

POLAR GEOPHYSICAL INSTITUTE
RUSSIAN ACADEMY OF SCIENCES



PGI
GEOPHYSICAL DATA

2021

APRIL

MAY

JUNE

MURMANSK, APATITY, RUSSIA

September, 2021

PGI

GEOPHYSICAL DATA

V. VOROBJEV, editor

V. Burnaeva and N. Kudriashova make-up editors

This bulletin presents the preliminary ground-based optical, geomagnetic and cosmic ray data obtained by Polar Geophysical Institute in the second quarter of 2021. All-sky camera observations are published only for the quarters when observations were carried out. All data are available by request.

Published since 1996

Reviewer K.G. Orlov

CONTENTS:

Data description.....	3
Geomagnetic K-indices.....	7
Cosmic ray data.....	10
All-sky camera observations.....	11
Magnetogram plots.....	23

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:

April 422 371

May 422 094

June 418 895

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

Please visit <http://pgia.ru/data/>

All-sky camera observations

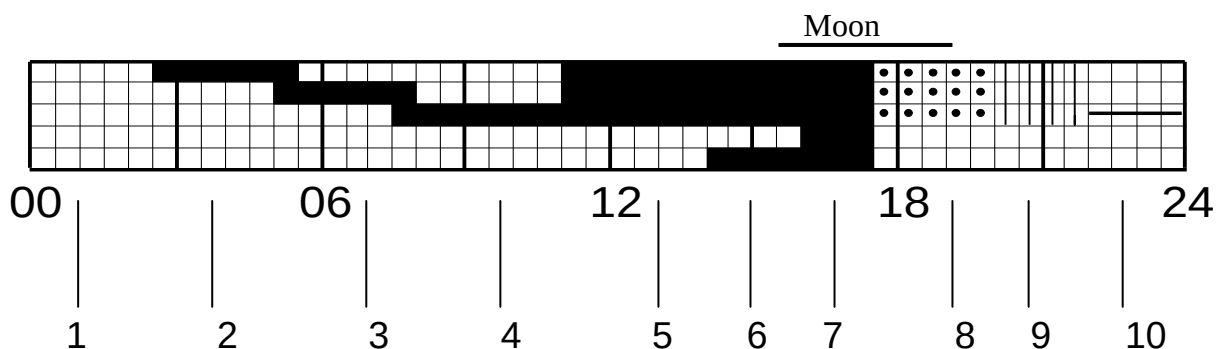
Calendar

Calendar shows the intervals of digital all-sky camera observations in Apatity, Lovozero and Verhnetulomsky, which are available during dark periods from 14:00 UT through midnight to 05:00 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 Apatity, Lovozero and Verhnetulomsky 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.

PLEASE NOTE:

Magnetometer in Lovozero was not in operation from 01 June to 24 June 2020 because of some technical problems.

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>Verhnetulomsky</i>	VTL	68.59° N	31.75° E	64.92° N	113.0° 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

Please visit

<http://pgia.ru/data/>

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GEOMAGNETIC K-INDICES, LOVOZERO

April, 2021

Lower limit of K=9 is 1500 nT

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

GEOMAGNETIC K-INDICES, LOVOZERO(LOPARSKAYA)

May, 2021

Lower limit of K=9 is 1500 nT

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

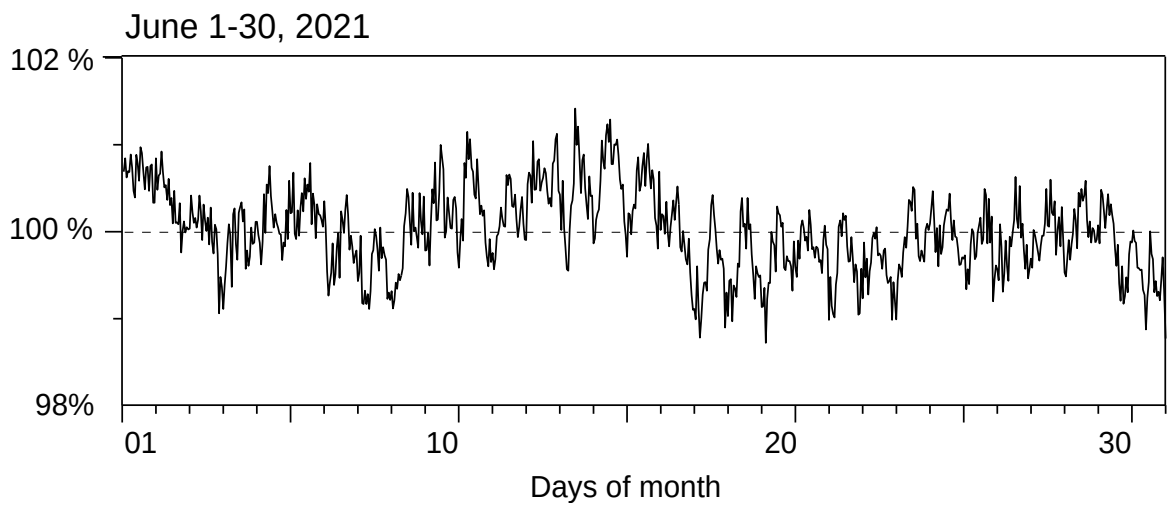
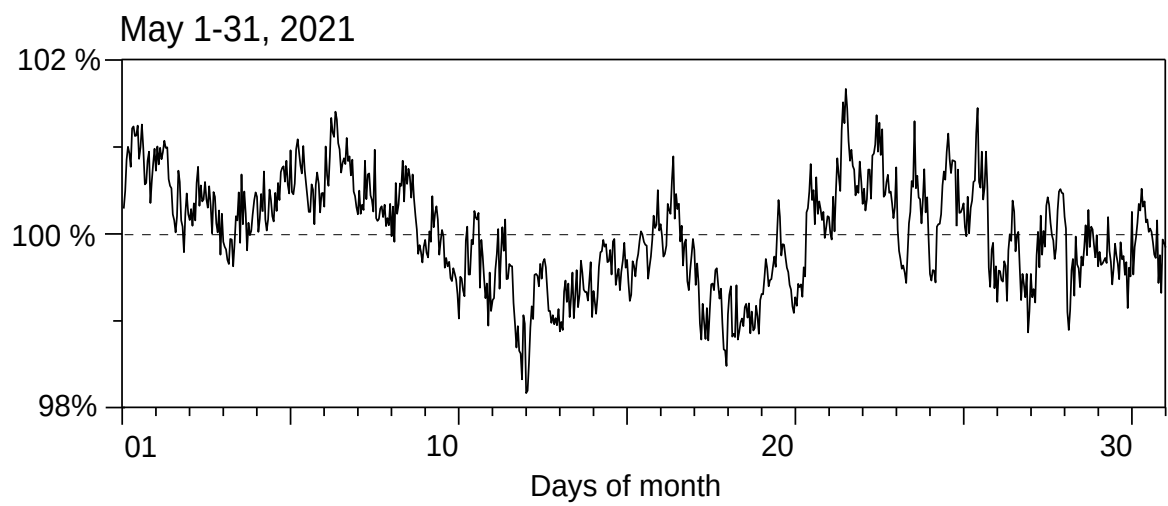
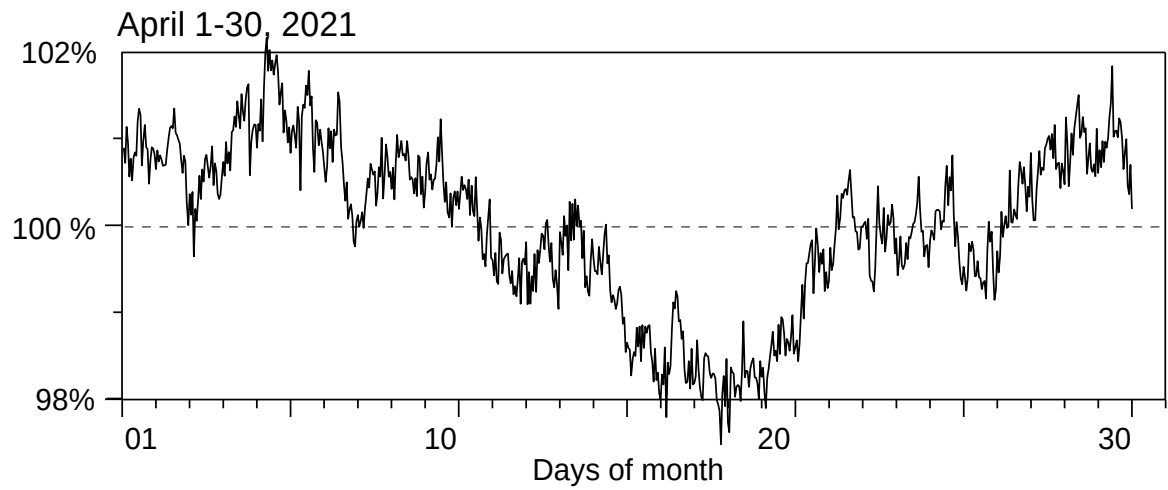
GEOMAGNETIC K-INDICES, LOVOZERO(LOPARSKAYA)

