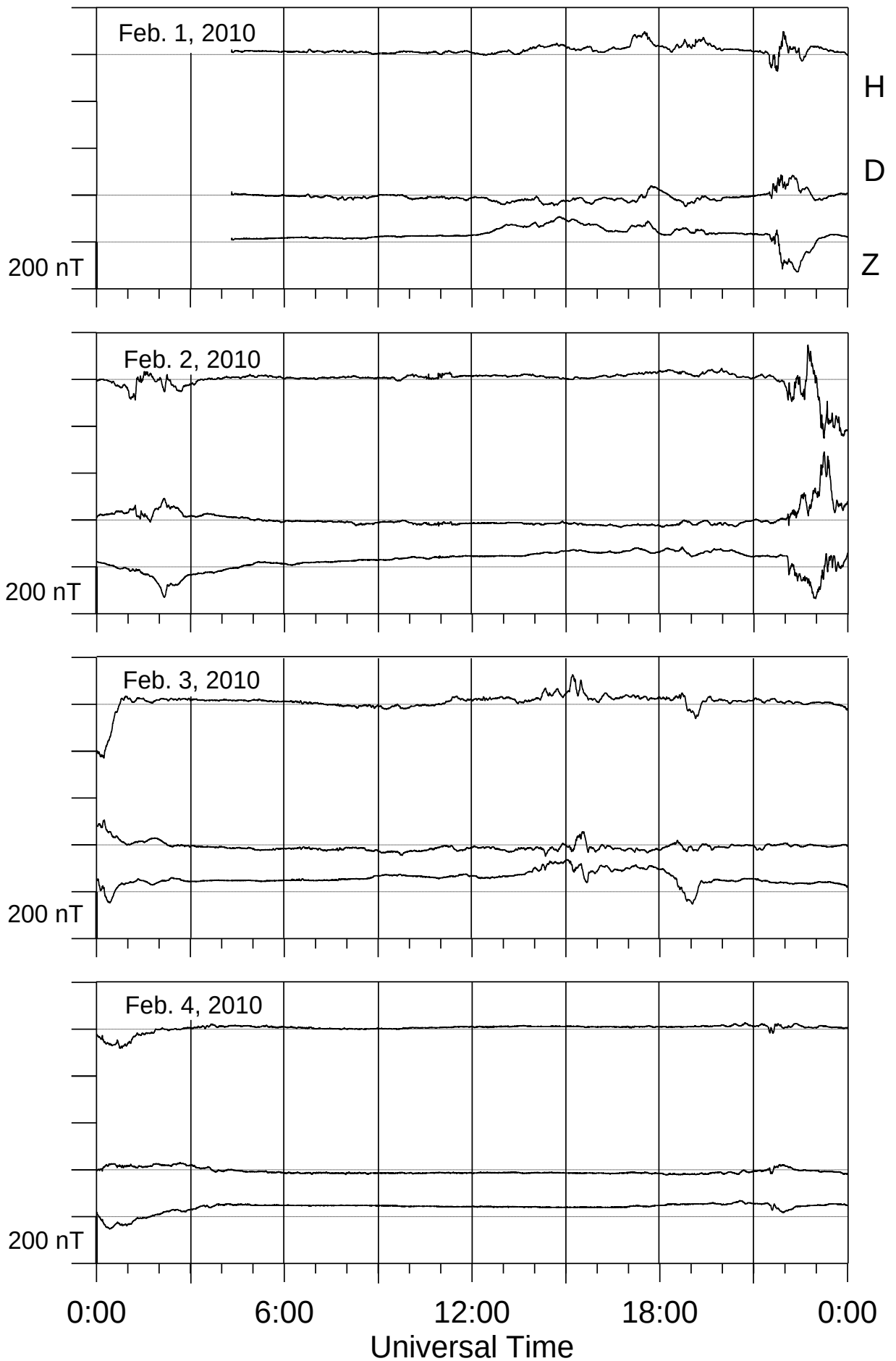
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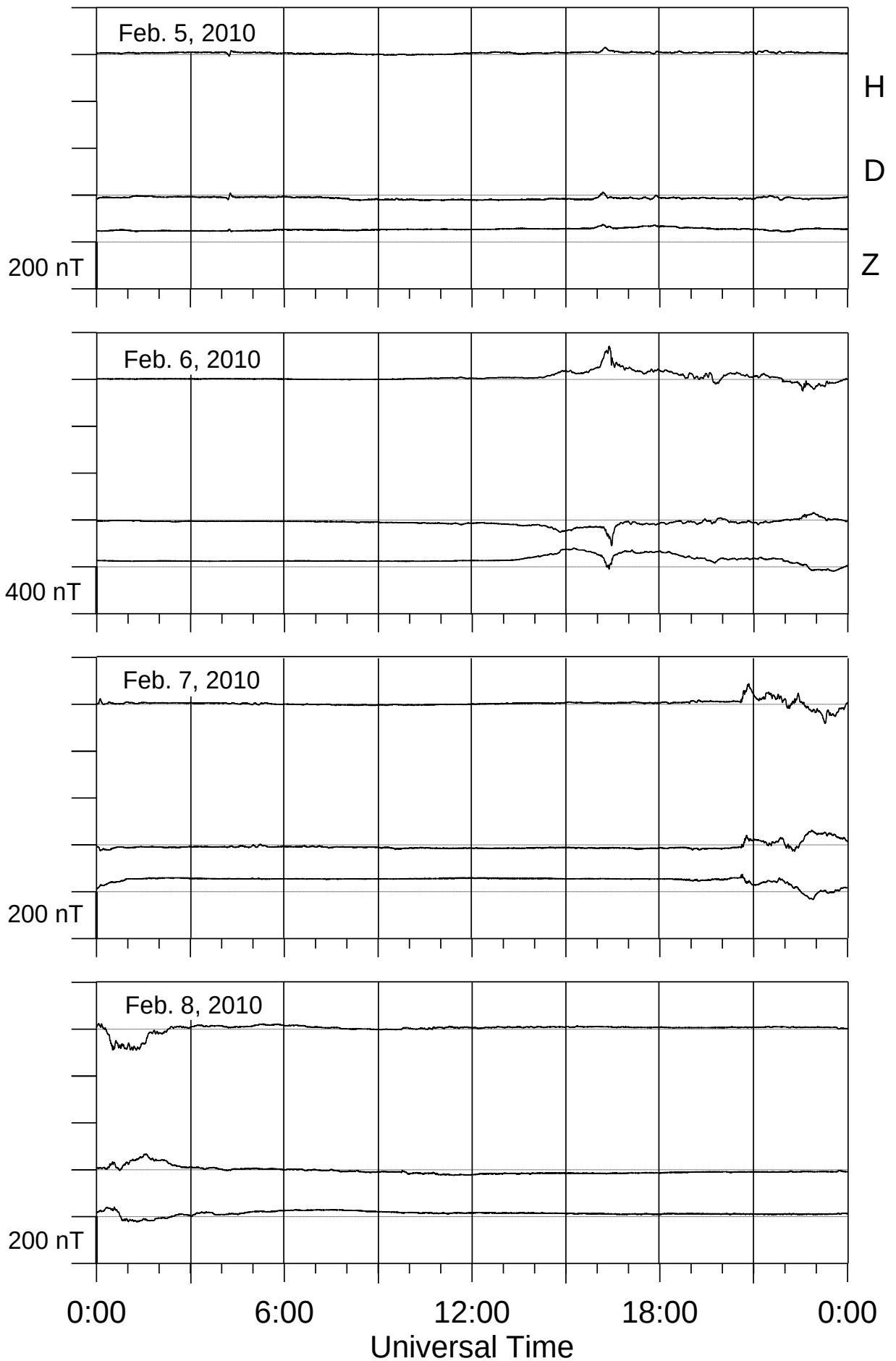
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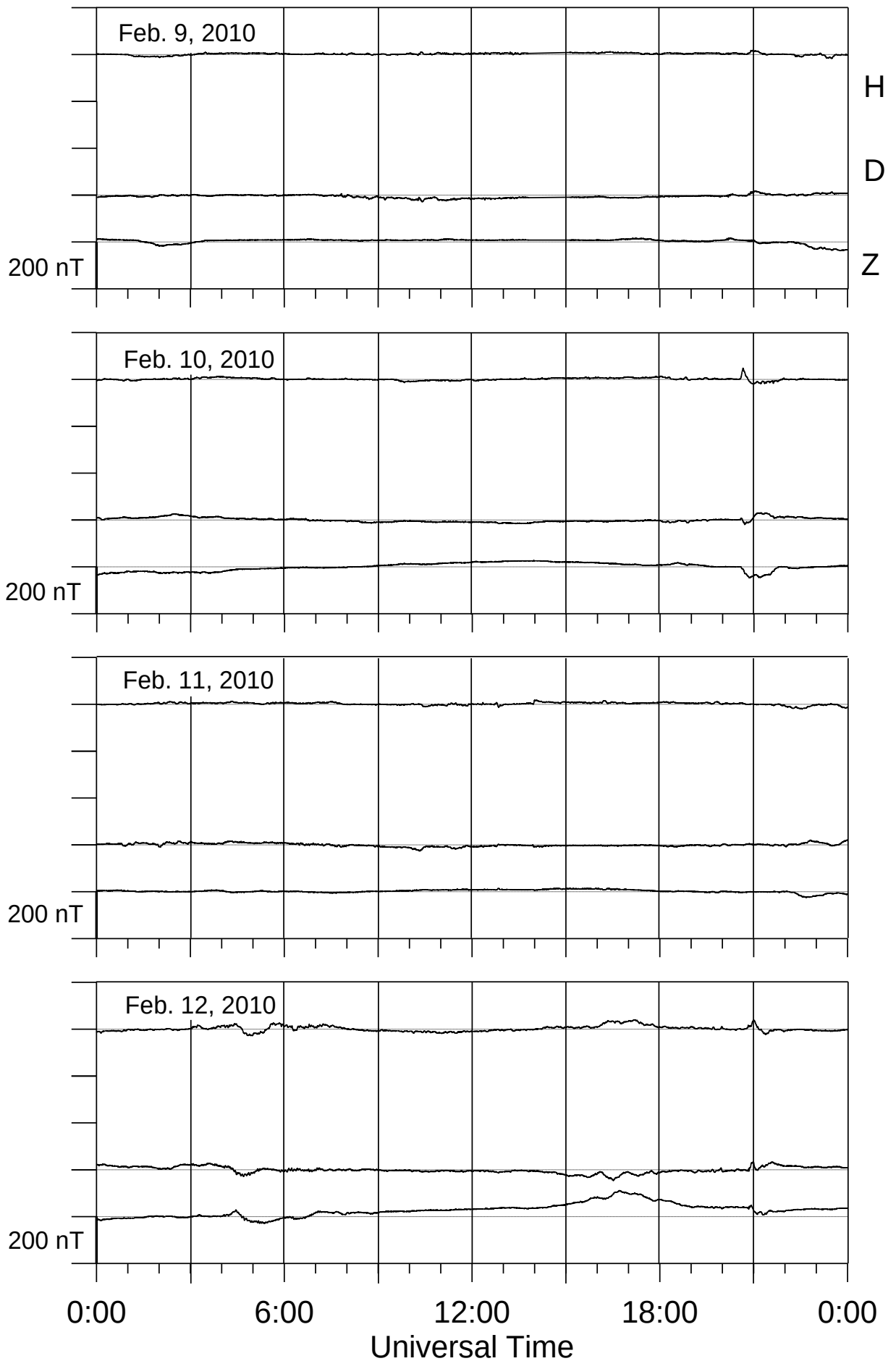
Loparskaya magnetometer



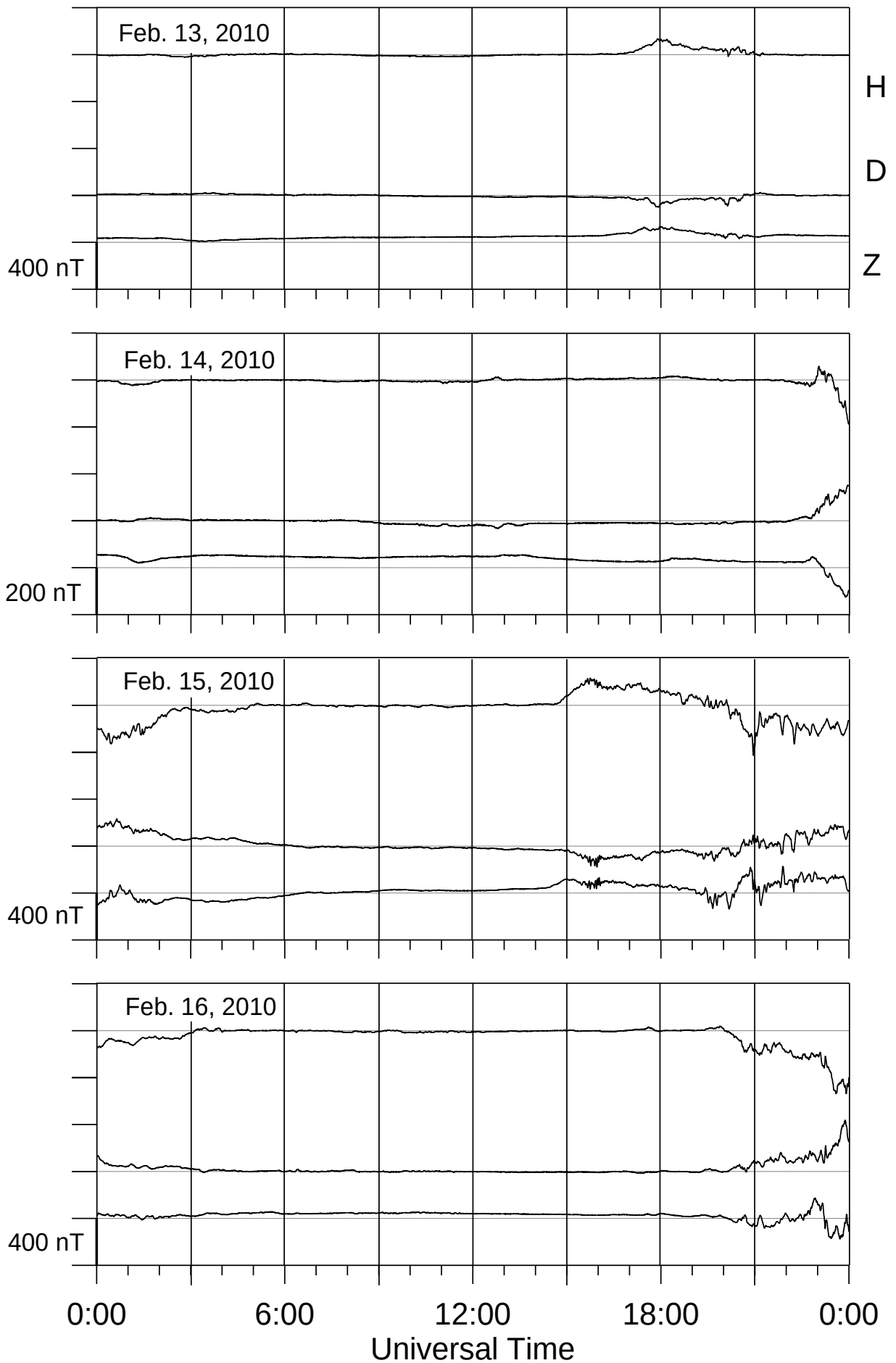