July, 2021

Lower limit of K=9 is 1500 nT

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

Apatity neutron monitor

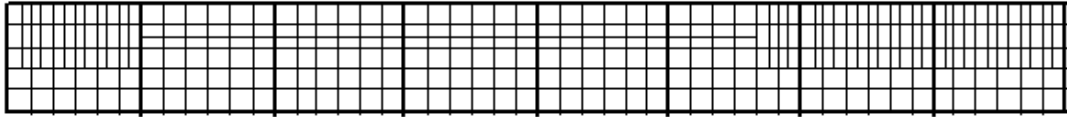


ALL – SKY CAMERA OBSERVATIONS

April 2021

Lovozero ascaplots

Apr. 01, 2021



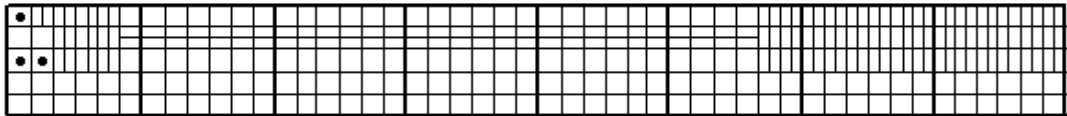
Apr. 02, 2021



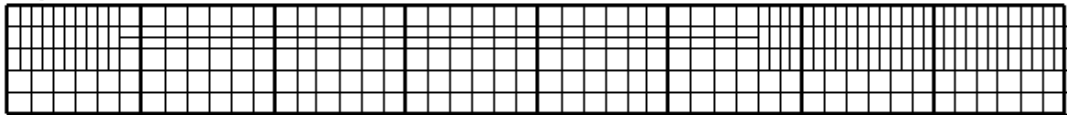
Apr. 03, 2021



Apr. 04, 2021



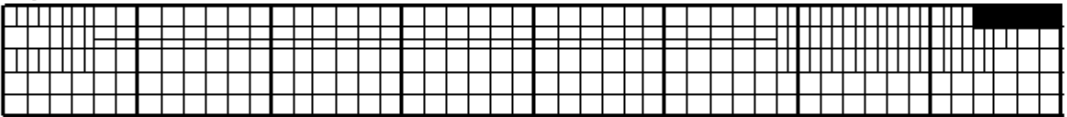
Apr. 05, 2021



Apr. 06, 2021



Apr. 07, 2021



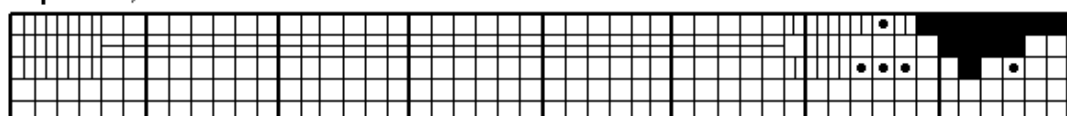
Apr. 08, 2021



Apr. 09, 2021



Apr. 10, 2021

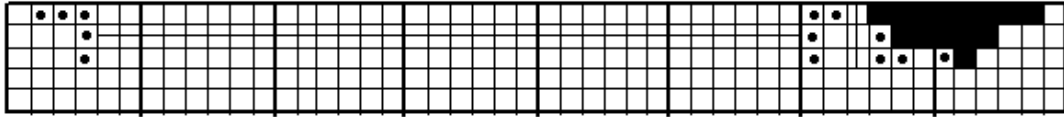


00 06 12 18 24

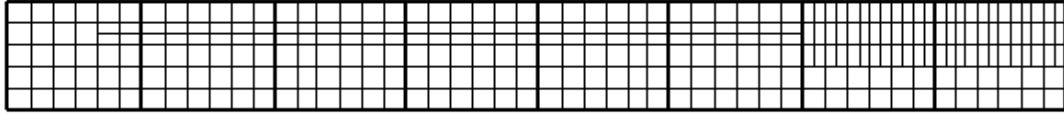
Universal Time

Lovozero ascaplots

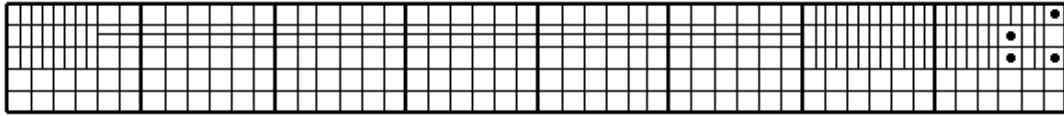
Apr. 11, 2021



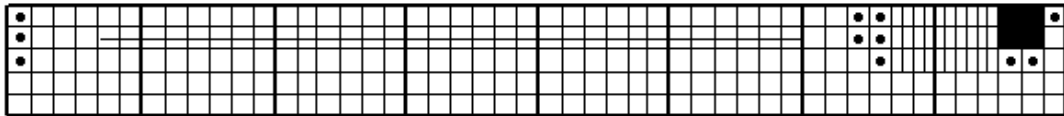
Apr. 12, 2021



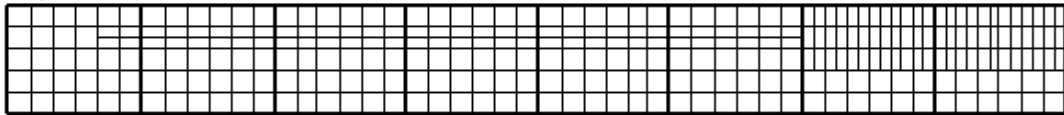
Apr. 13, 2021



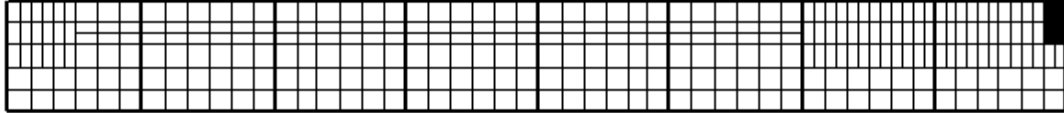
Apr. 14, 2021



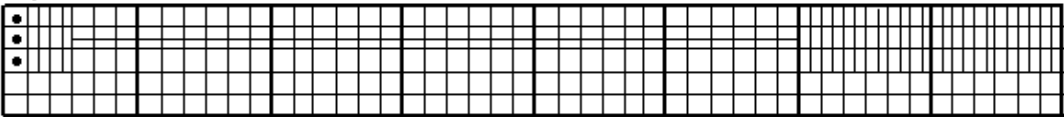
Apr. 15, 2021



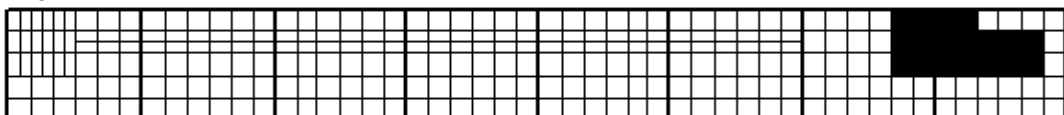
Apr. 16, 2021



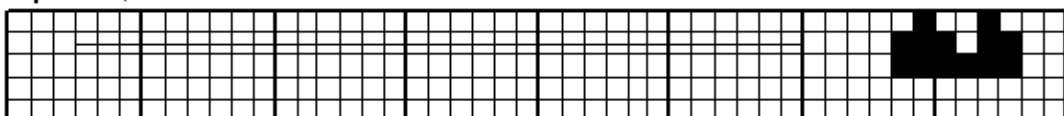
Apr. 17, 2021



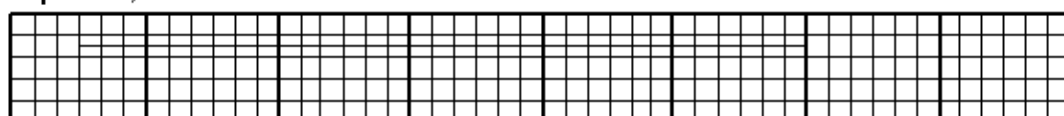
Apr. 18, 2021



Apr. 19, 2021



Apr. 20, 2021

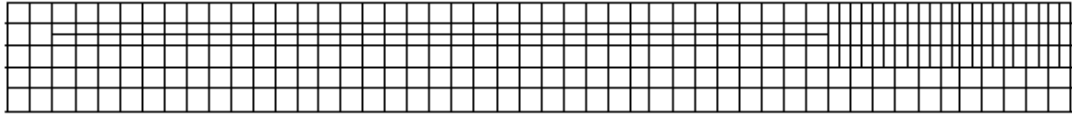


00 06 12 18 24

Universal Time

Lovozero ascaplots

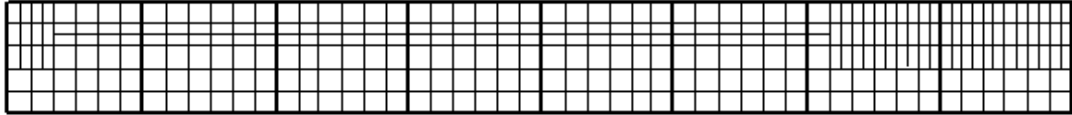
Apr. 21, 2021



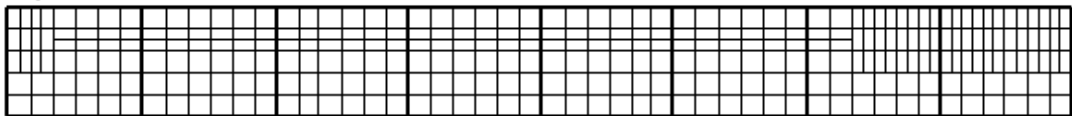
Apr. 22, 2021



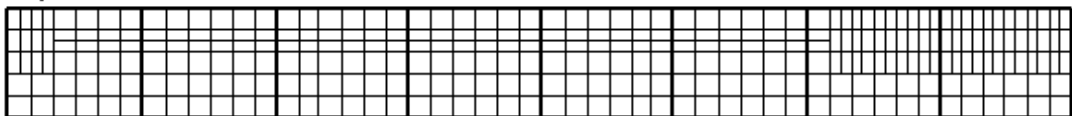
Apr. 23, 2021



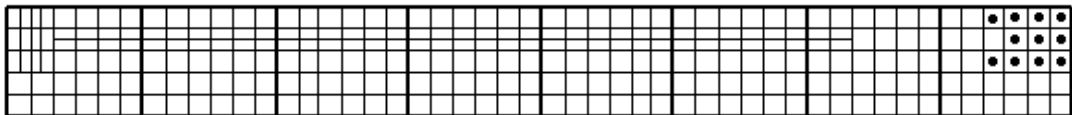
Apr. 24, 2021



Apr. 25, 2021



Apr. 26, 2021



00

06

12

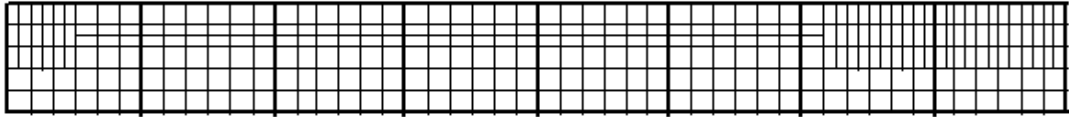
18

24

Universal Time

Verhnetulomsky ascaplots

Apr. 01, 2021



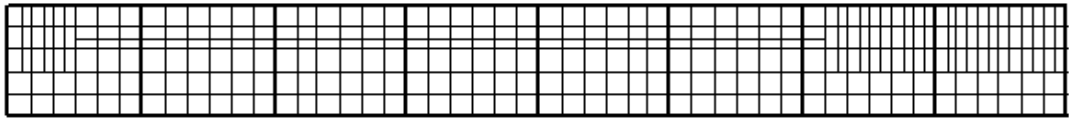
Apr. 02, 2021



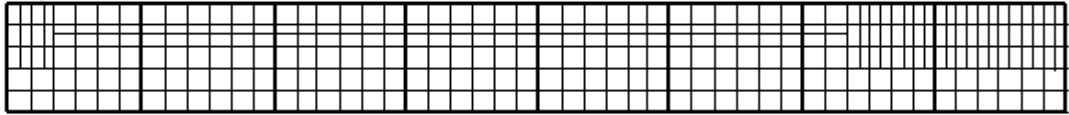
Apr. 03, 2021



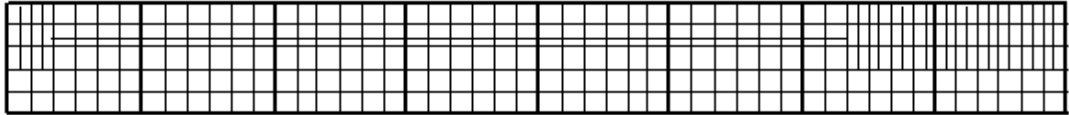
Apr. 04, 2021



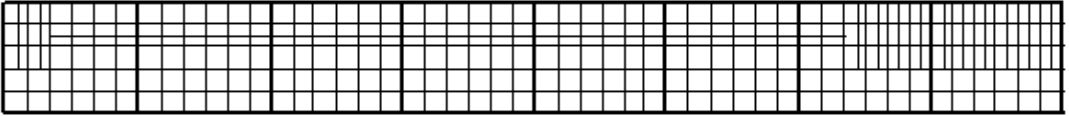
Apr. 05, 2021



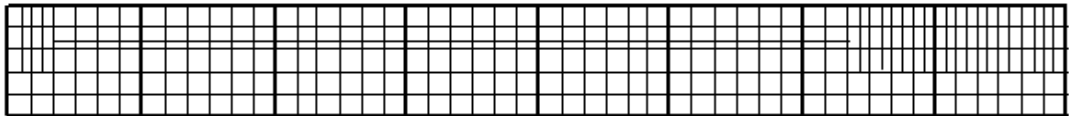
Apr. 06, 2021



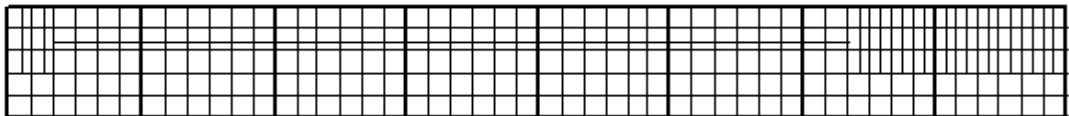
Apr. 07, 2021



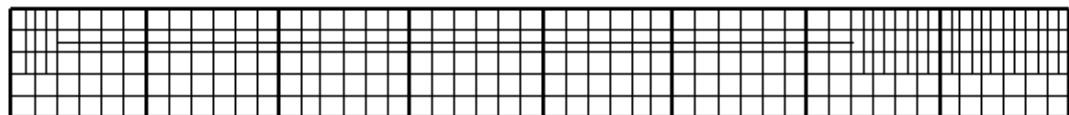
Apr. 08, 2021



Apr. 09, 2021



Apr. 10, 2021

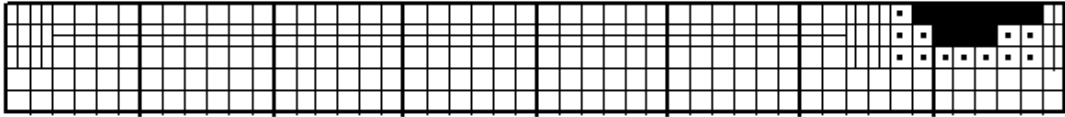


00 06 12 18 24

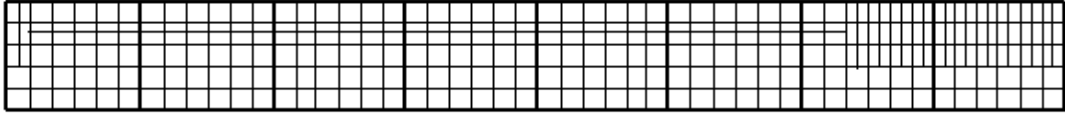
Universal Time

Verhnetulomsky ascaplots

Apr. 11, 2021



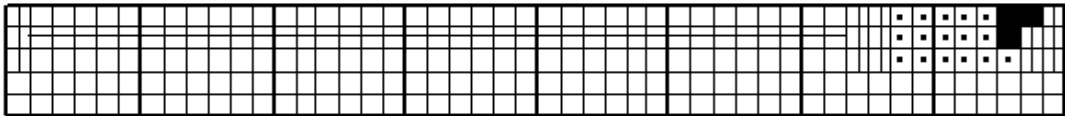
Apr. 12, 2021



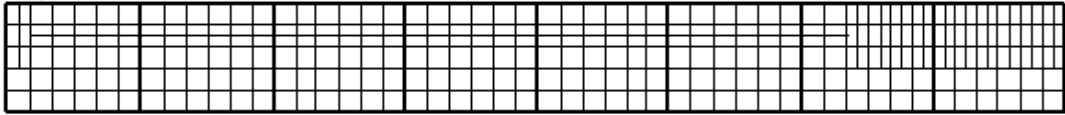
Apr. 13, 2021



Apr. 14, 2021



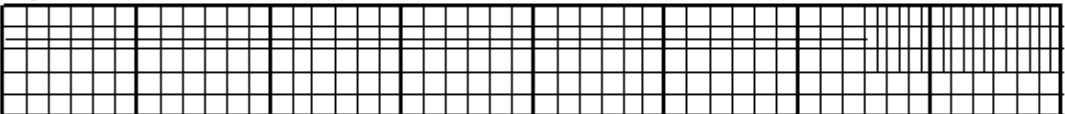
Apr. 15, 2021



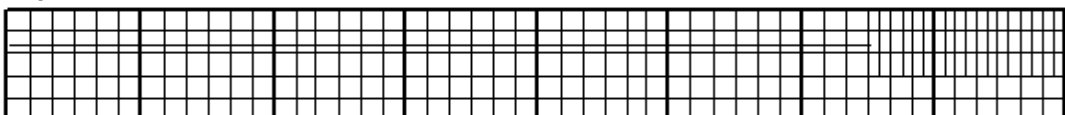
Apr. 16, 2021



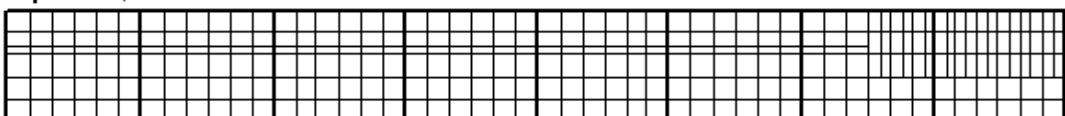
Apr. 17, 2021



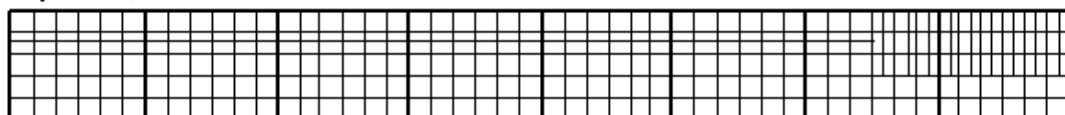
Apr. 18, 2021



Apr. 19, 2021



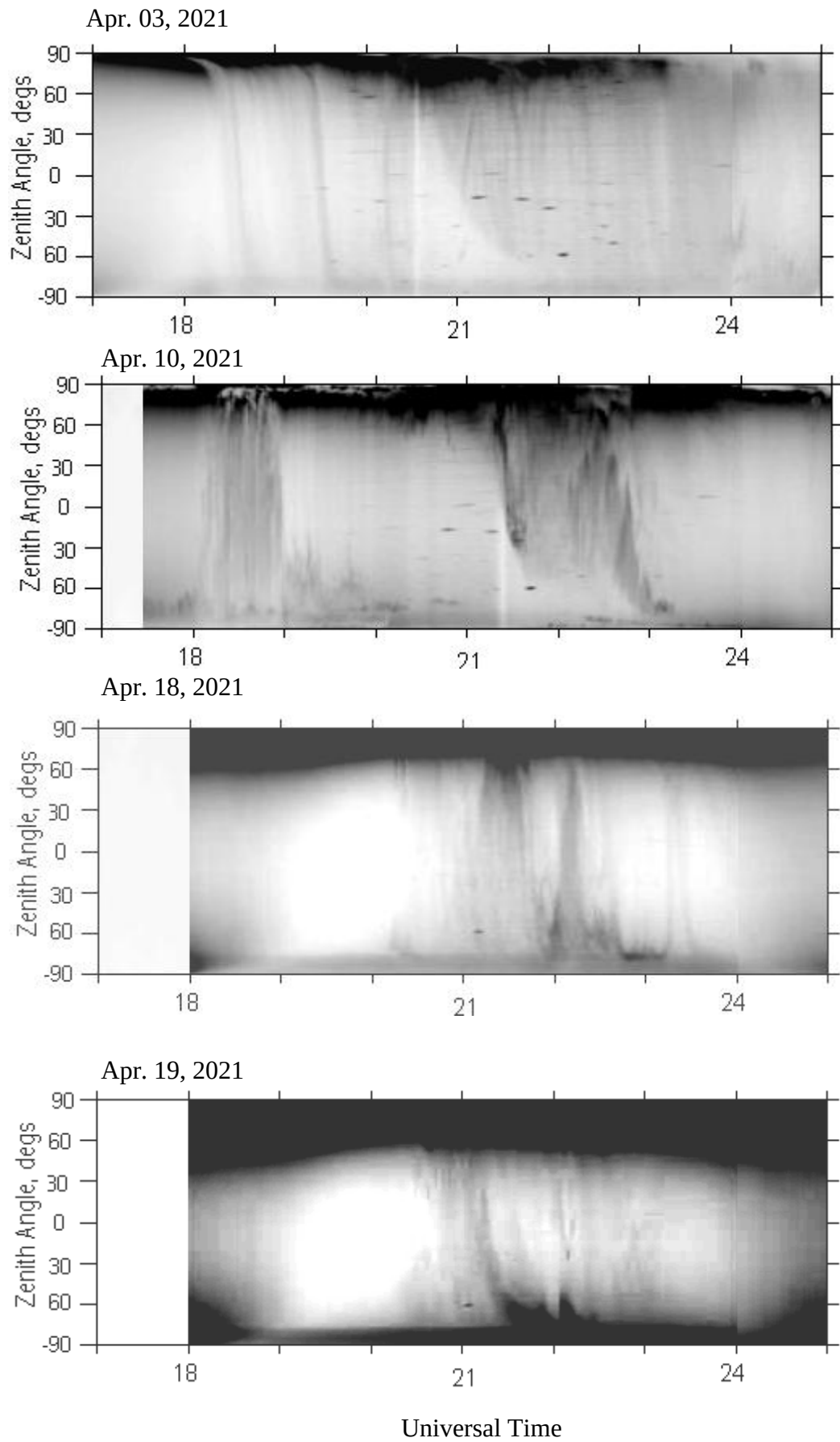
Apr. 20, 2021



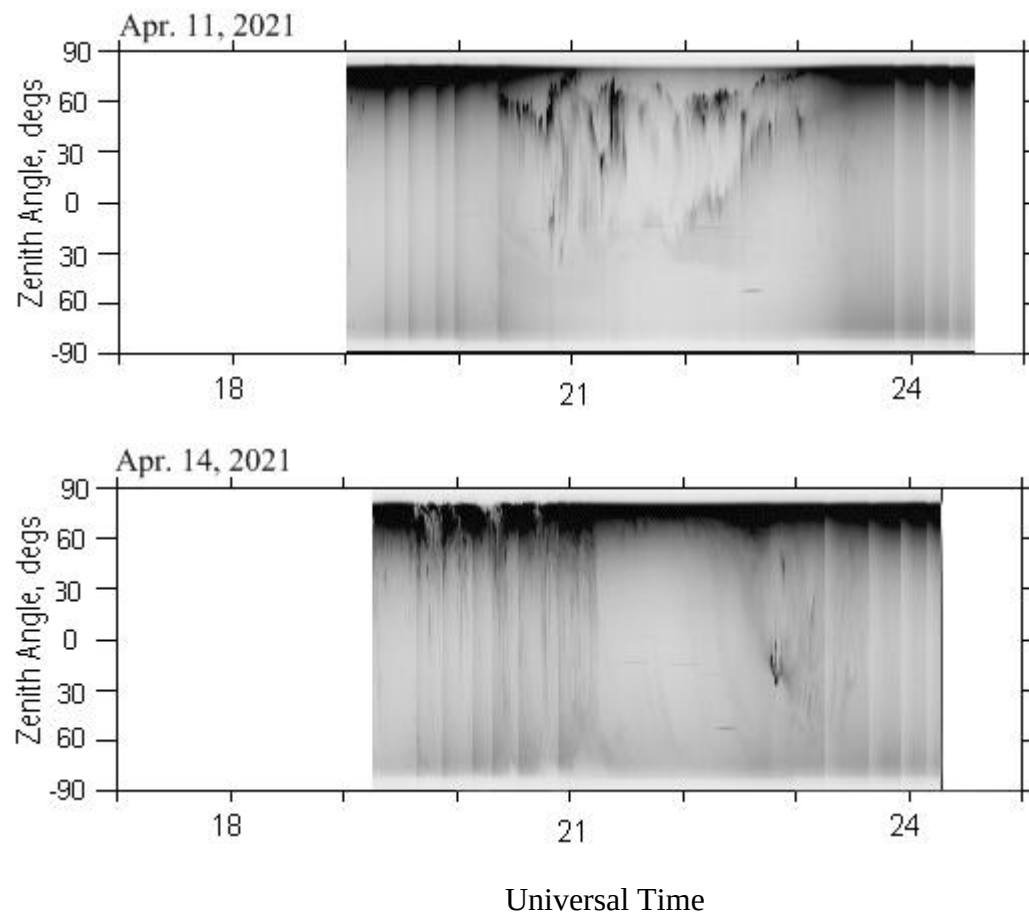
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Universal Time

Lovozero TV keograms



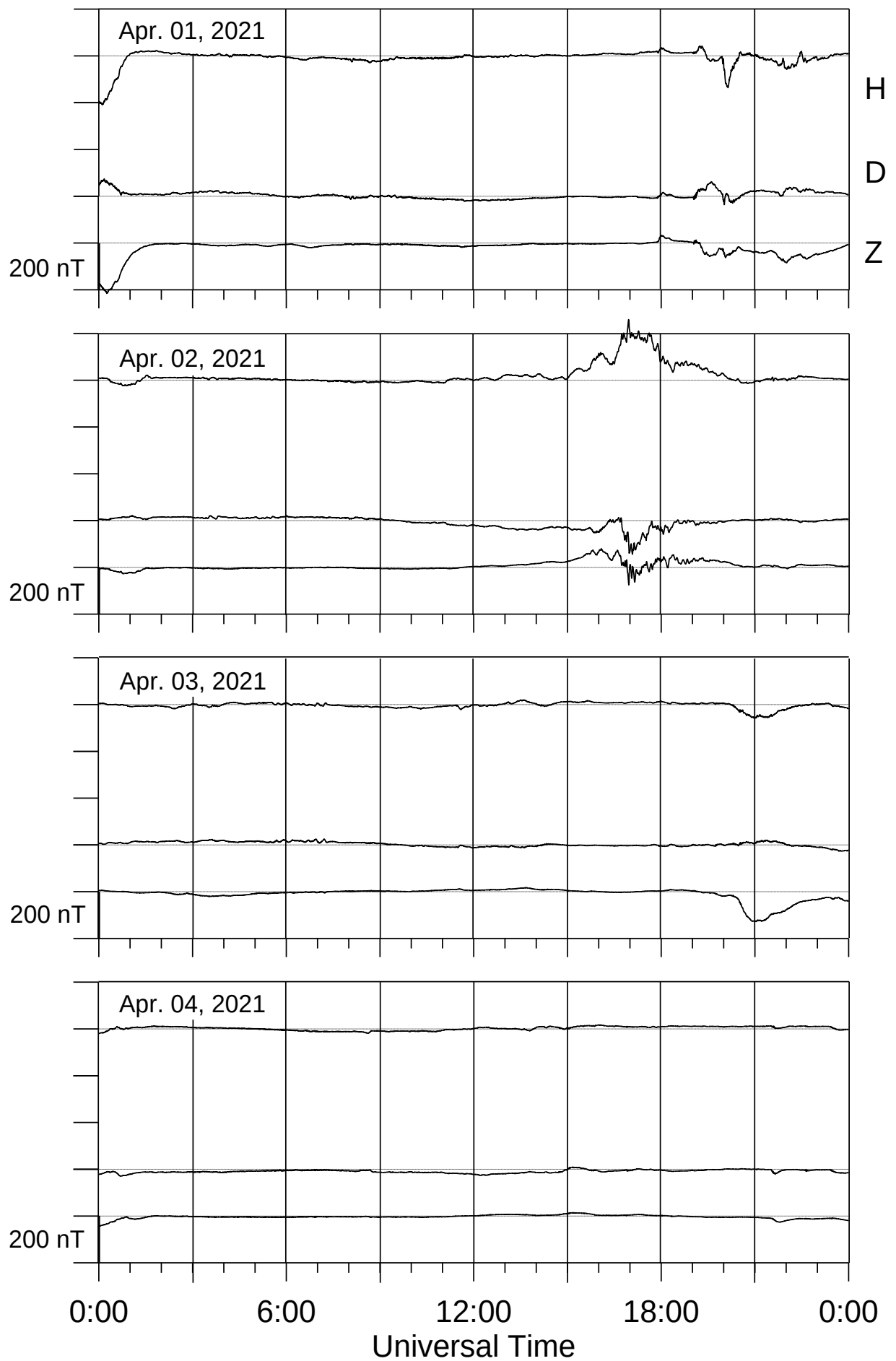
Verhnetulomsky TV keograms



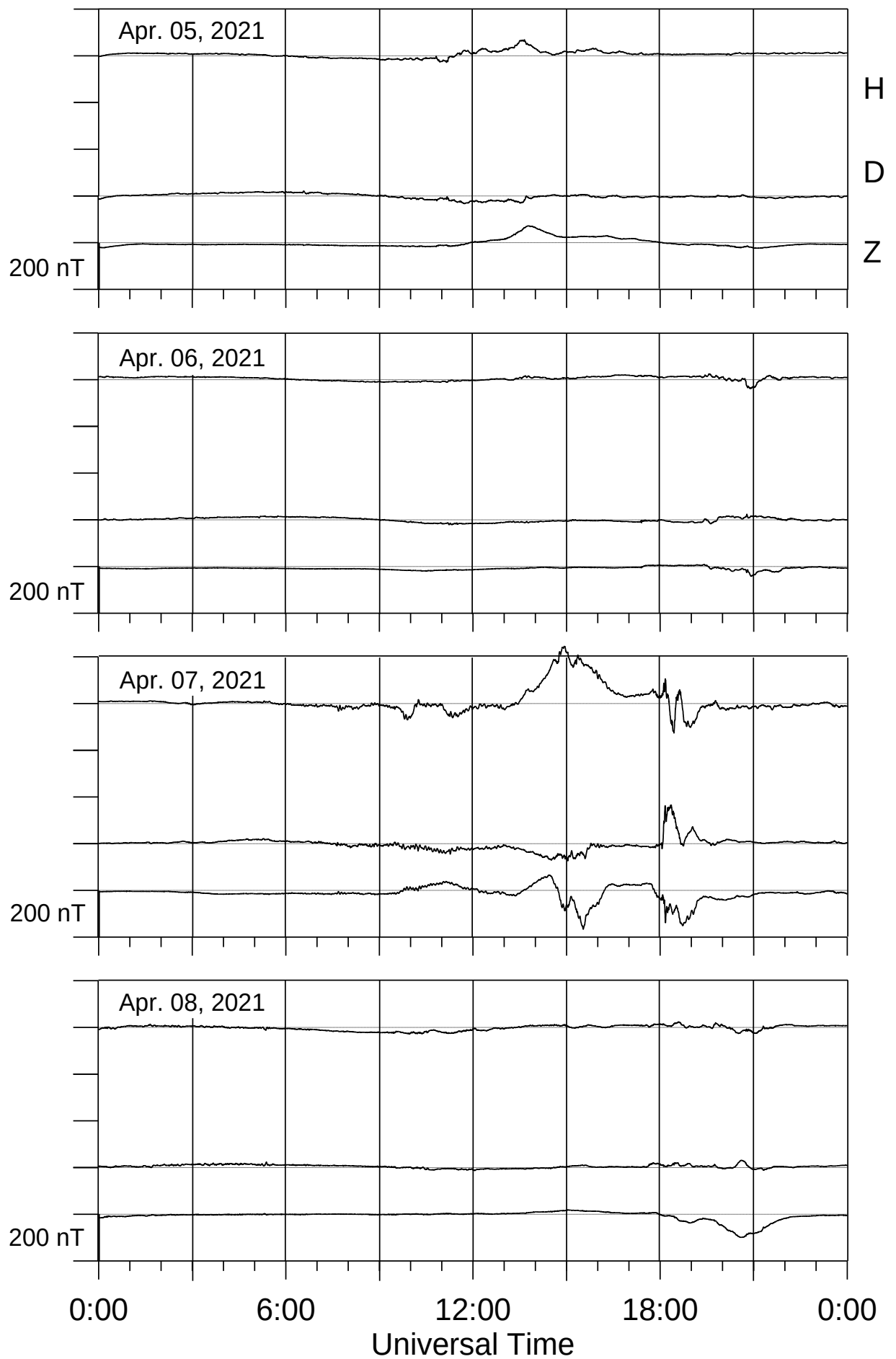
LOVOZERO MAGNETOGRAMS

April - June 2020

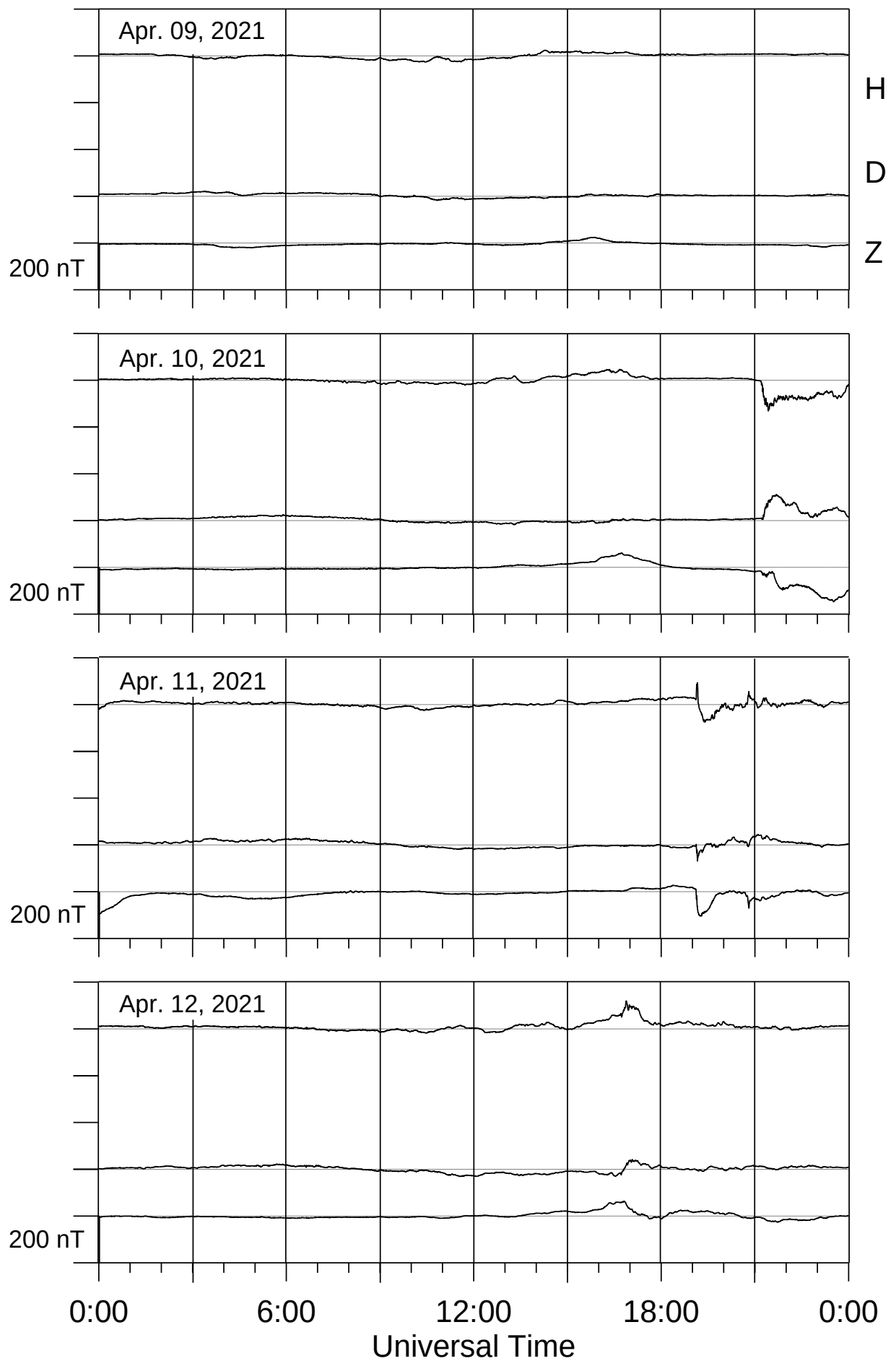
Lovozero magnetometer



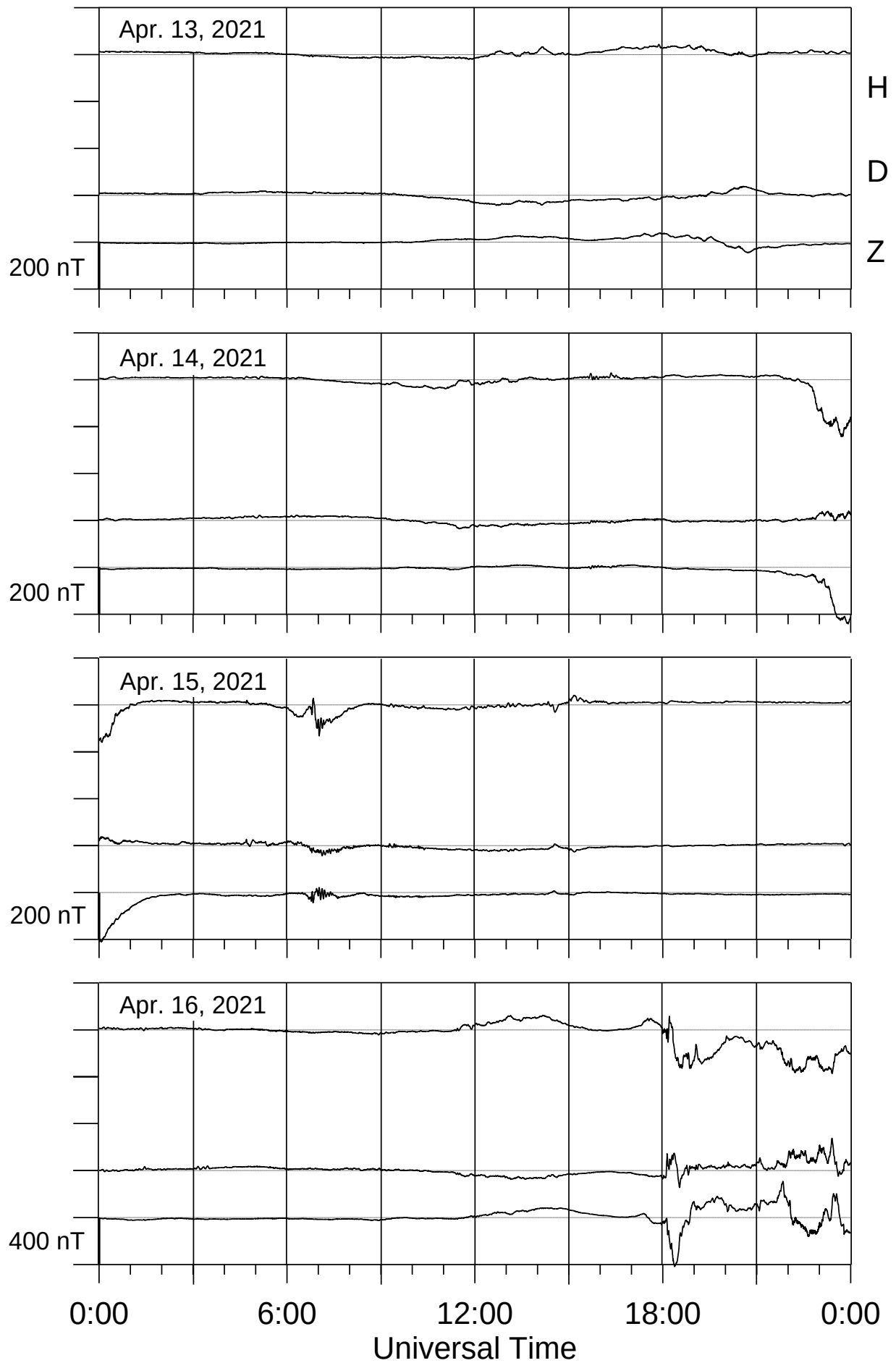
Lovozero magnetometer



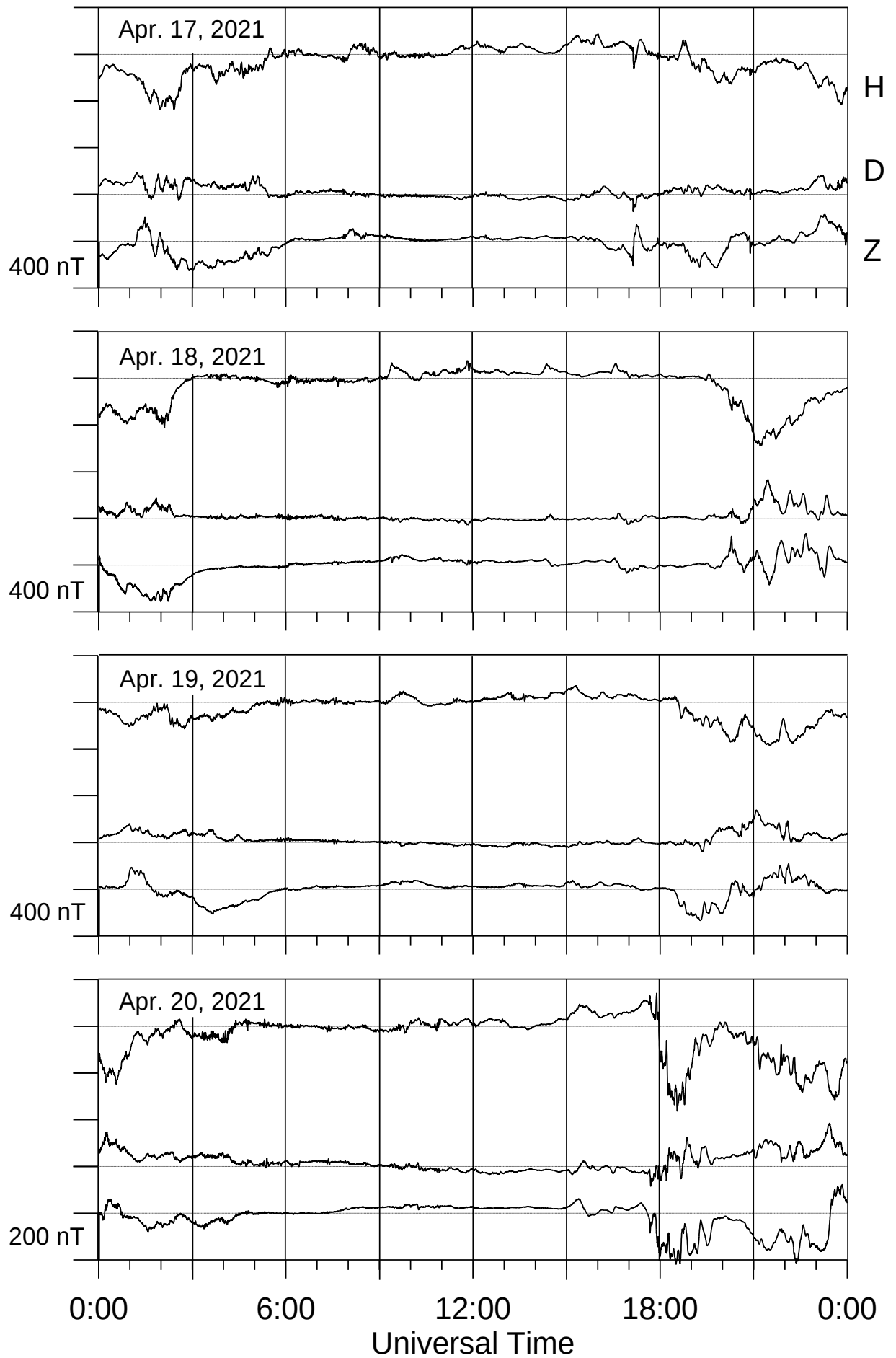
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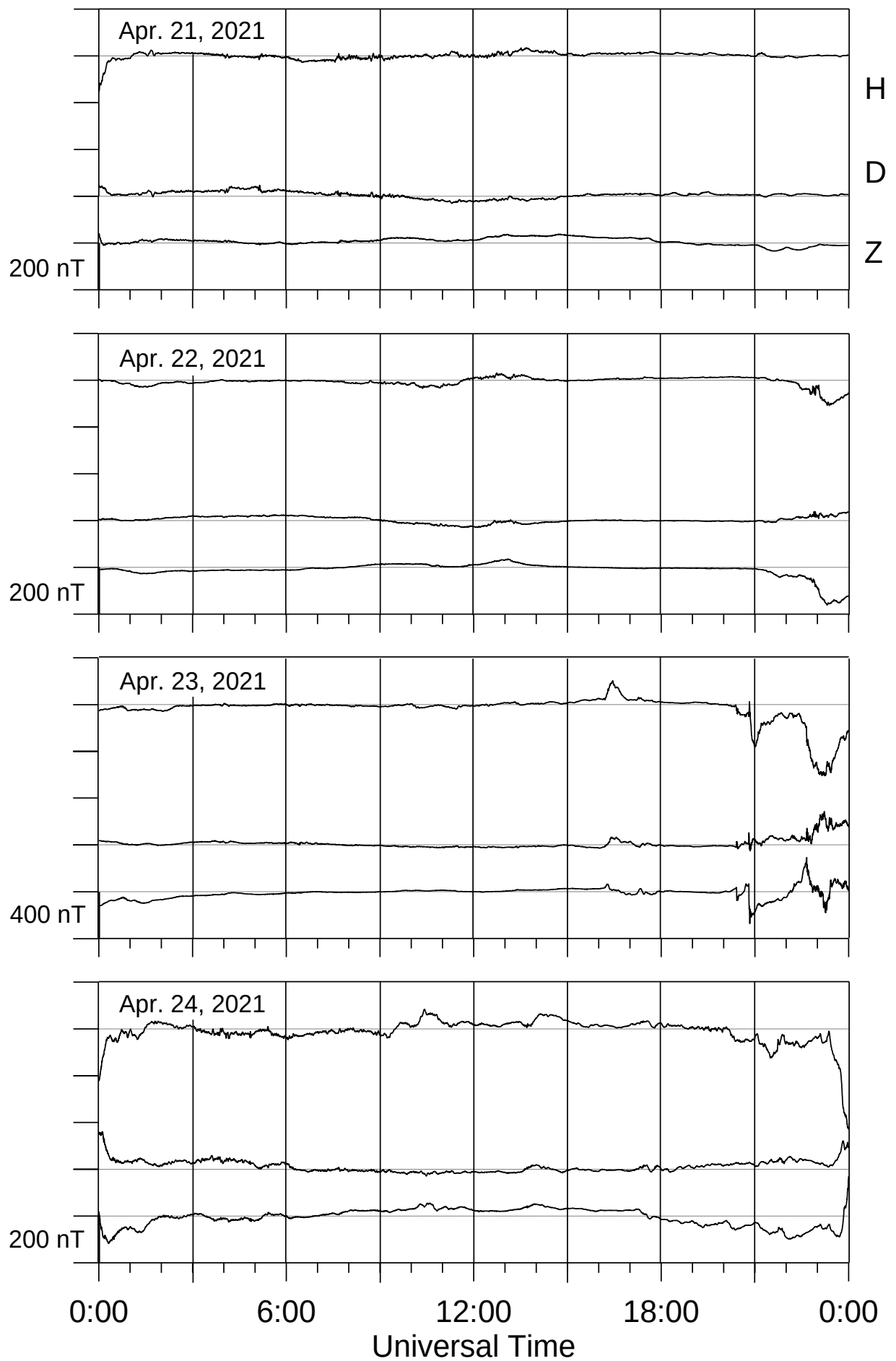