Loparskaya magnetometer



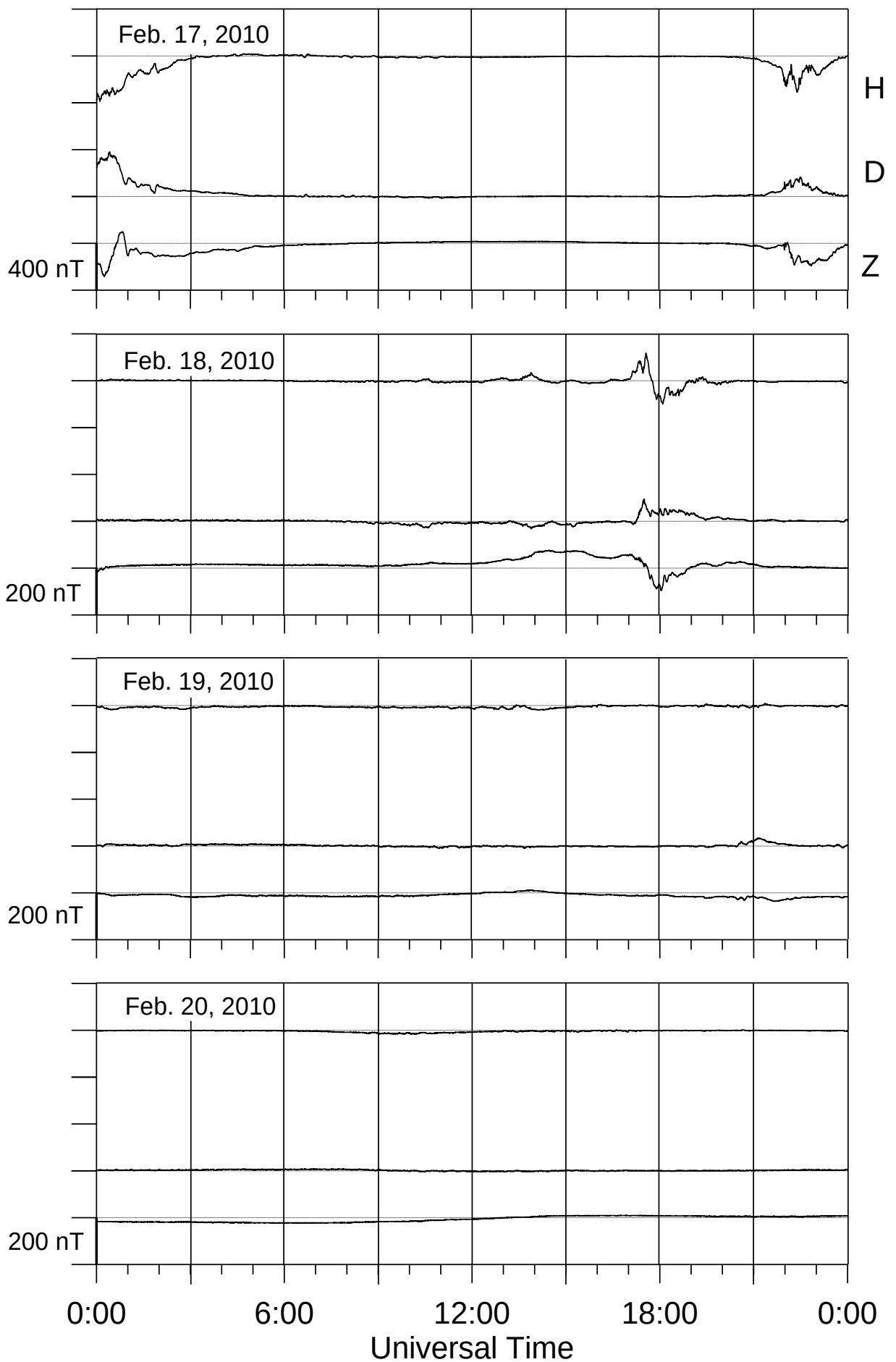
Loparskaya magnetometer



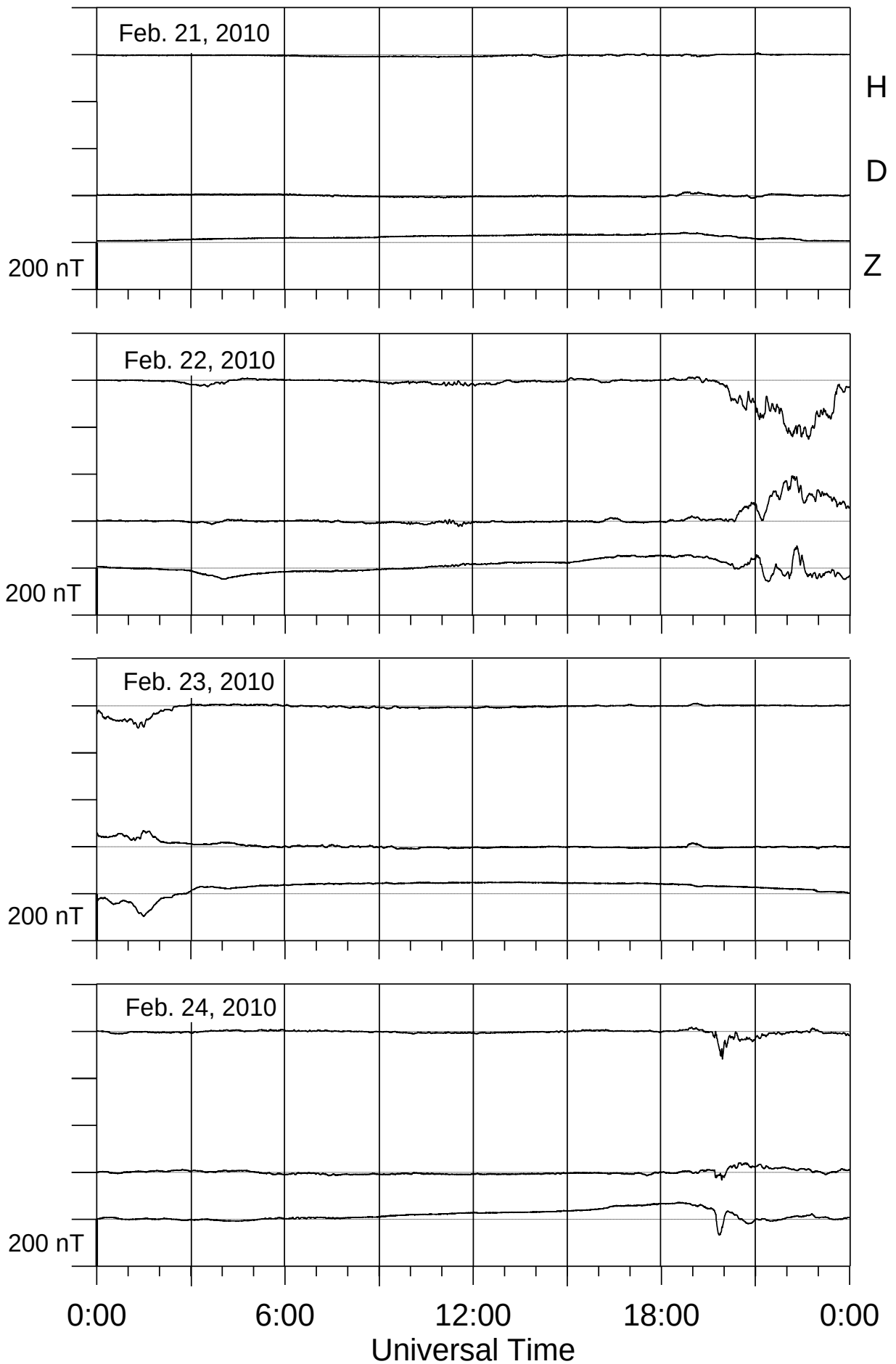
Loparskaya magnetometer



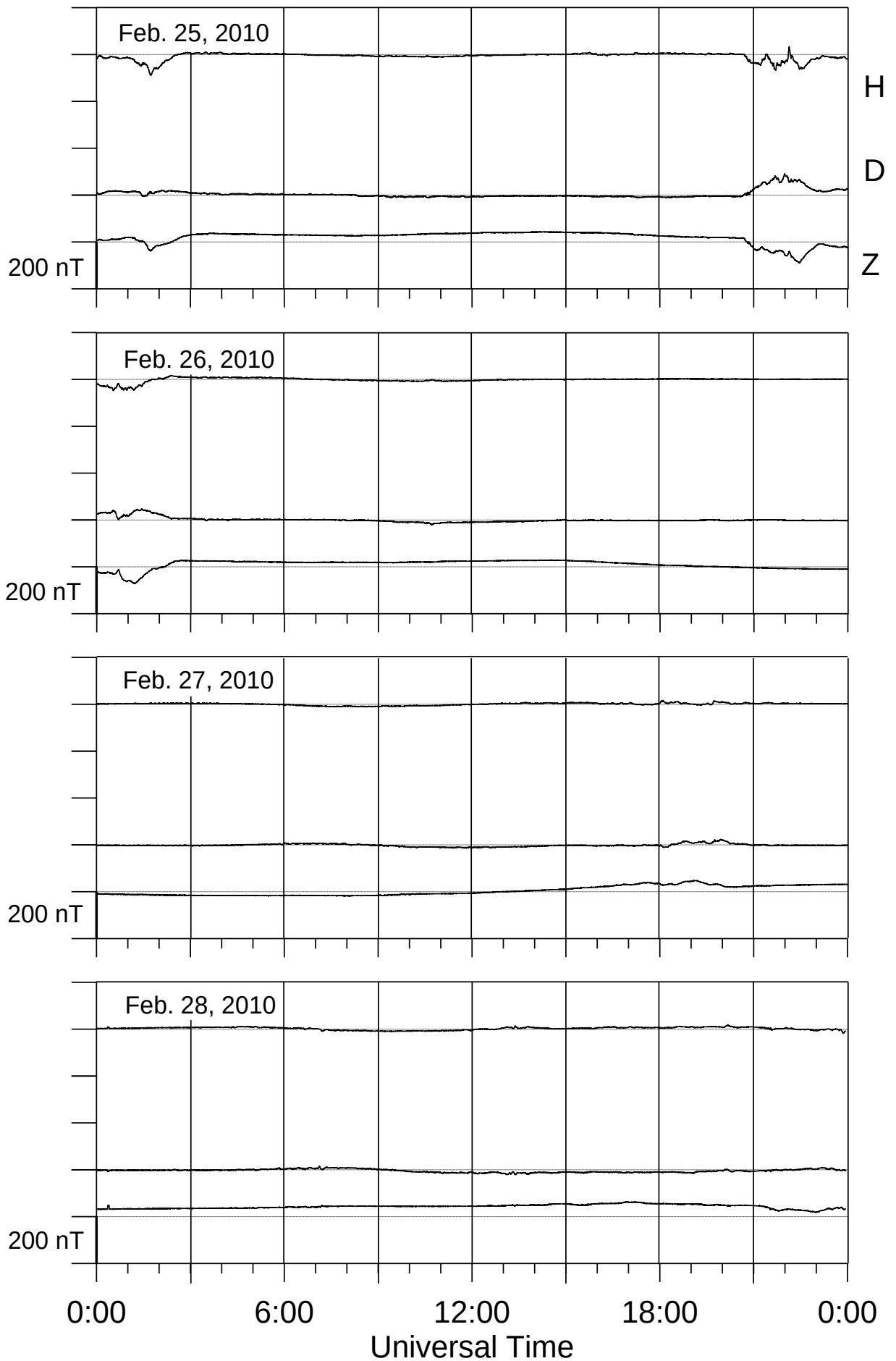
Loparskaya magnetometer



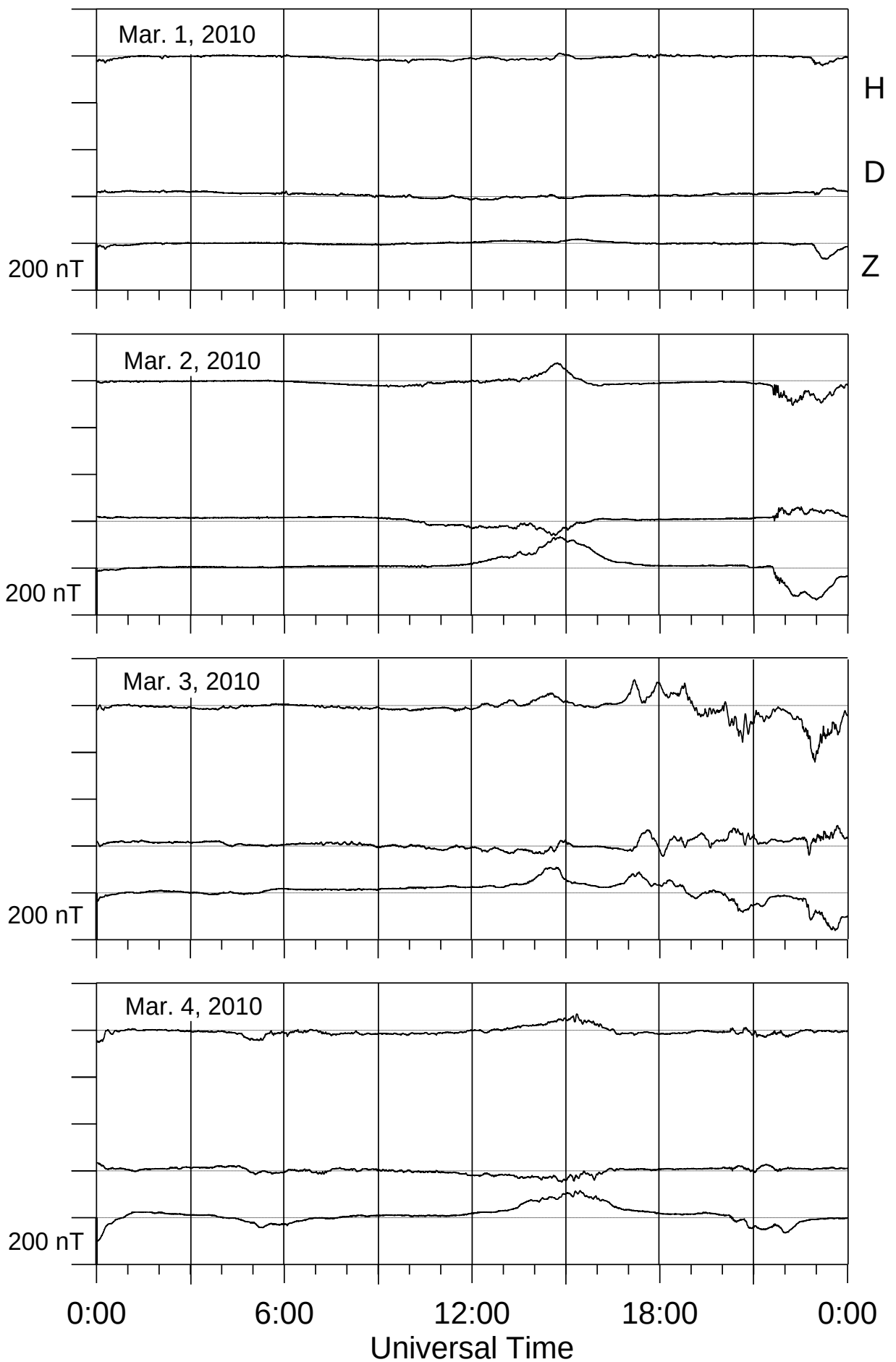