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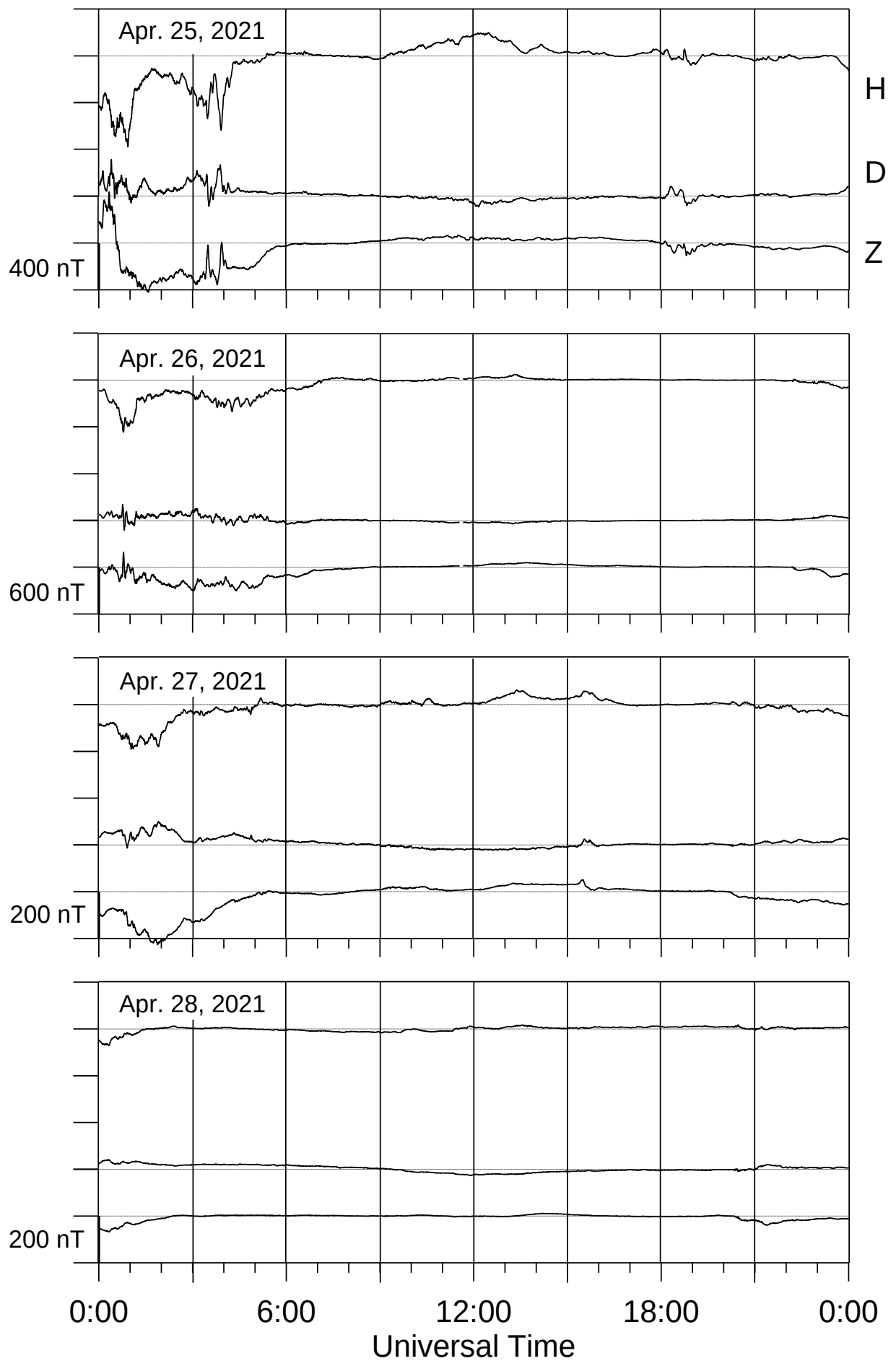
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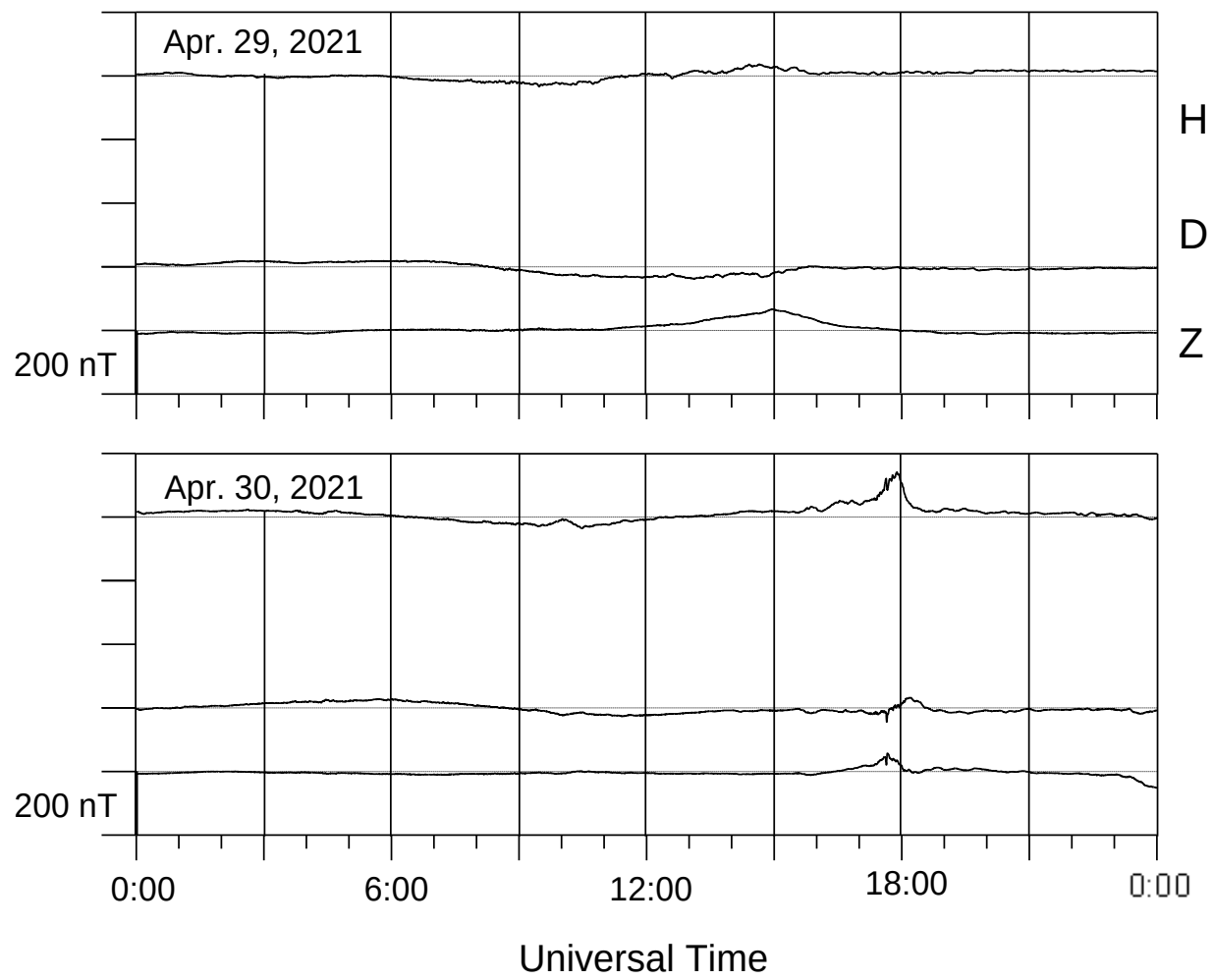
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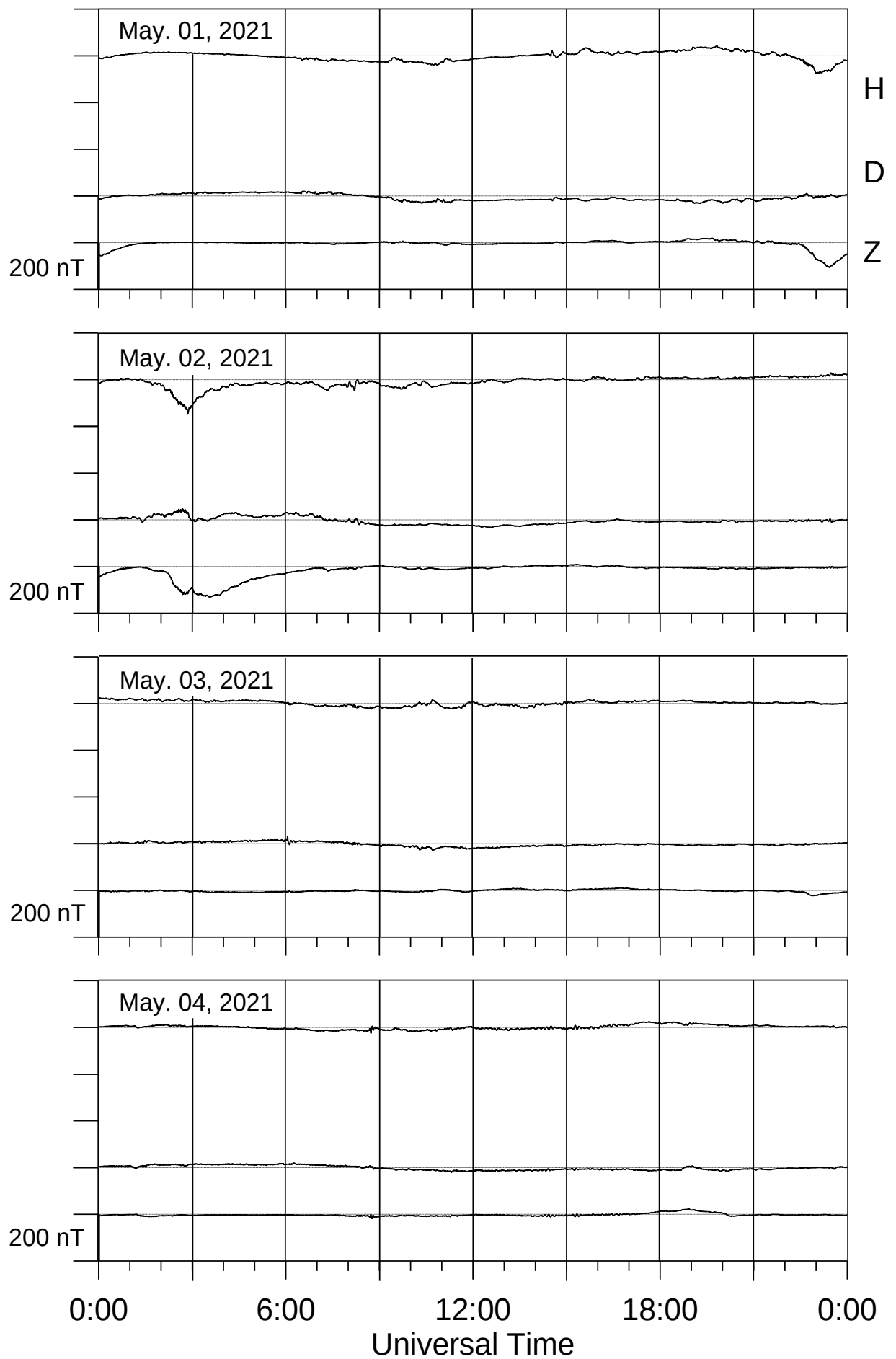
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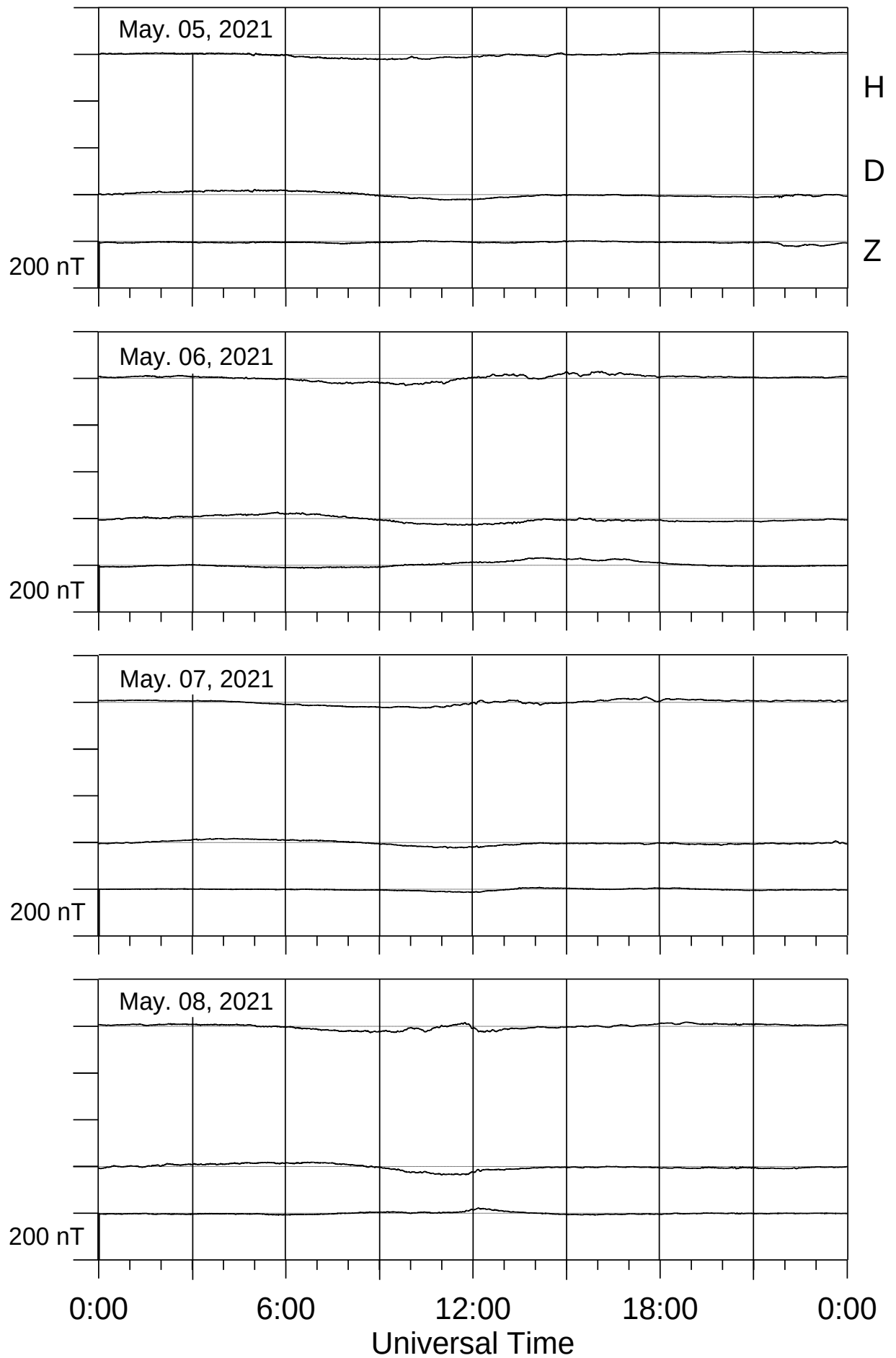
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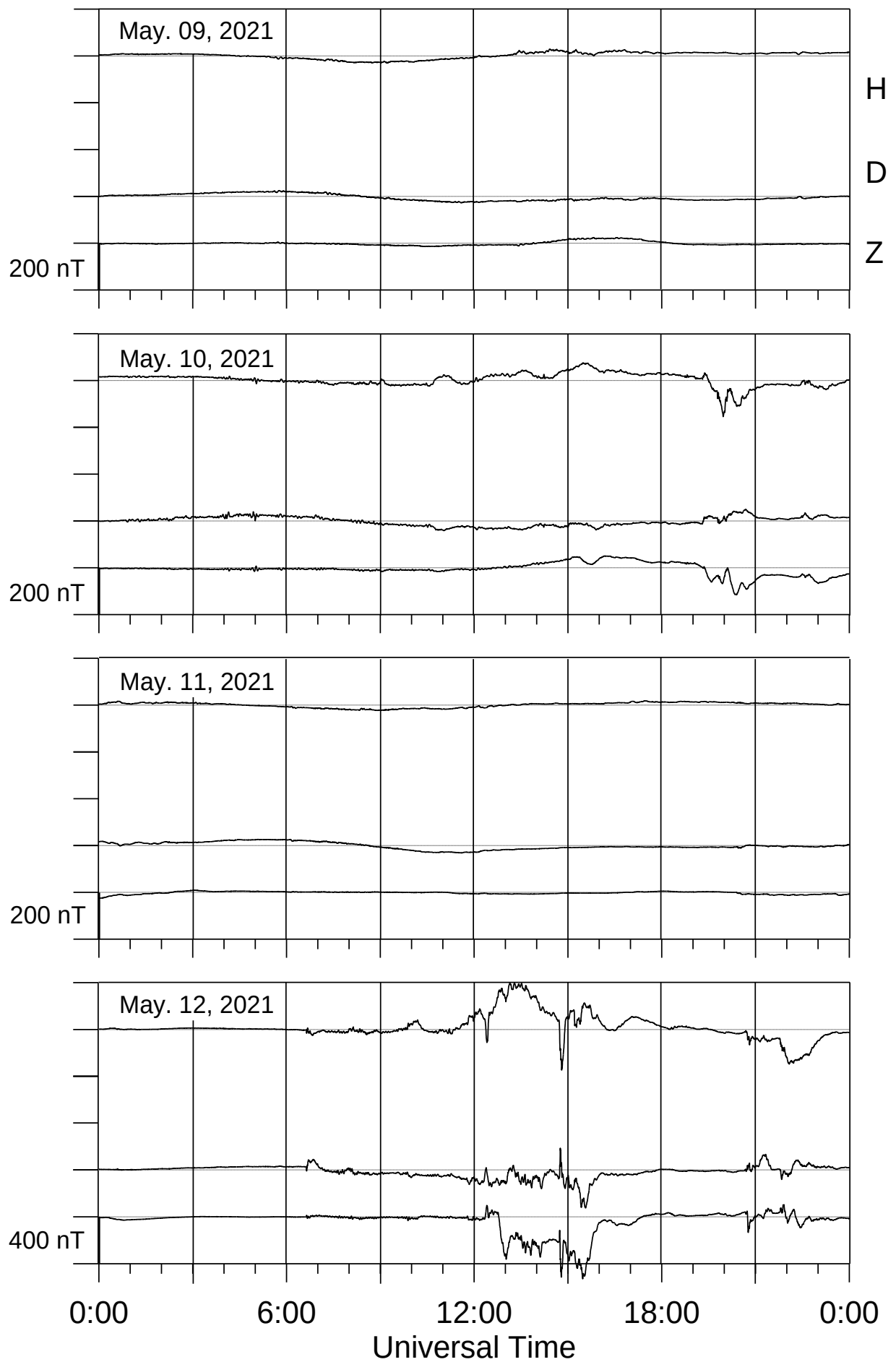
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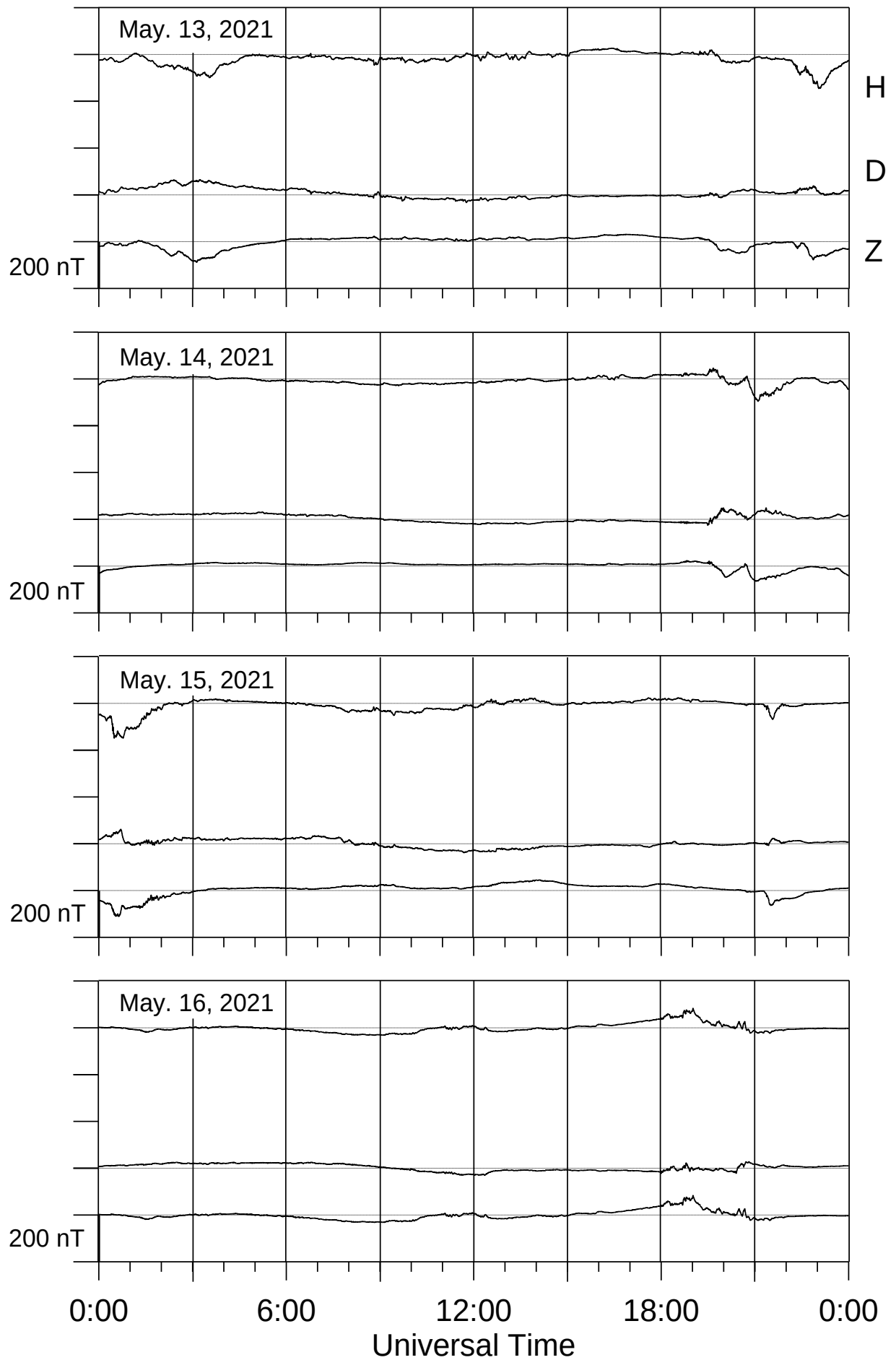
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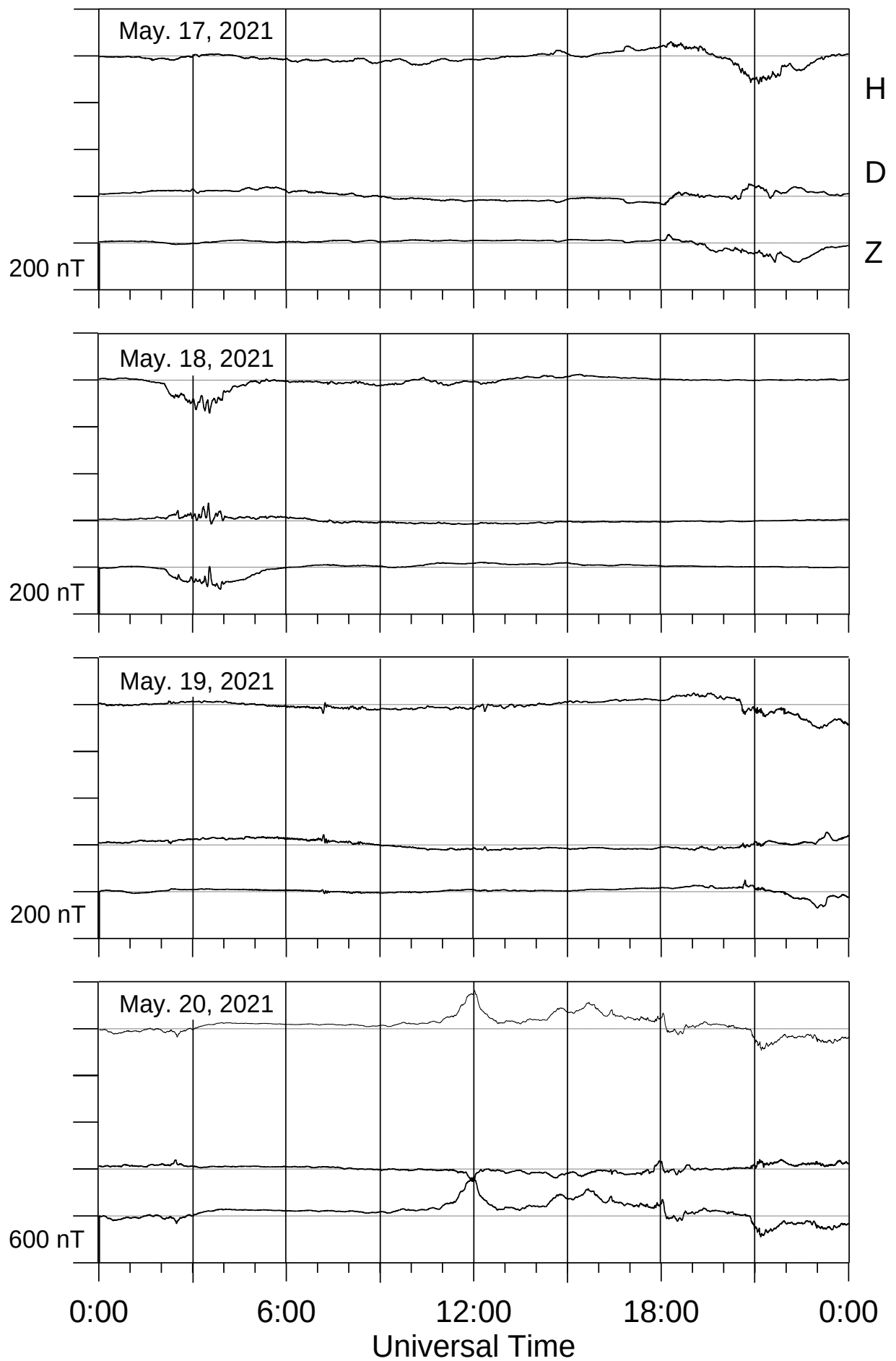
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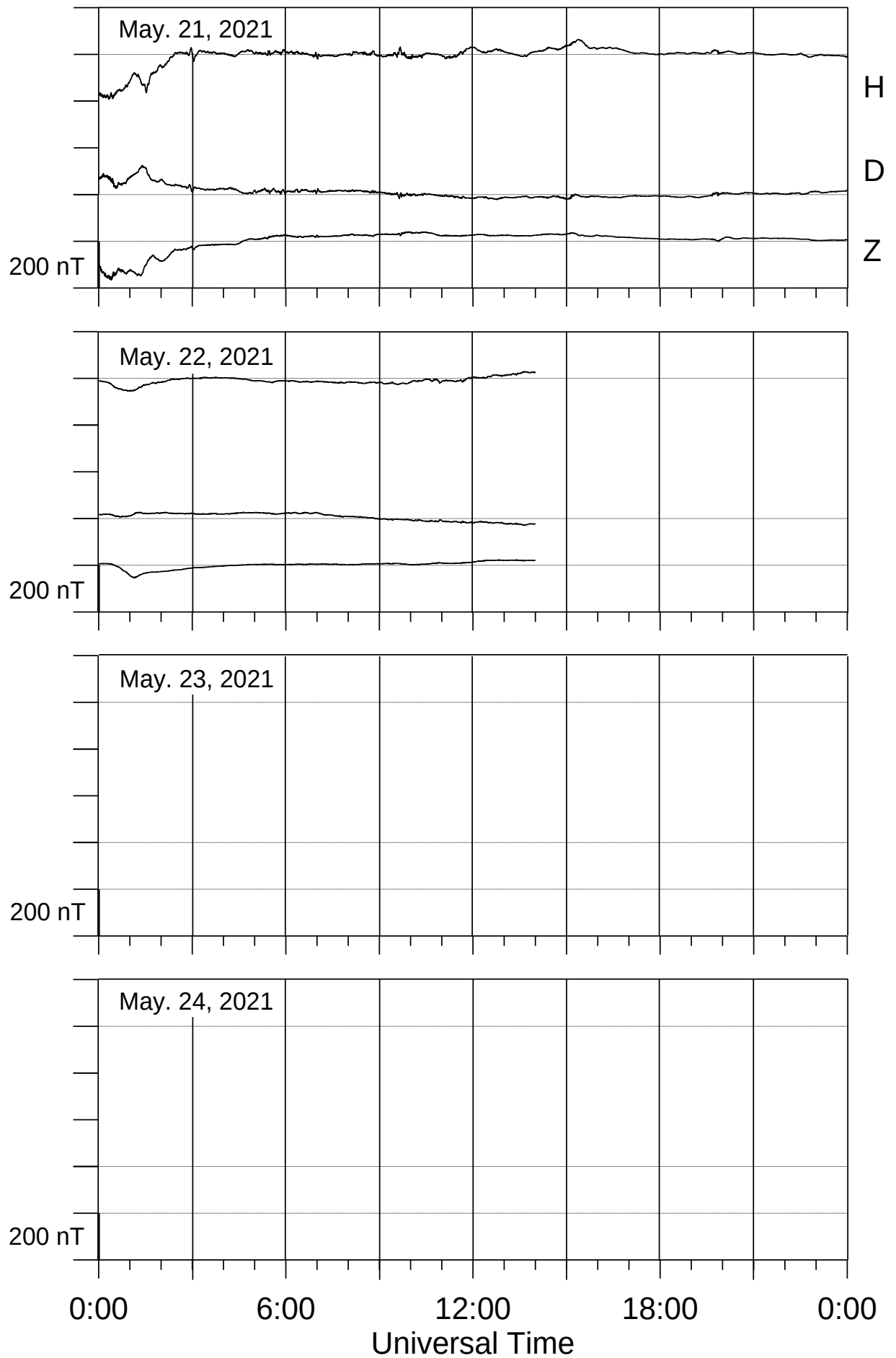
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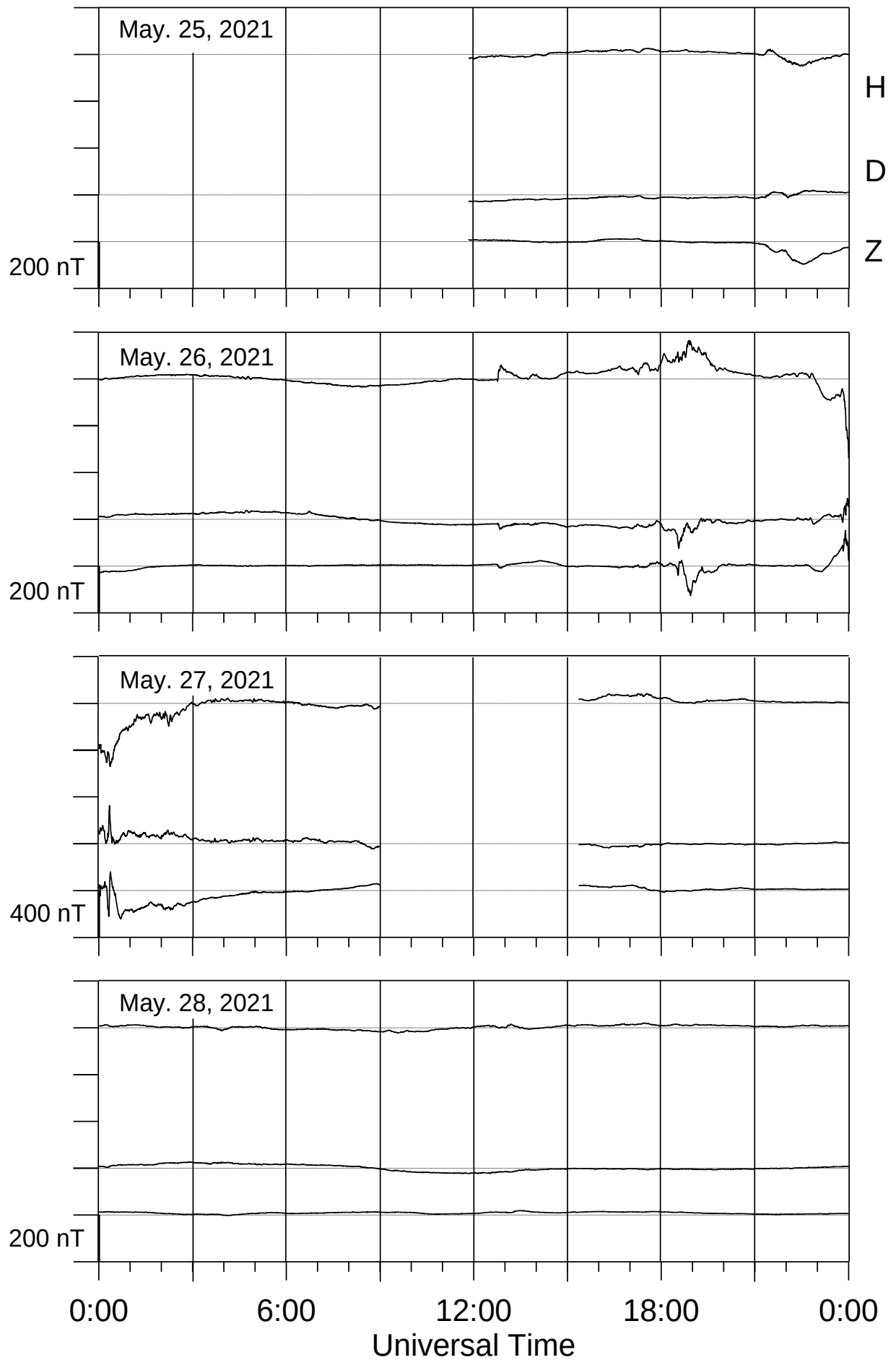
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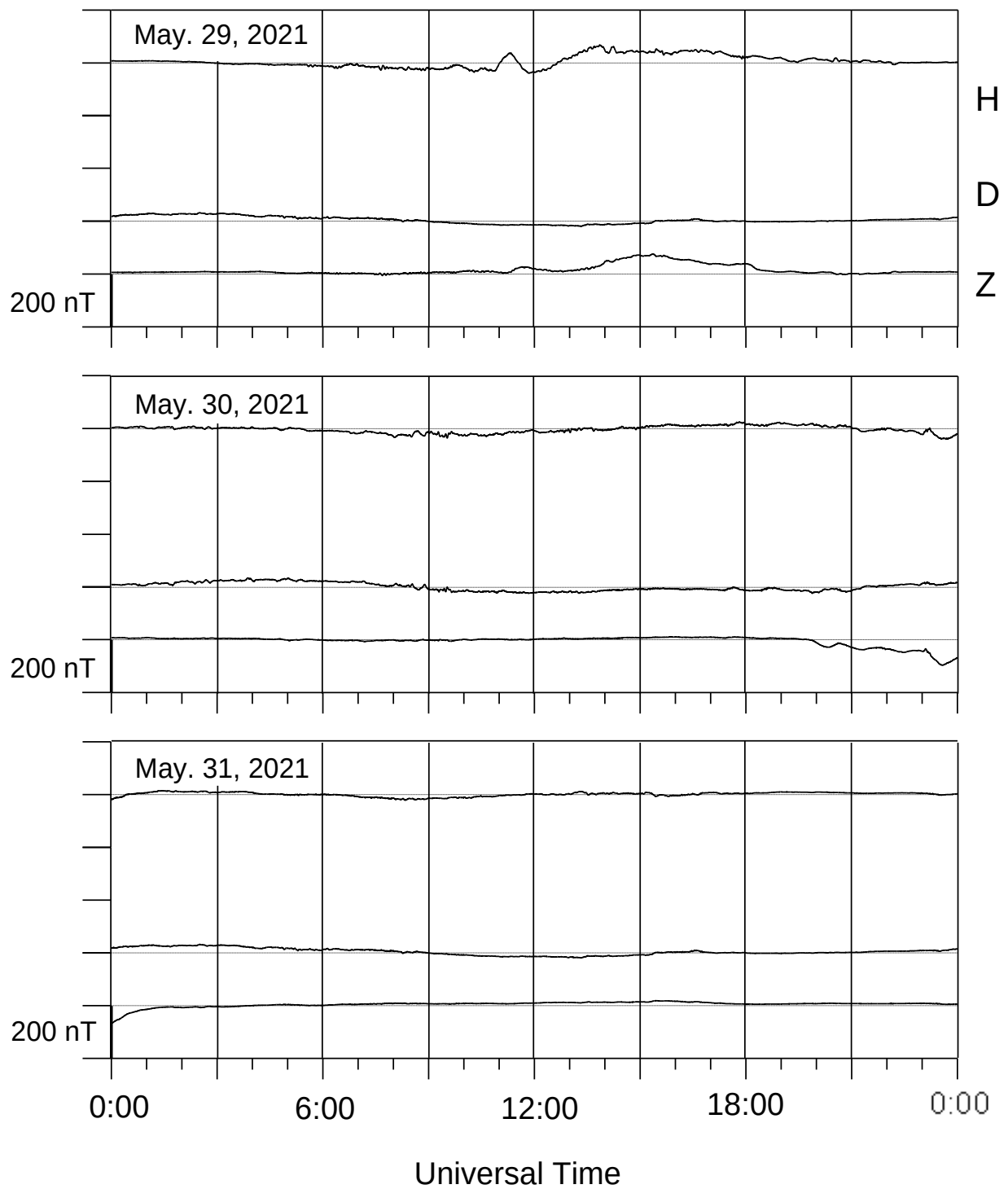