Loparskaya magnetometer



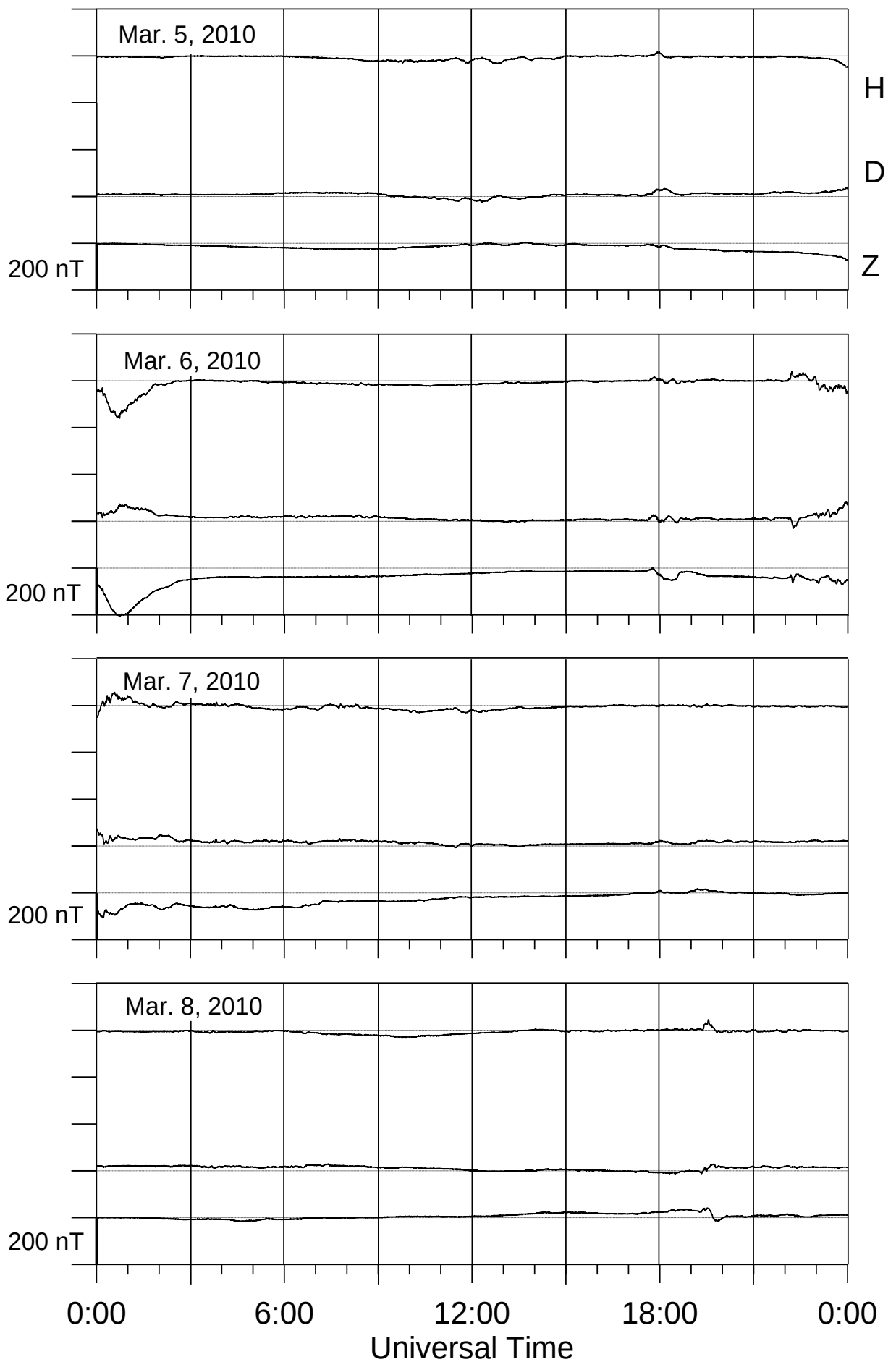
Loparskaya magnetometer



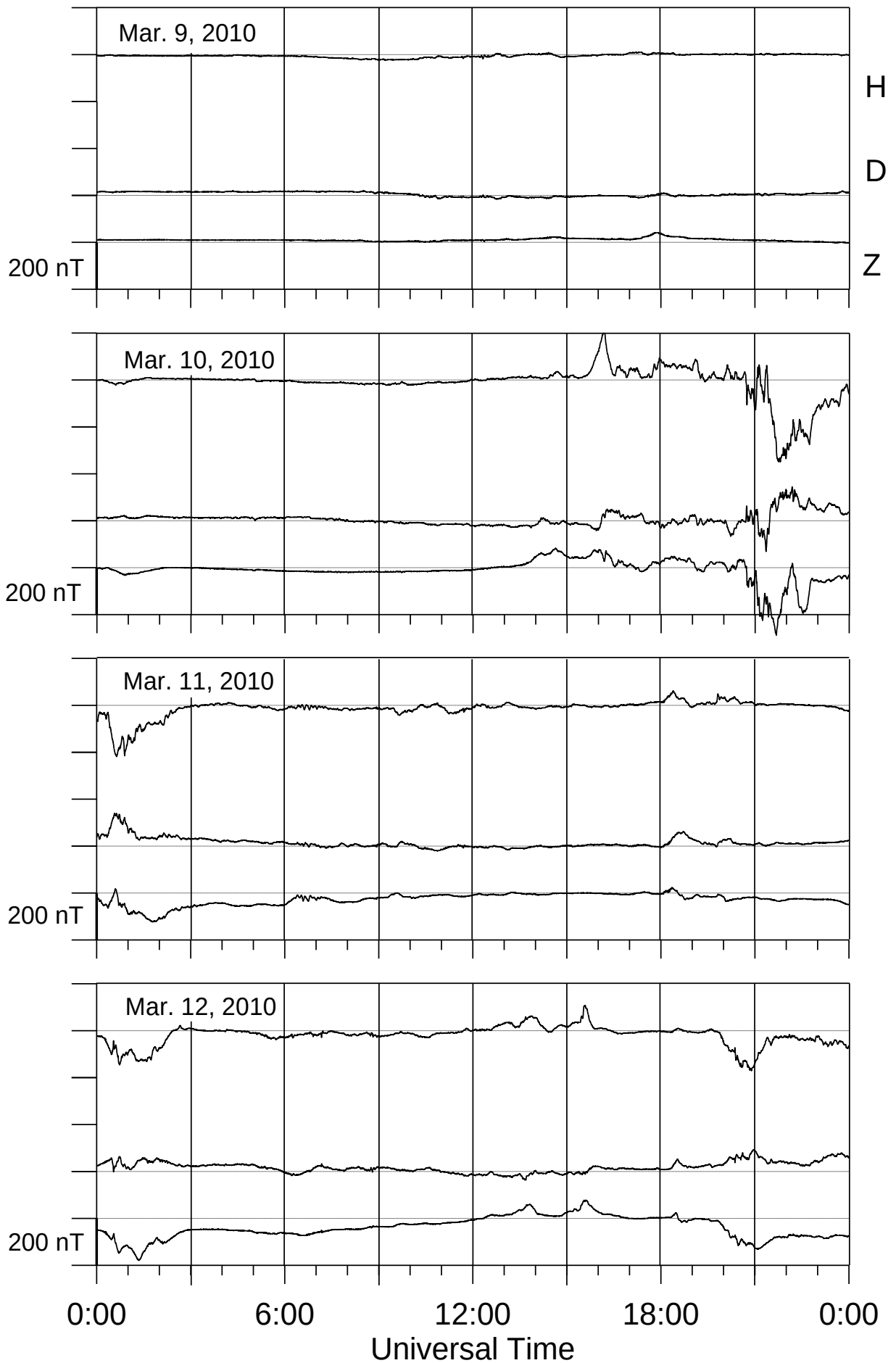
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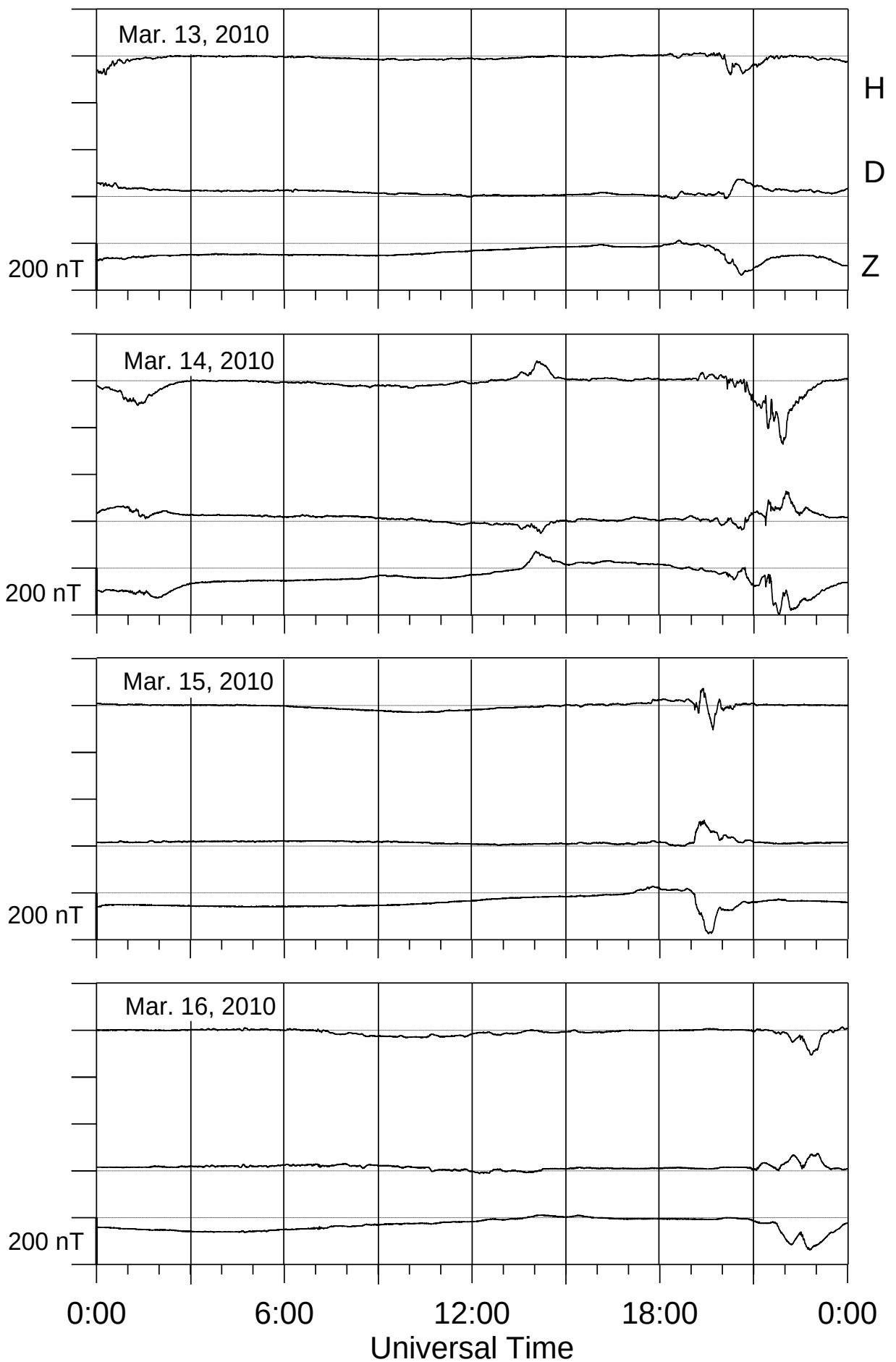