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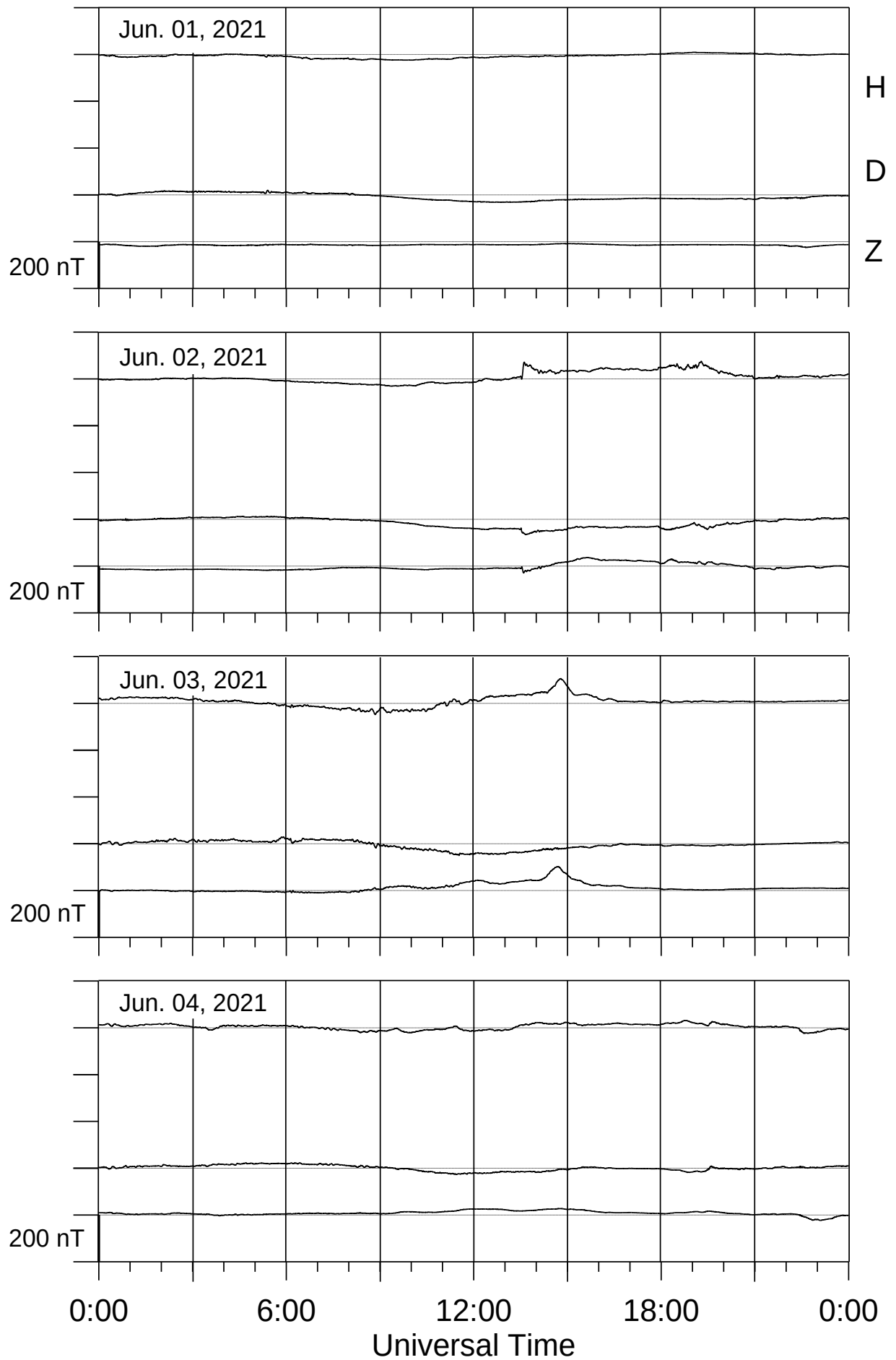
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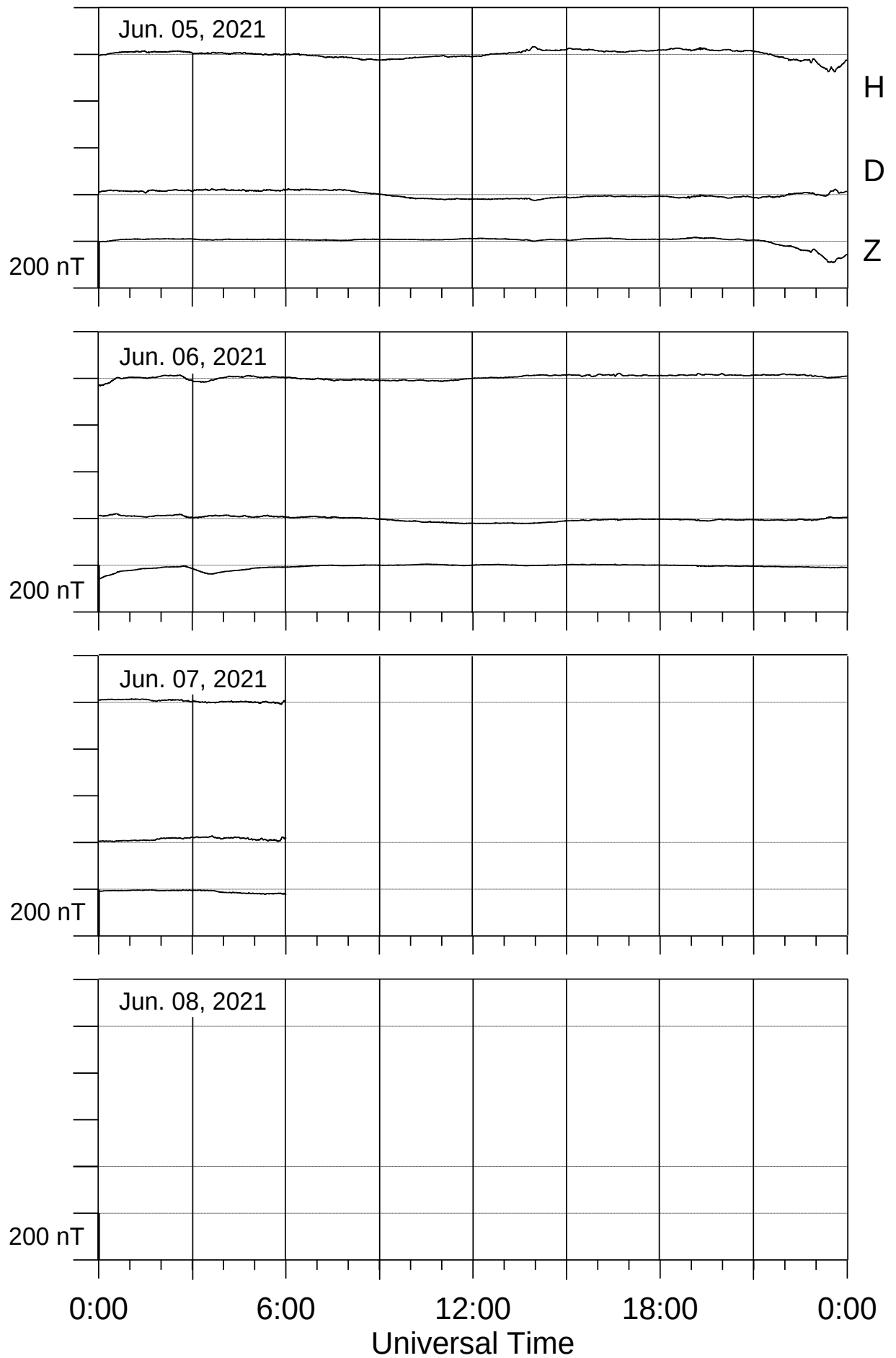
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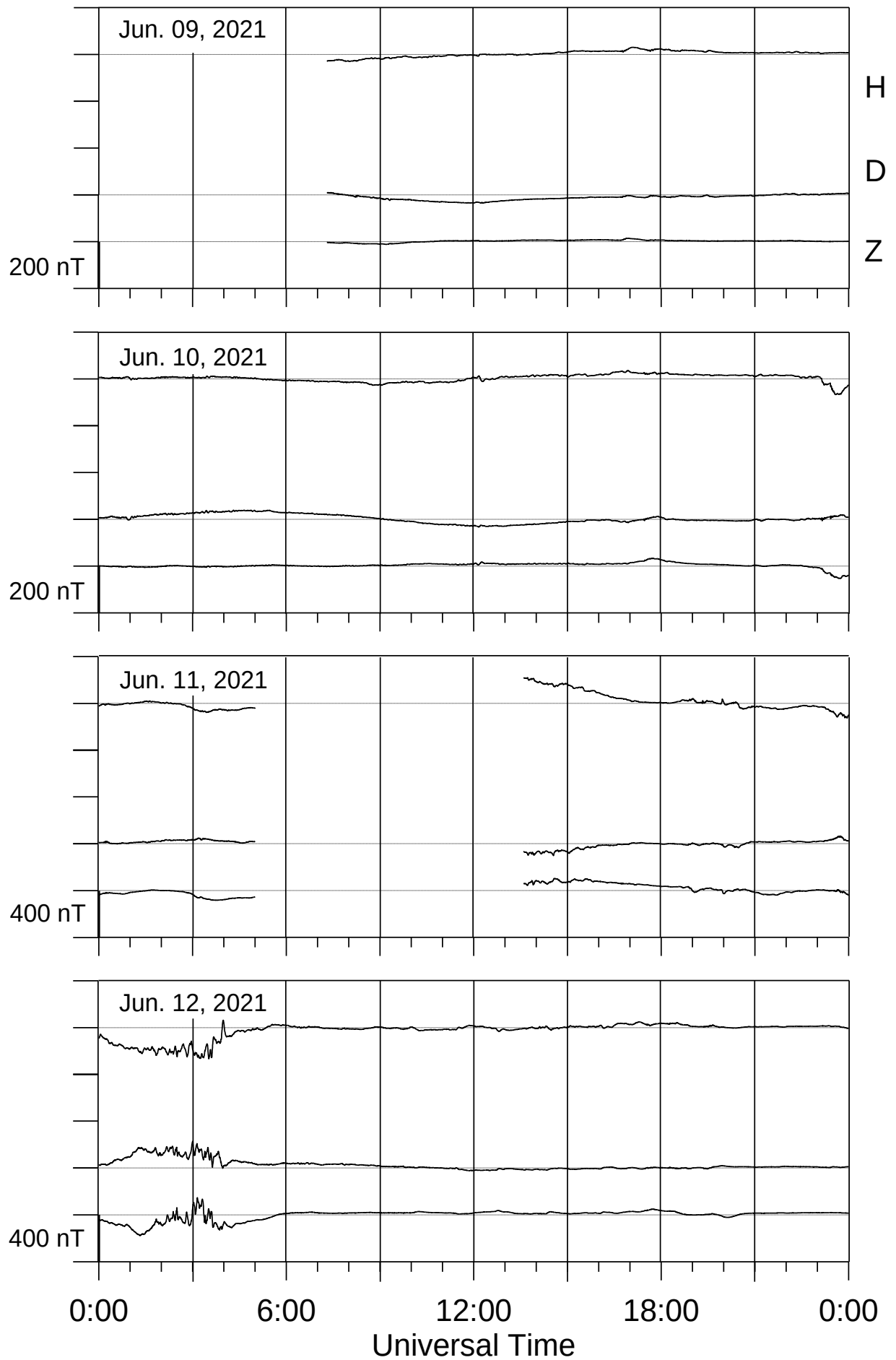
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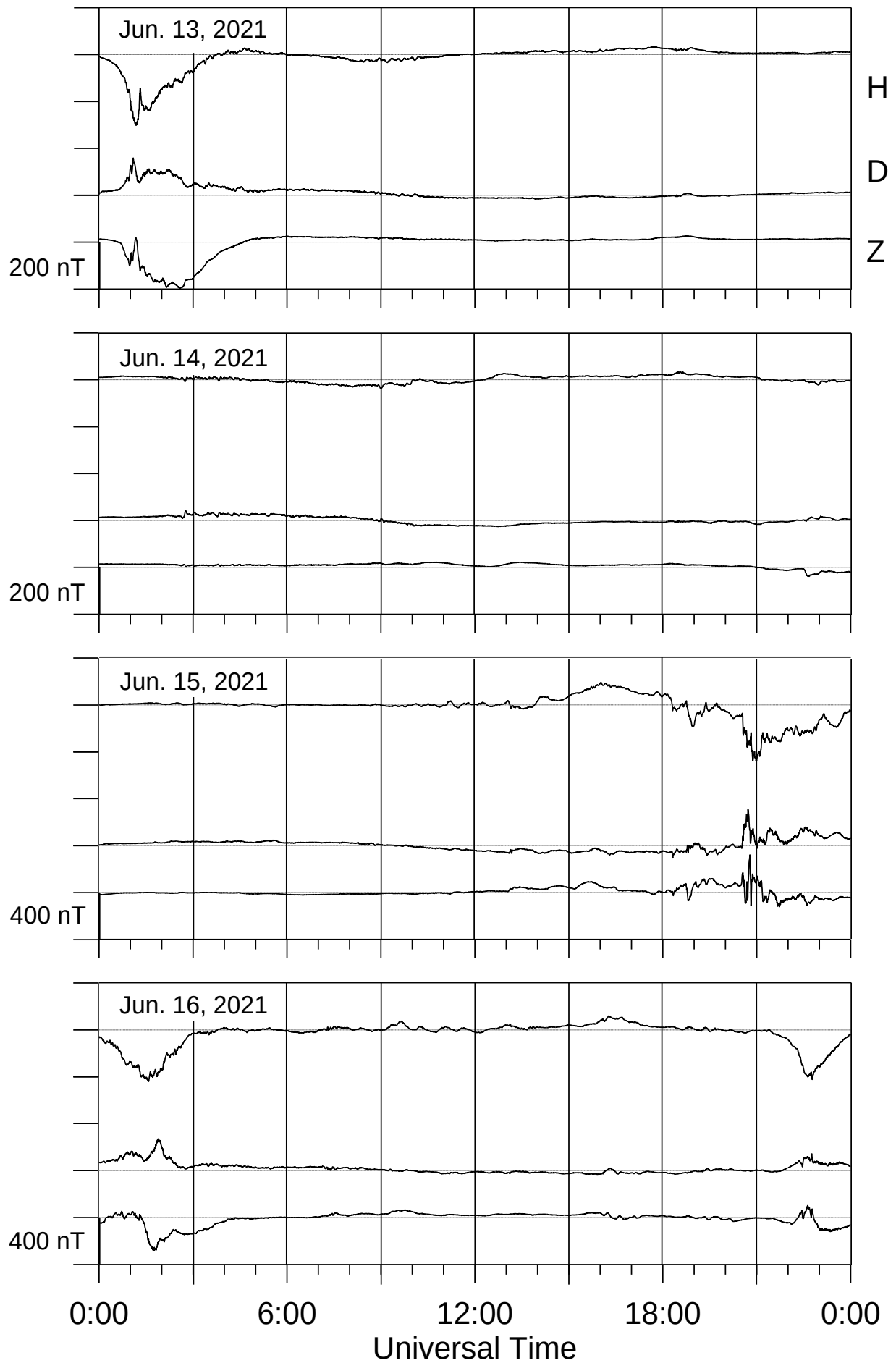
Lovozero magnetometer



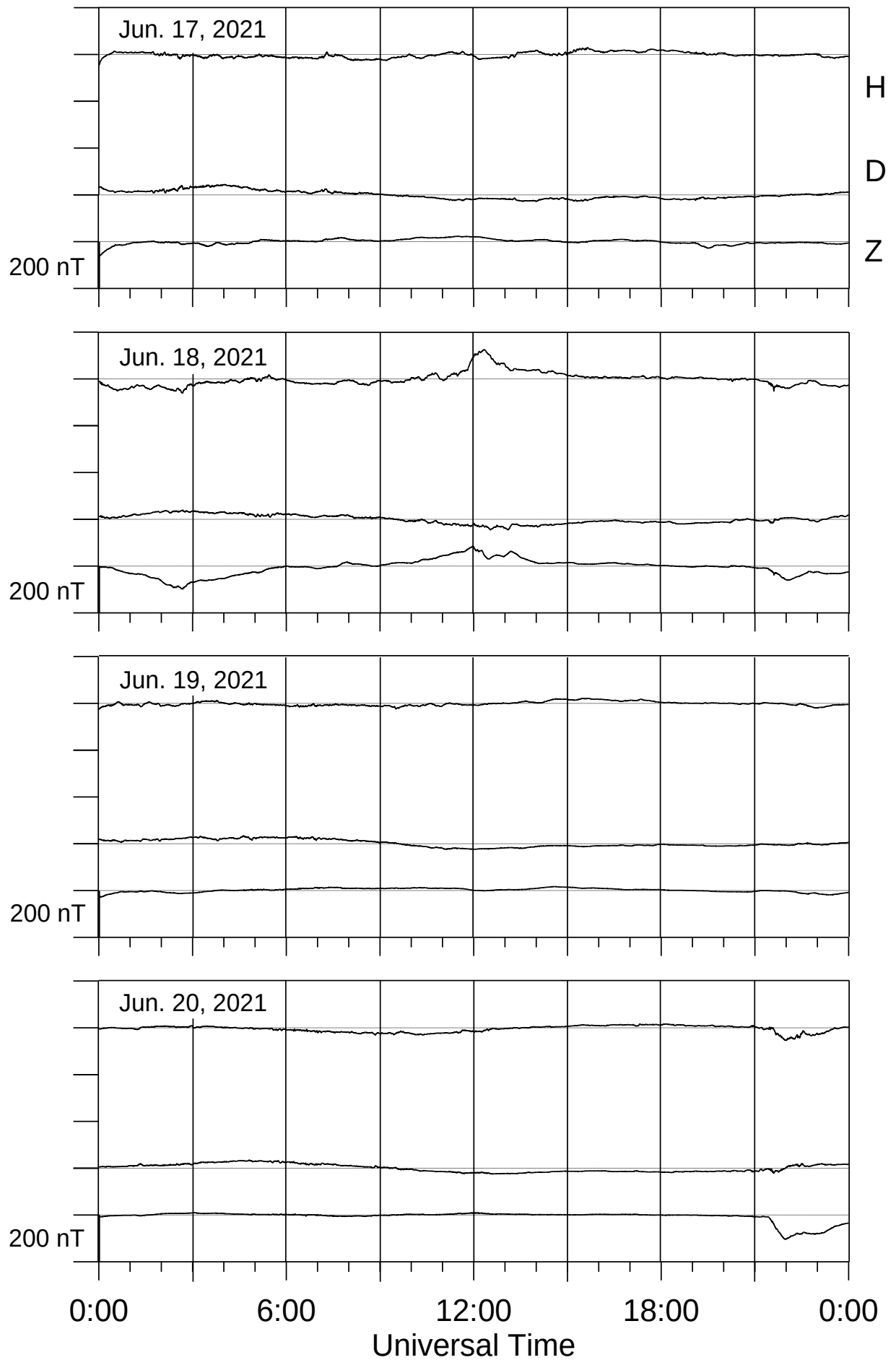
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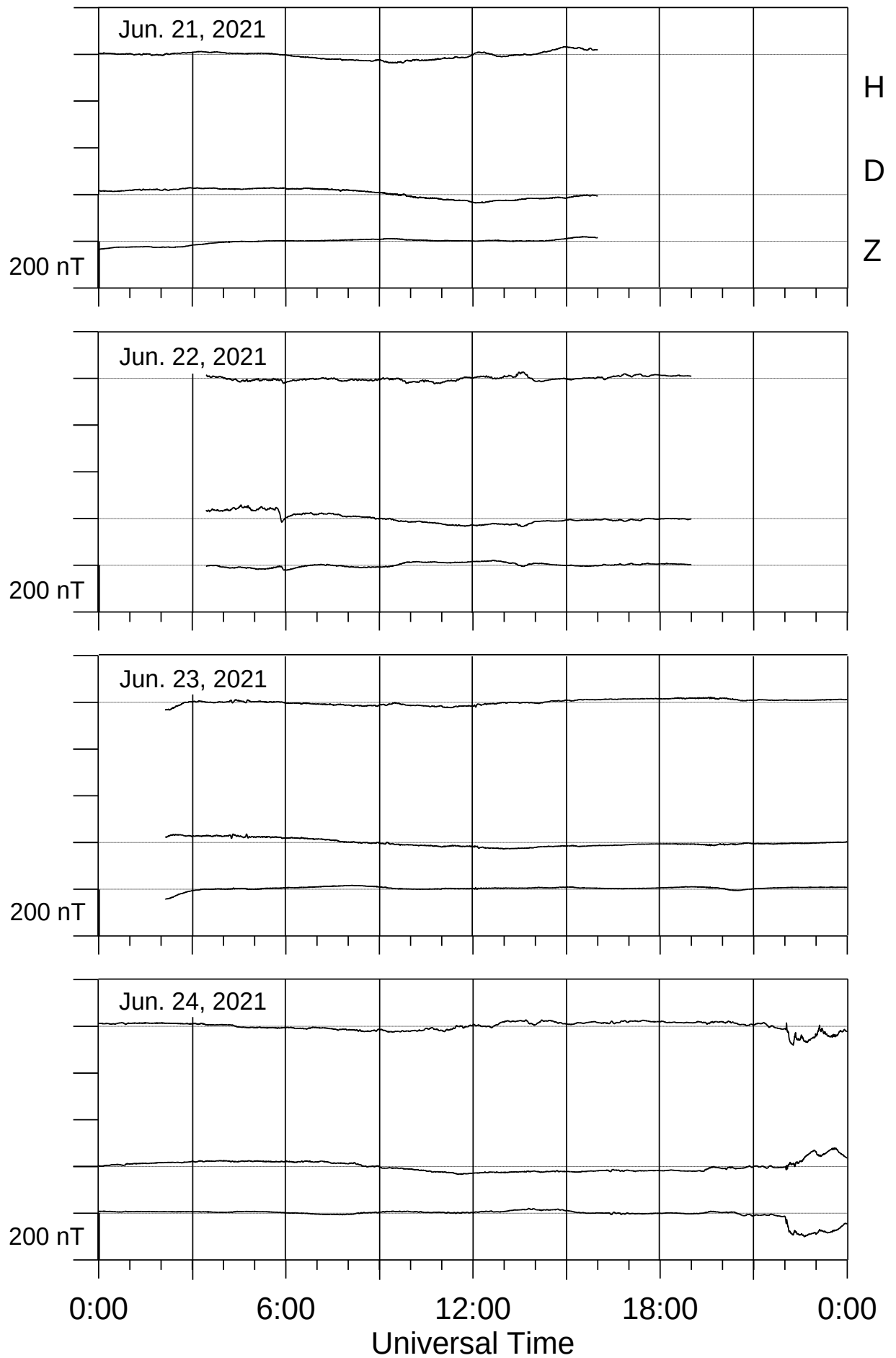
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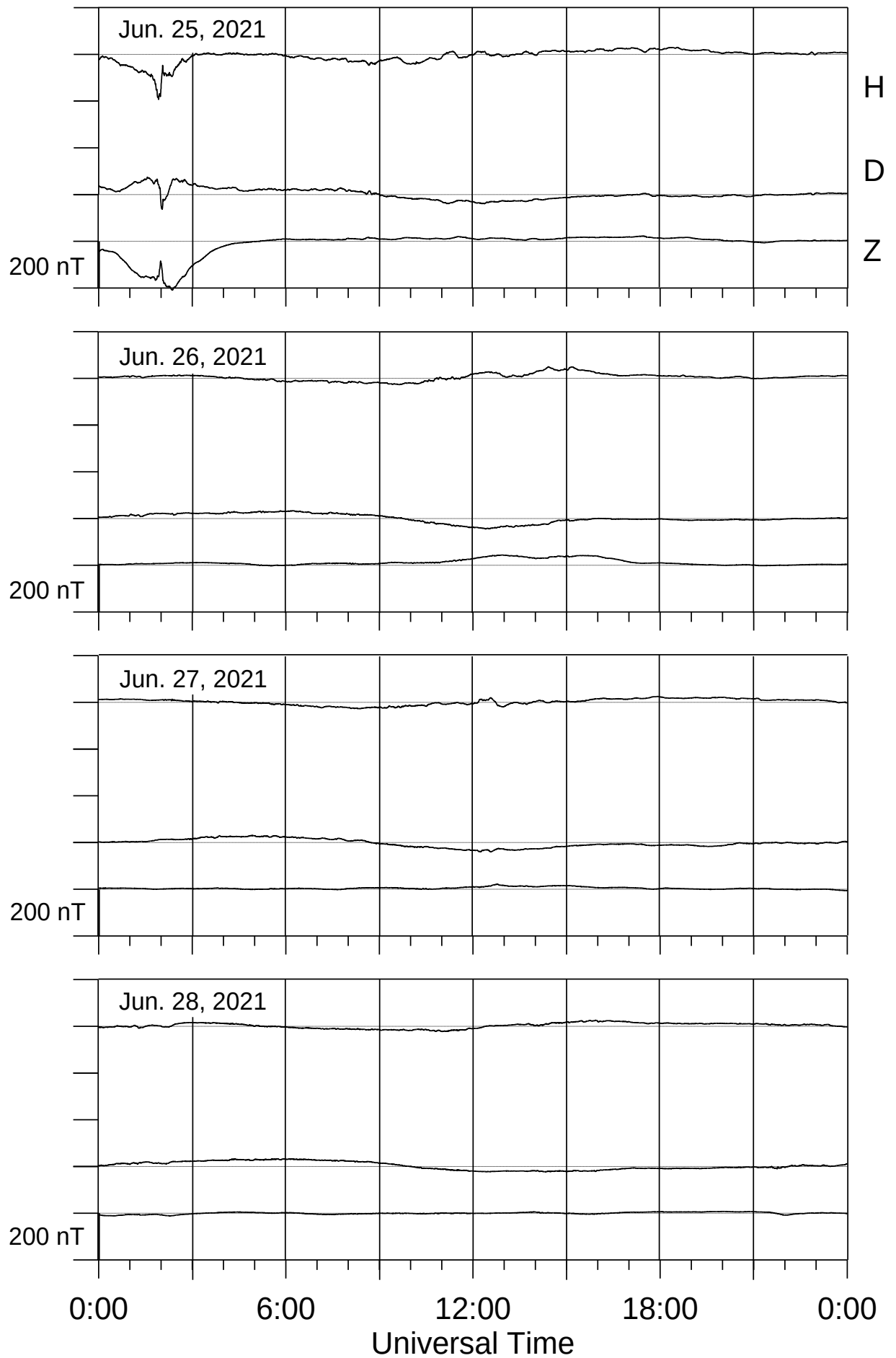
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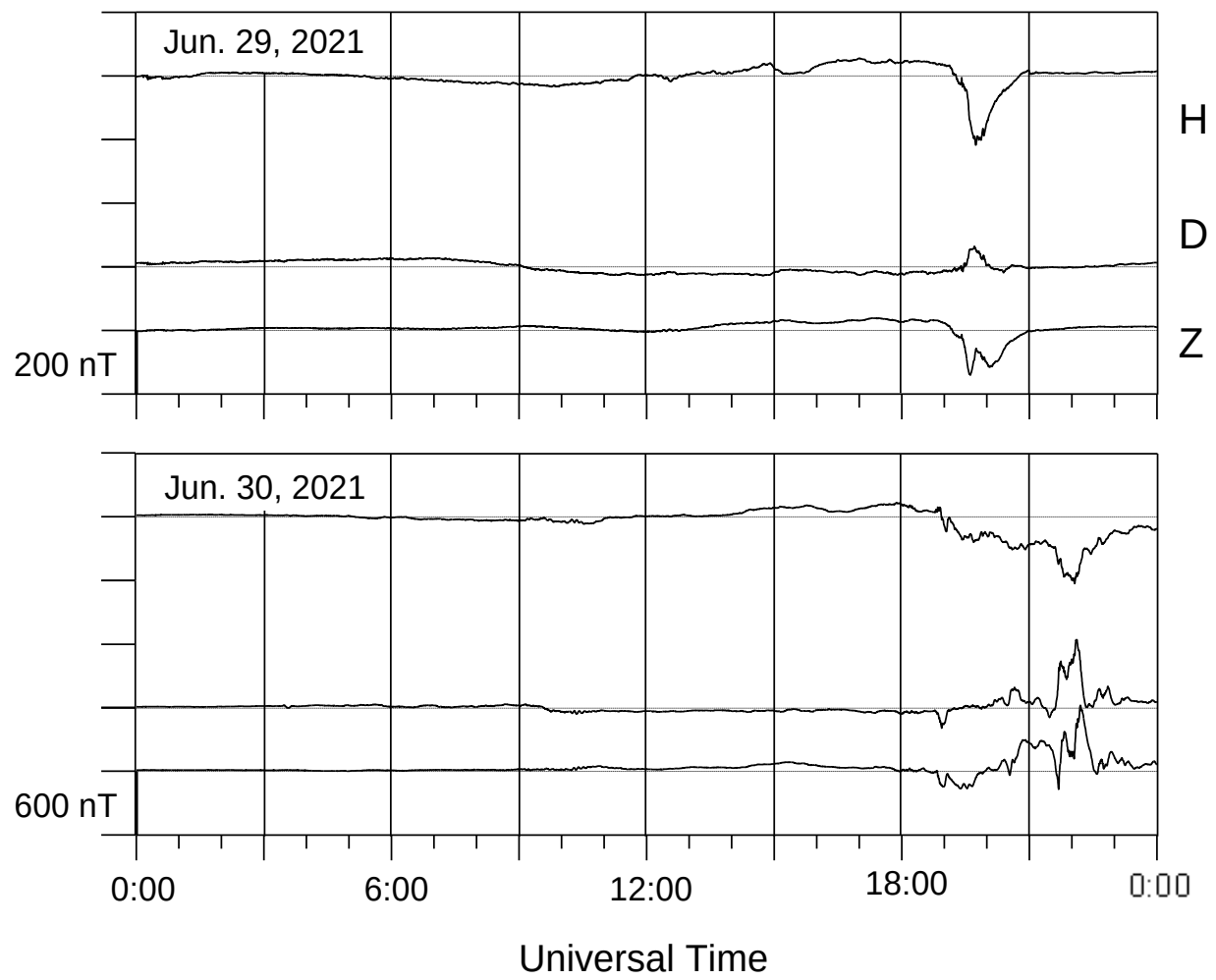
Lovozero magnetometer