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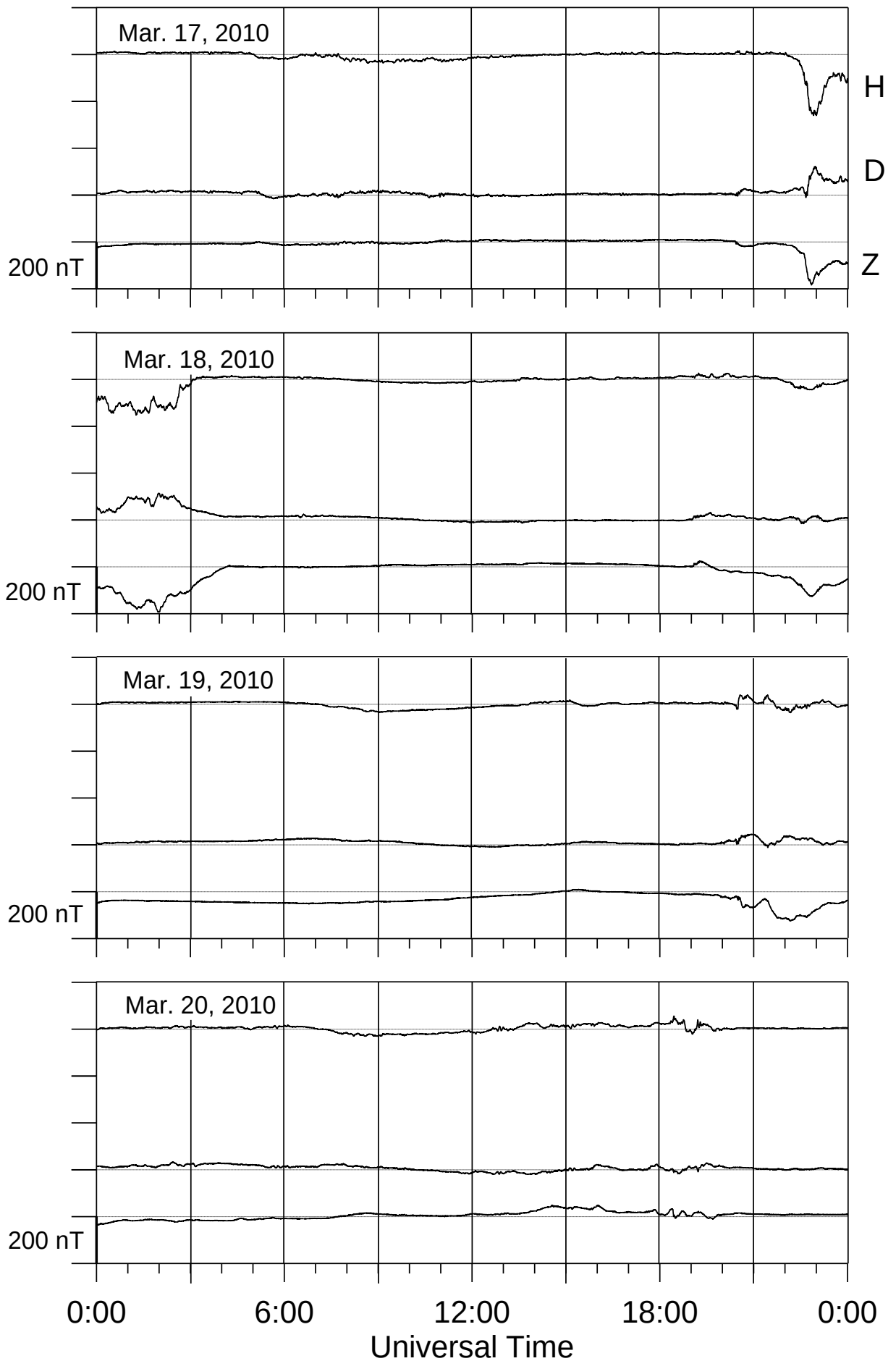
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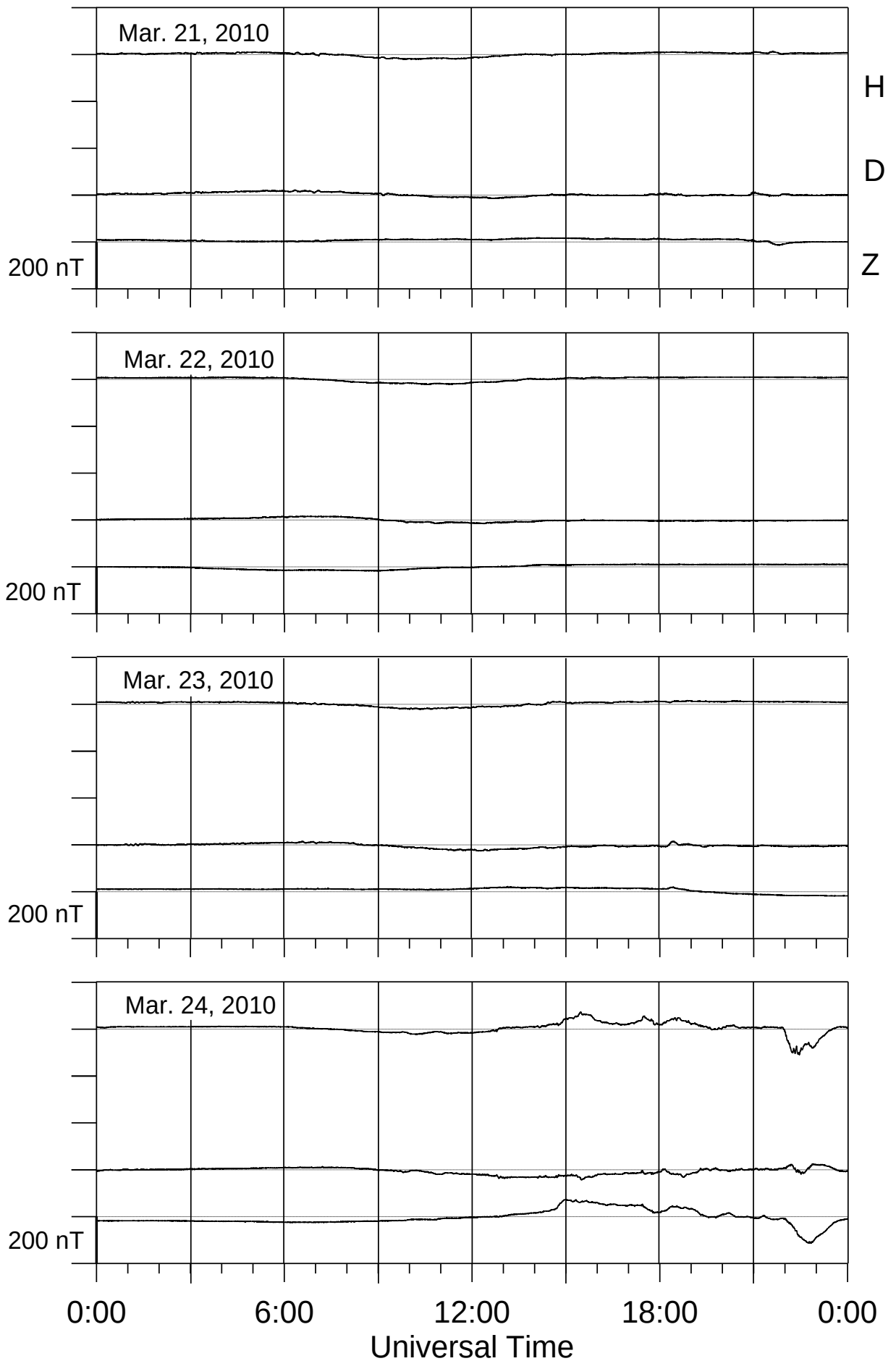
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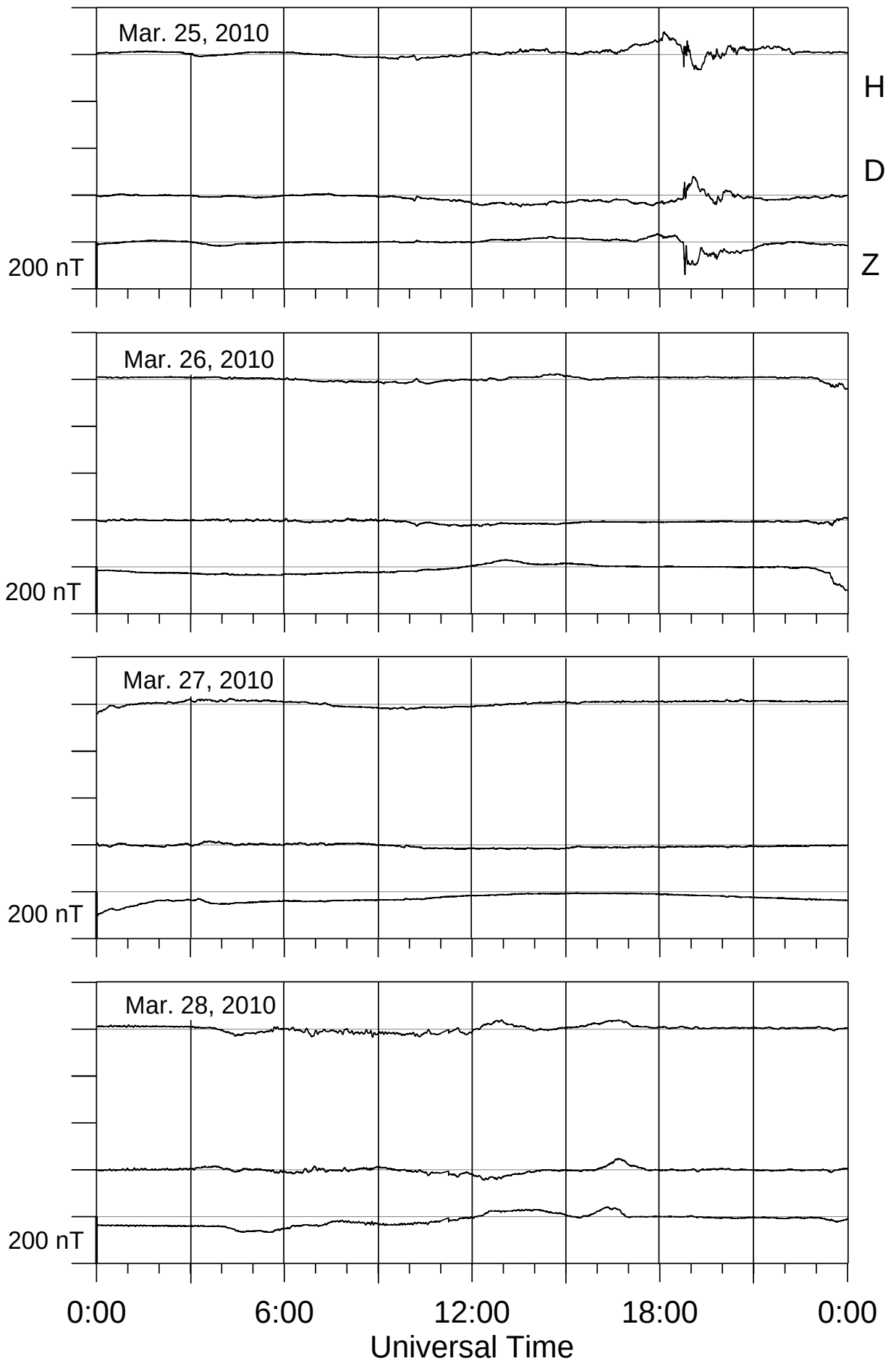
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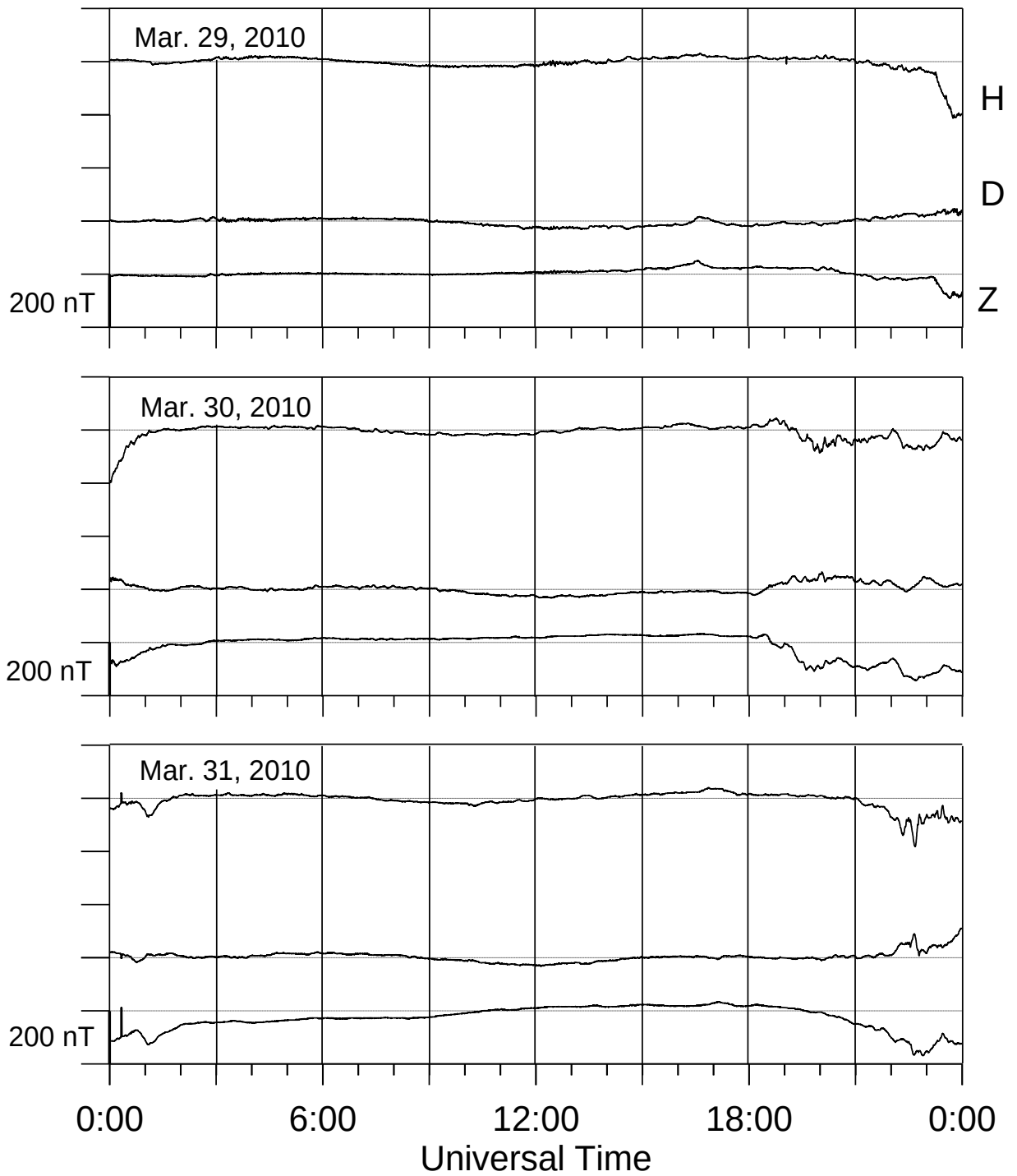
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Loparskaya magnetometer



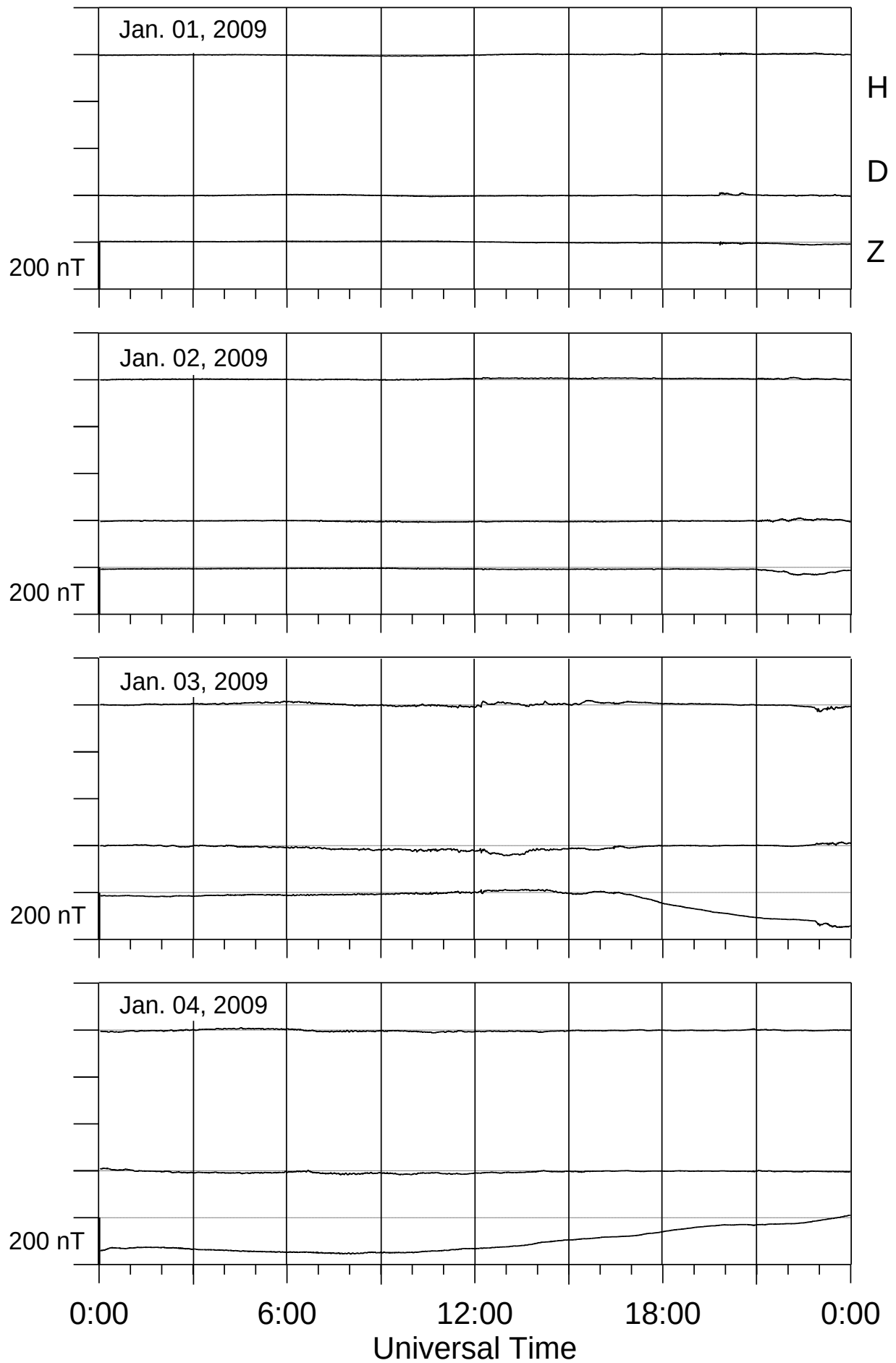
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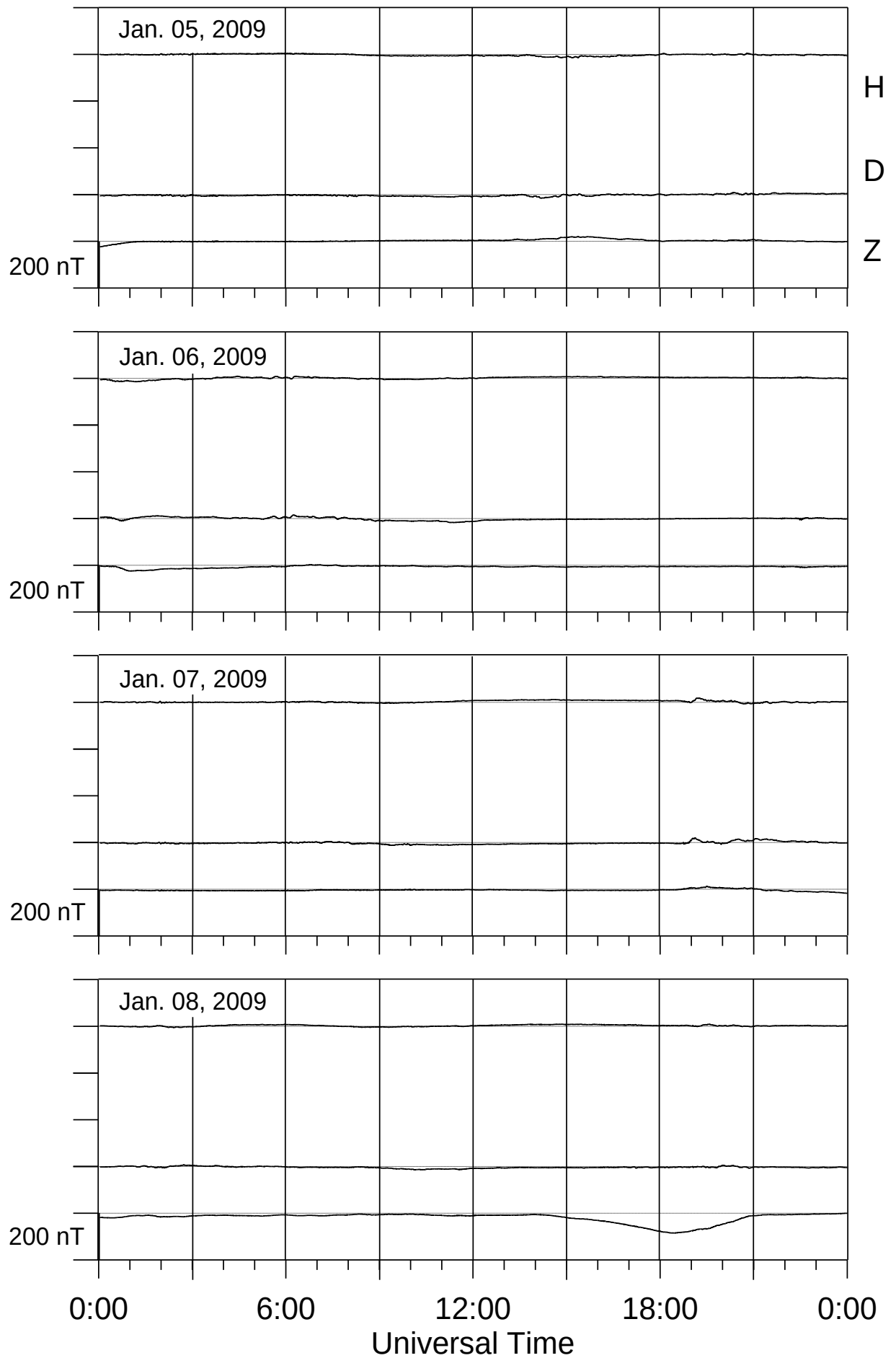
TUMANNY MAGNETOGRAMS

January - March 2010

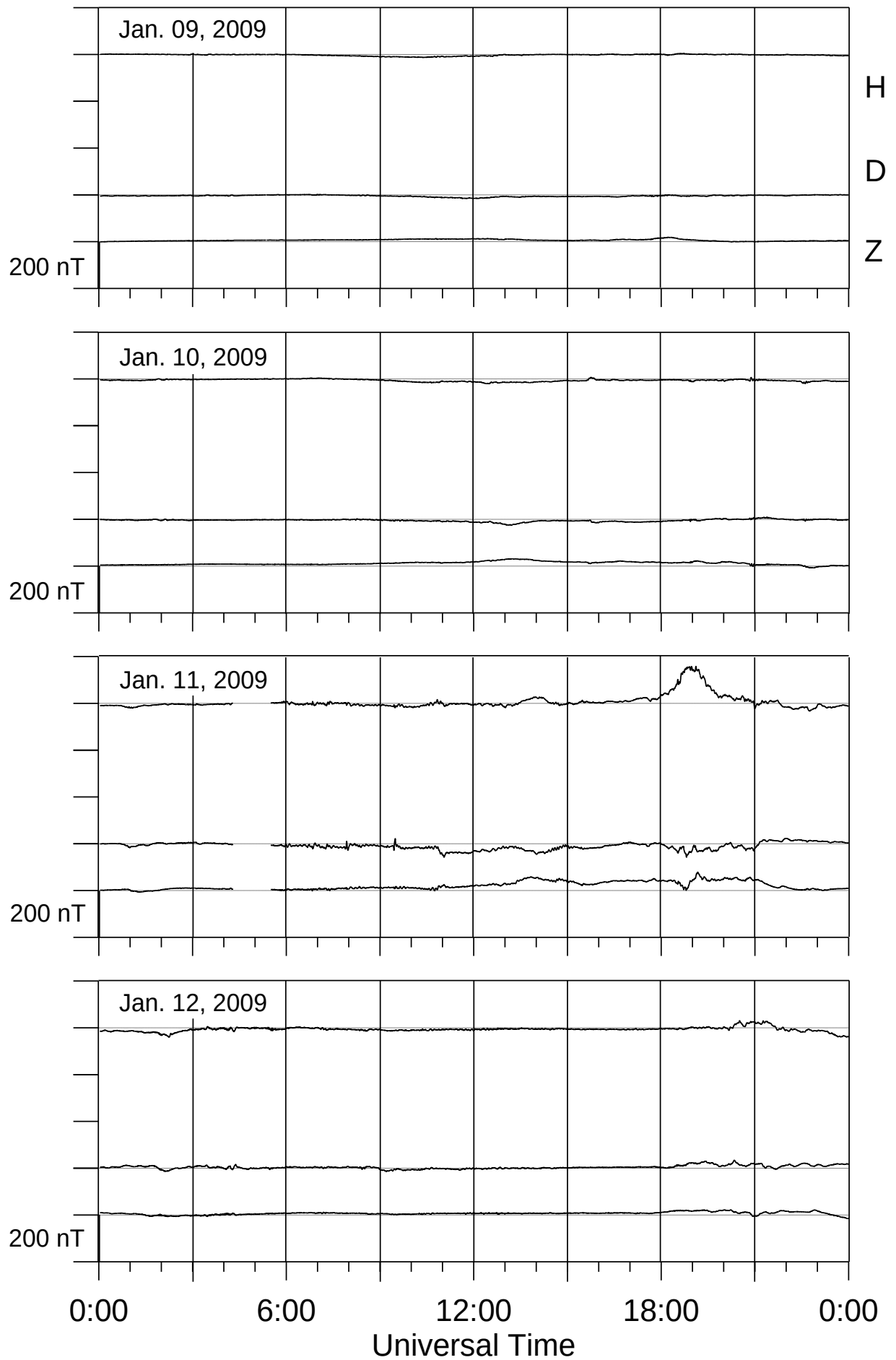
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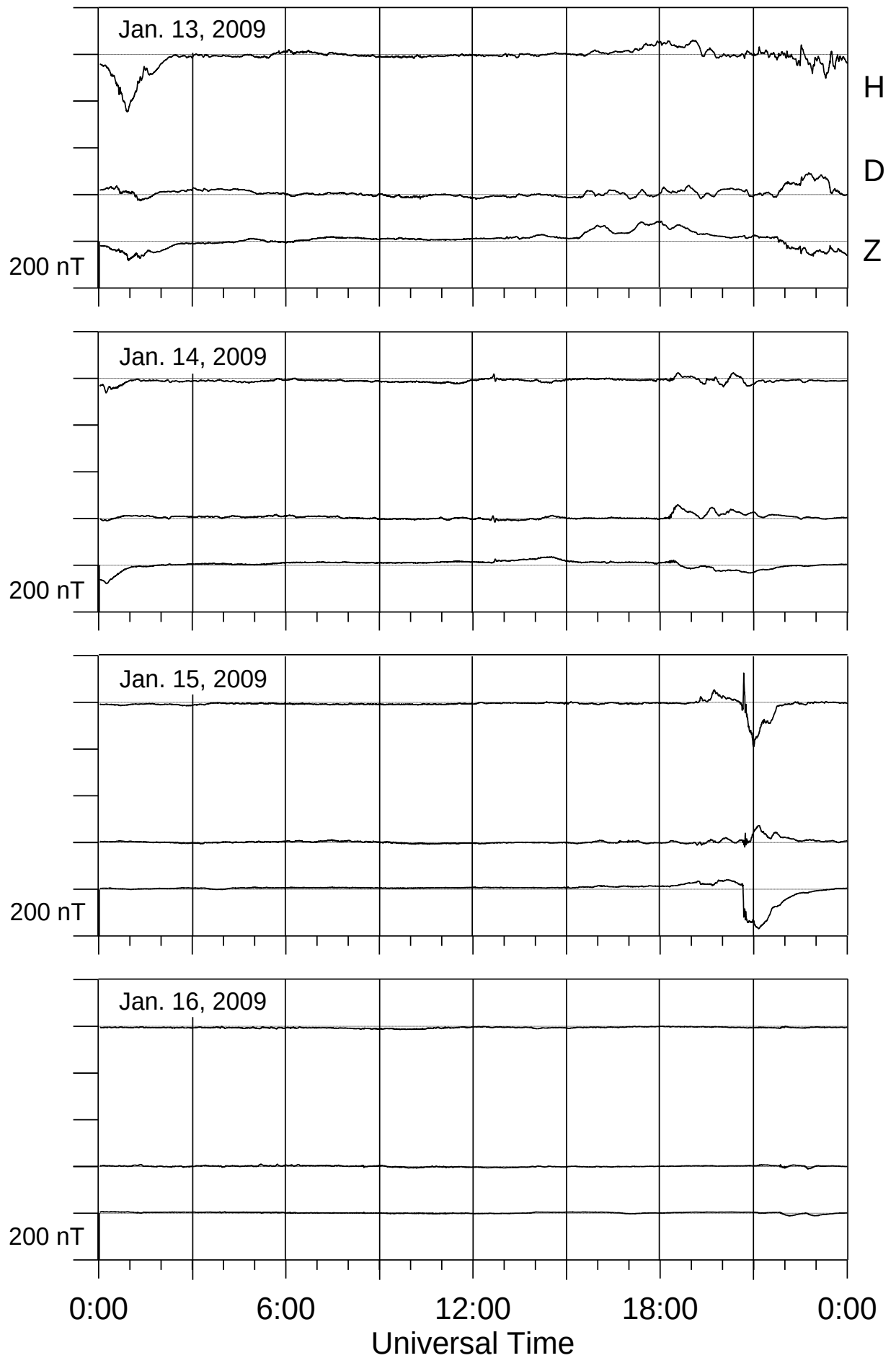
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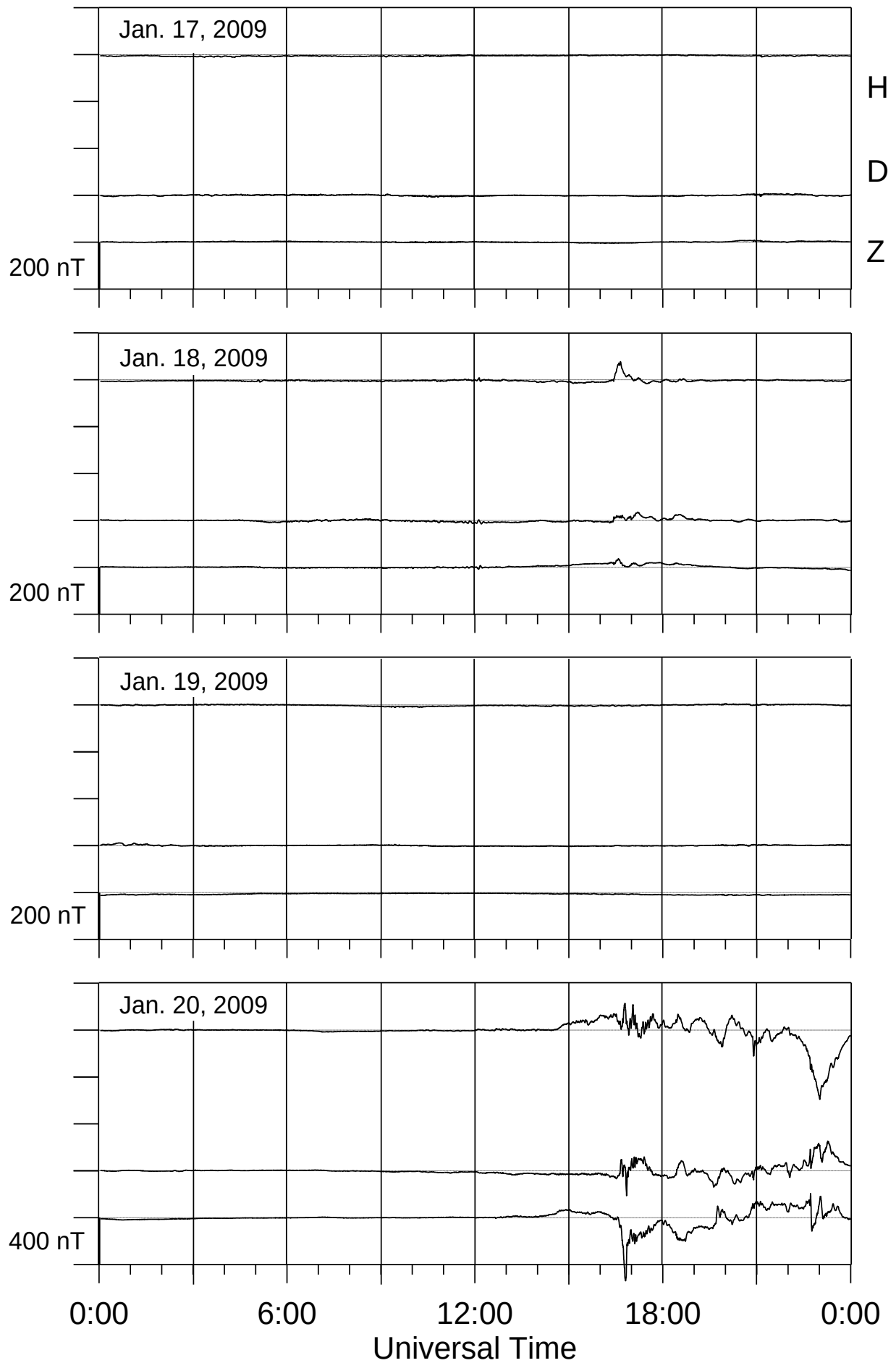
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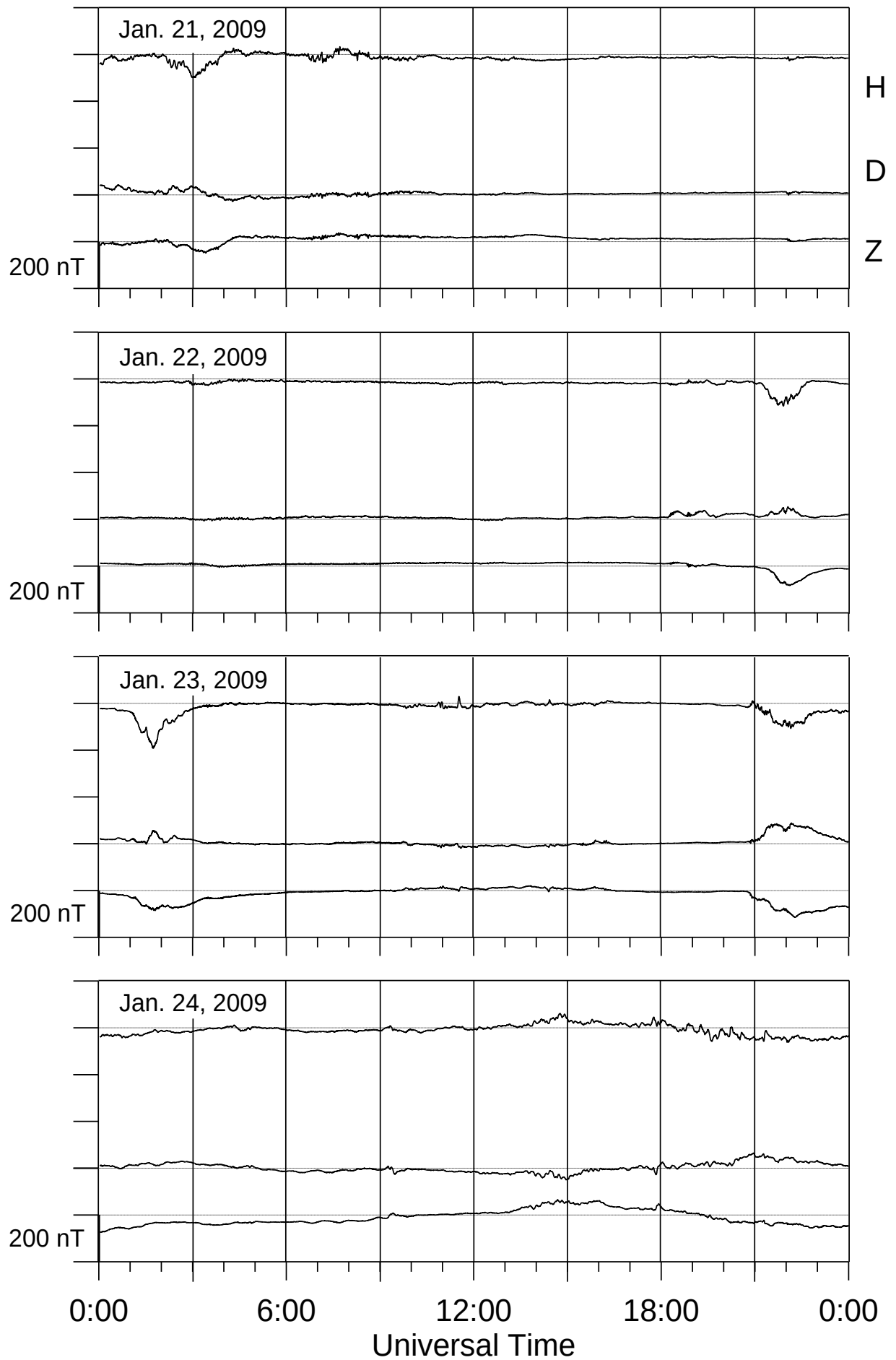
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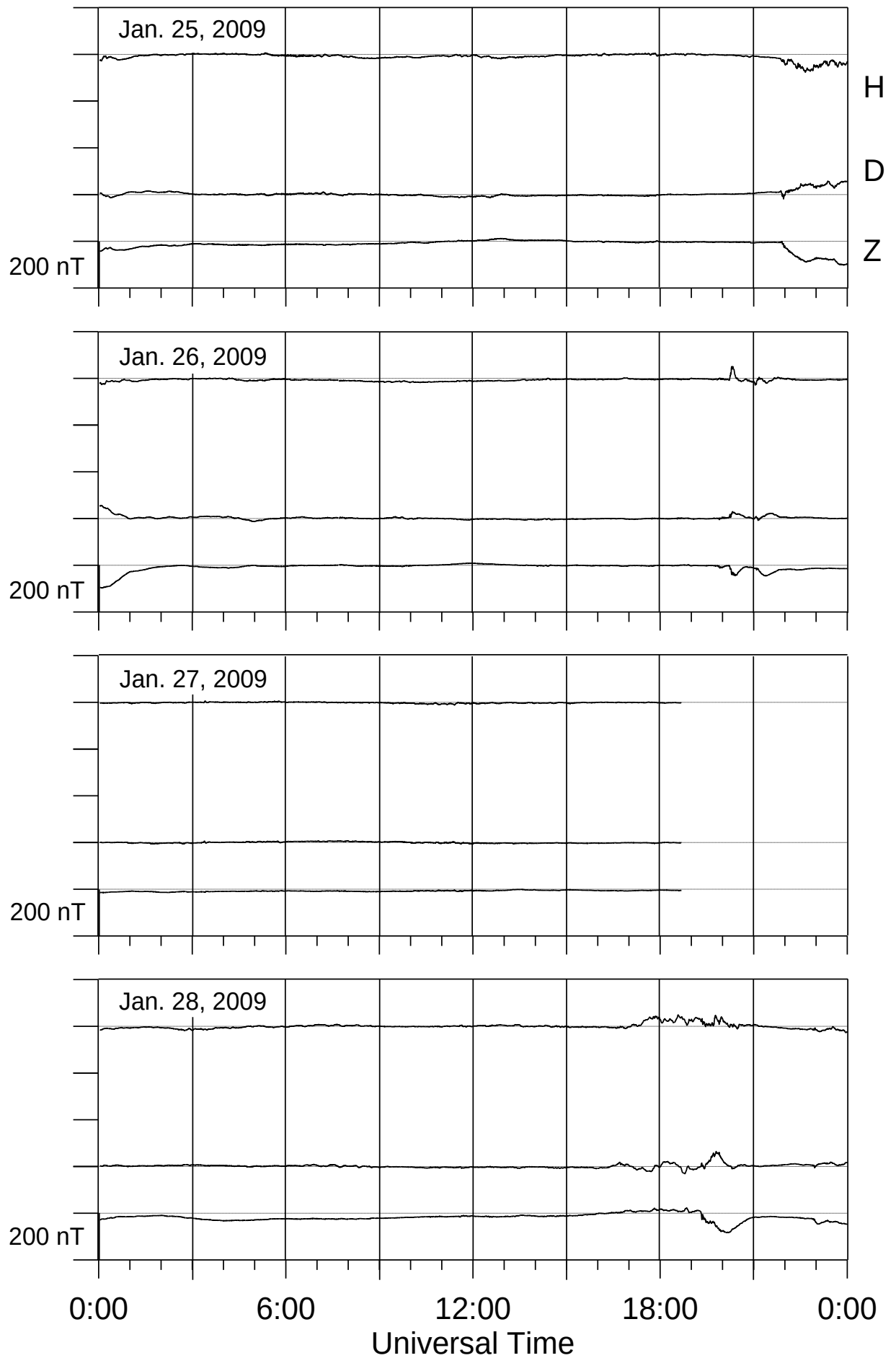
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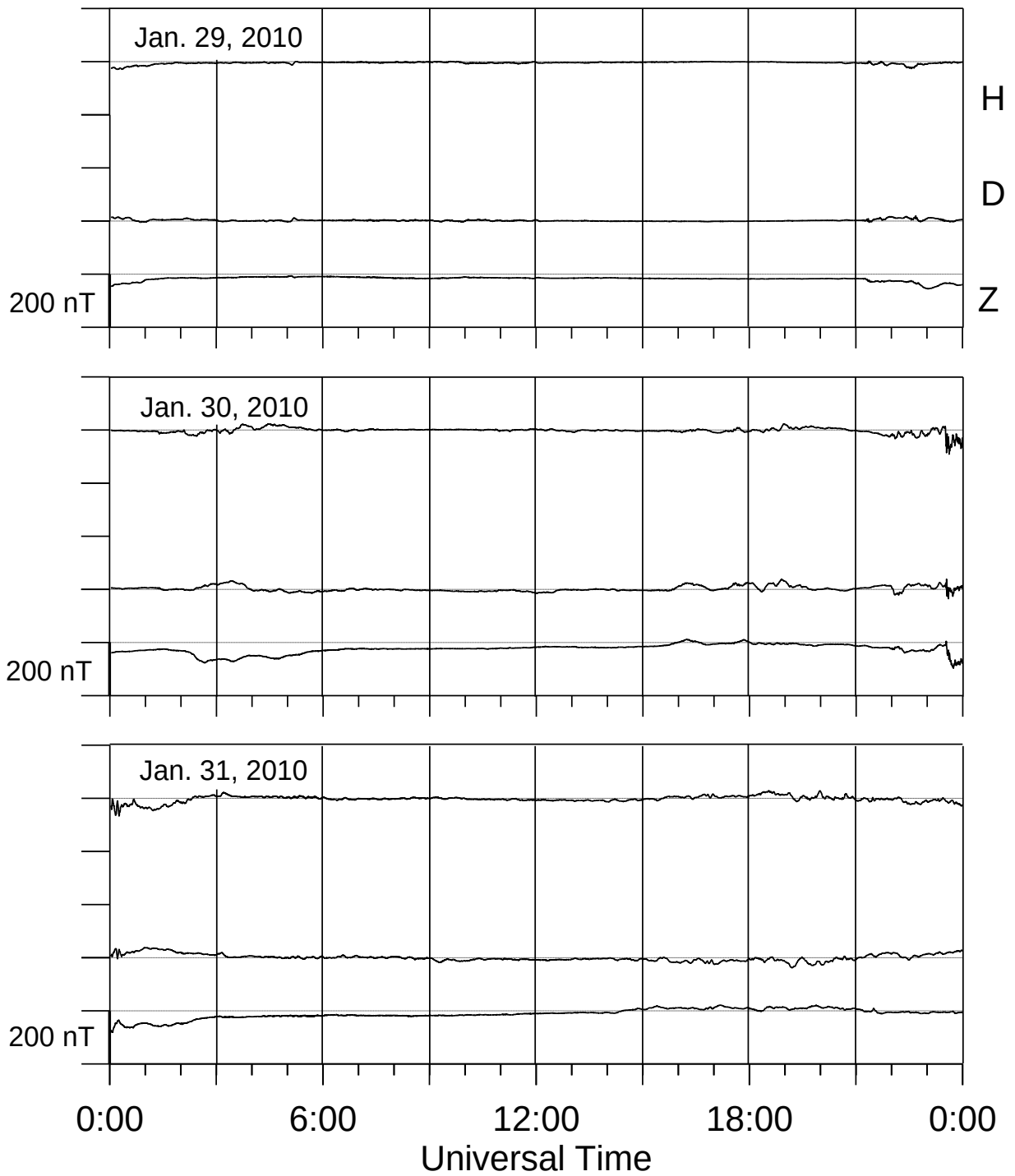
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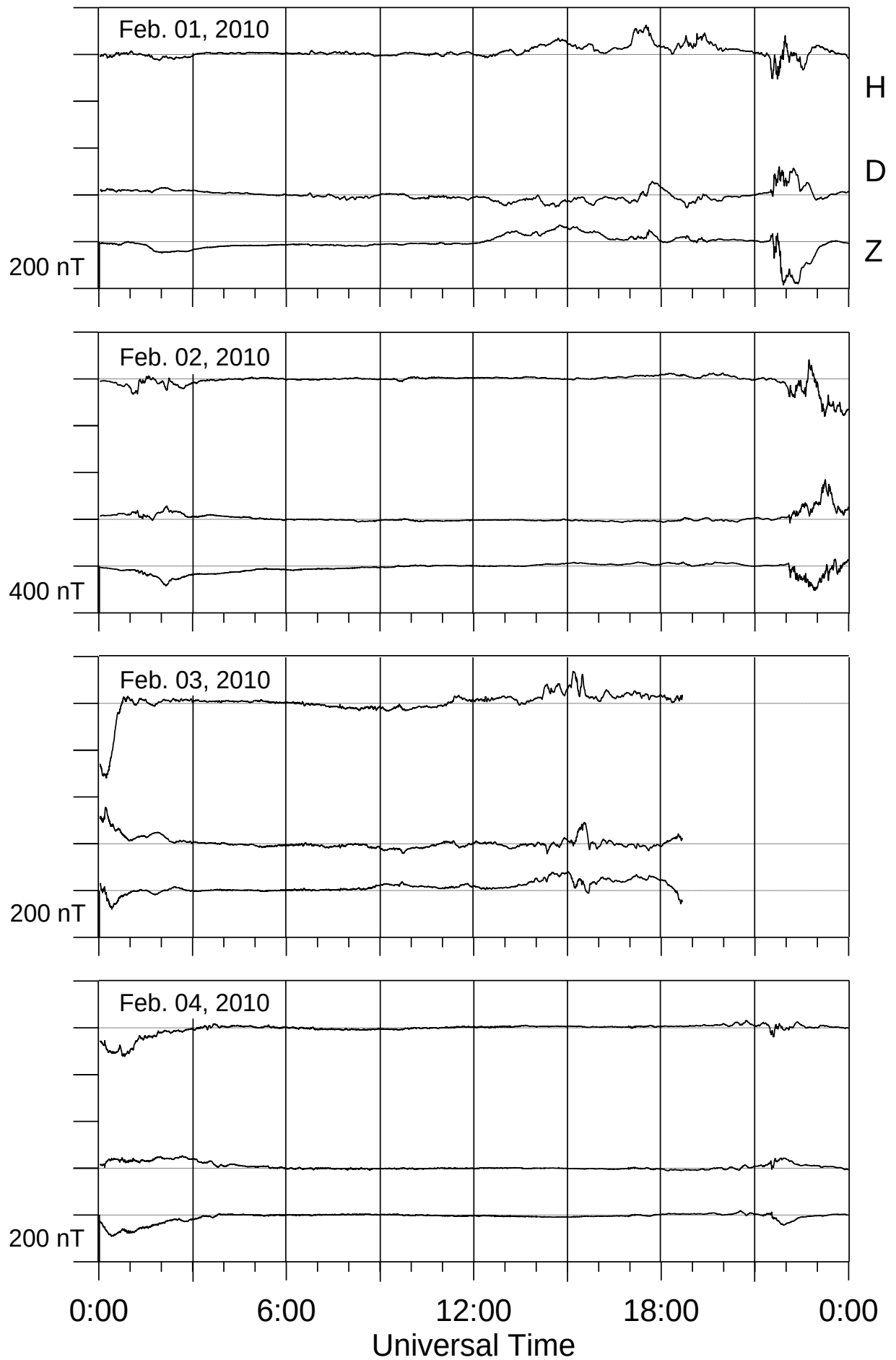
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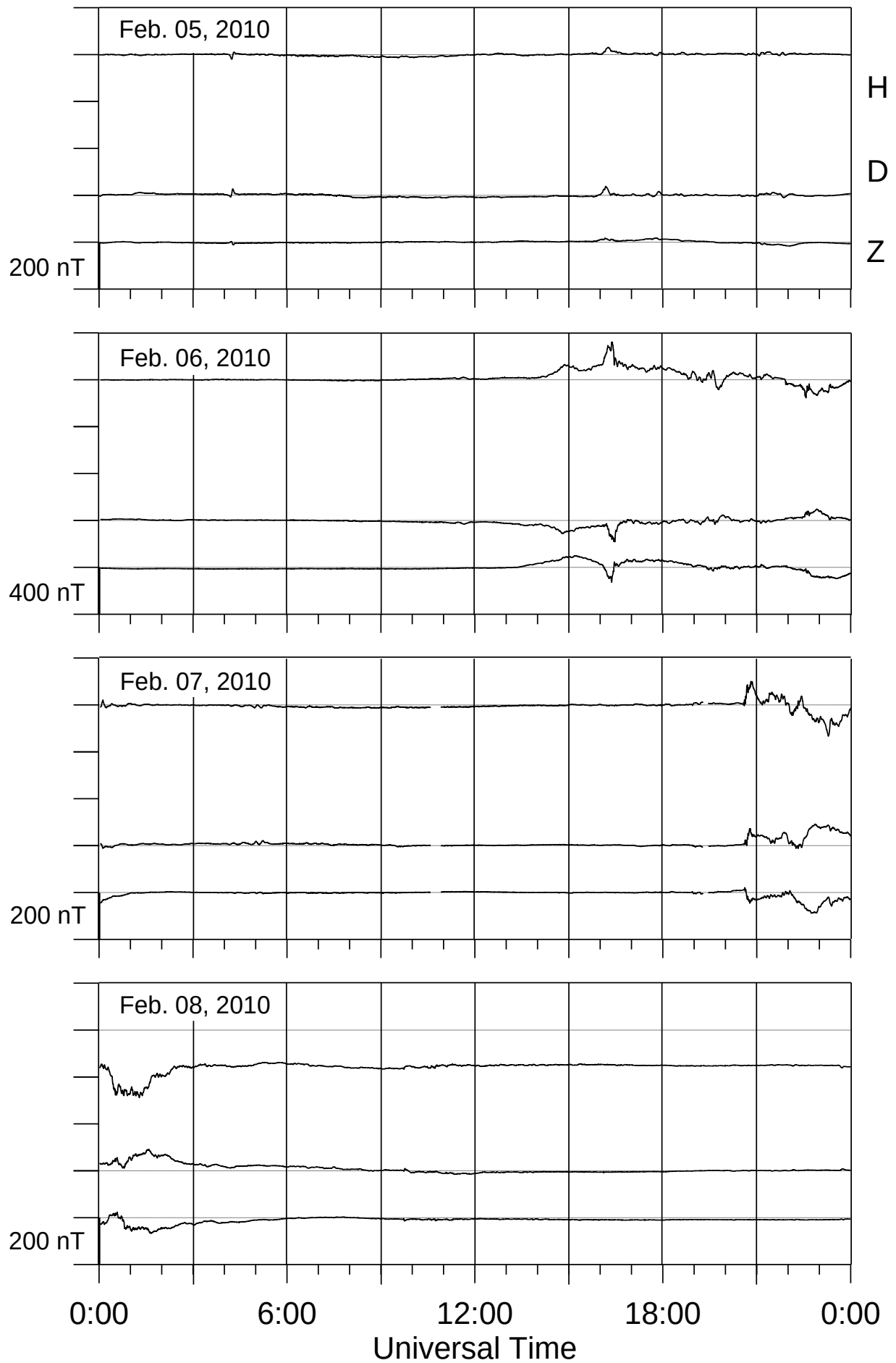
Tumanny magnetometer



Tumanny magnetometer



Tumanny magnetometer



Tumanny magnetometer