Lovozero magnetometer



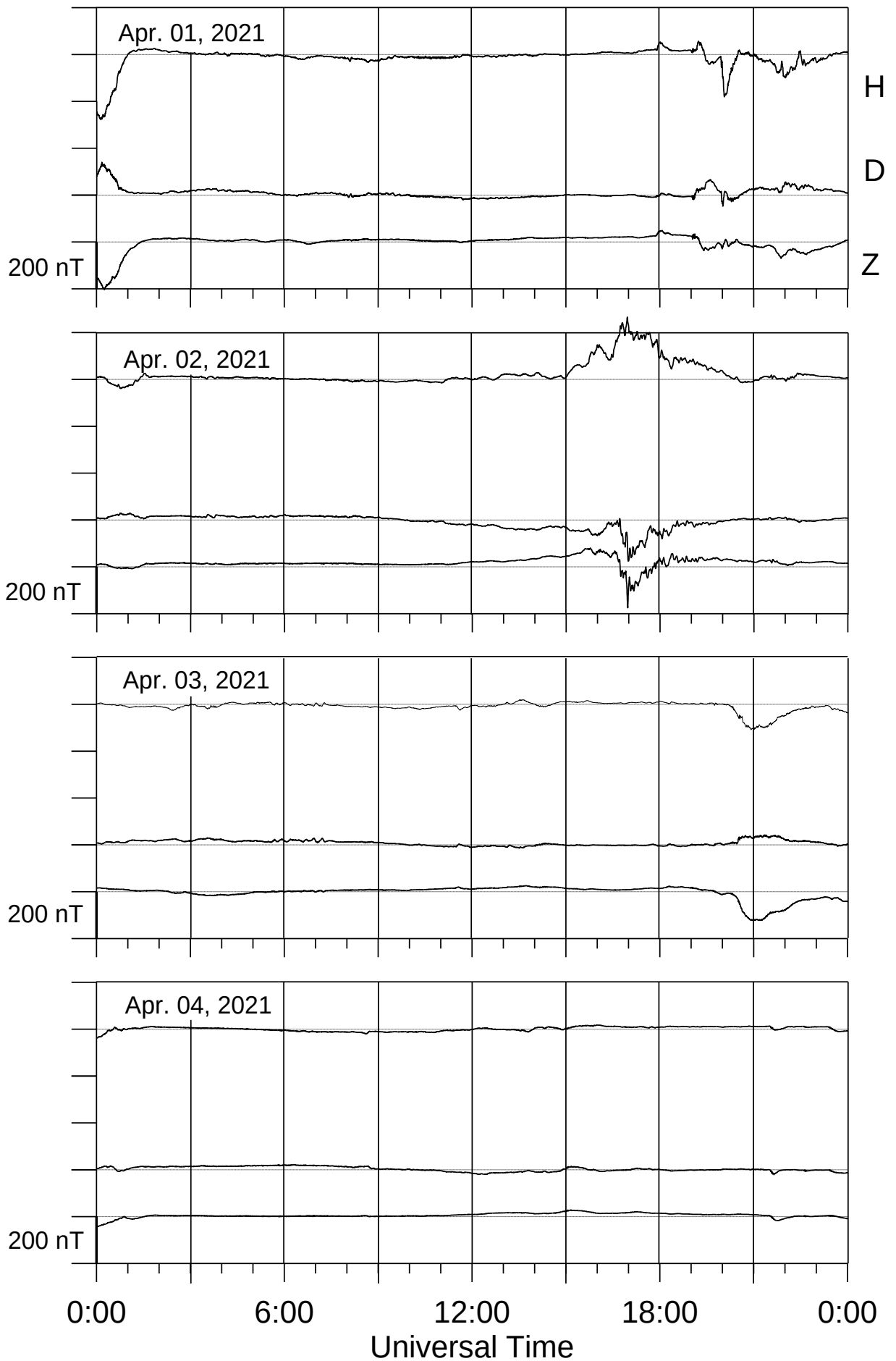
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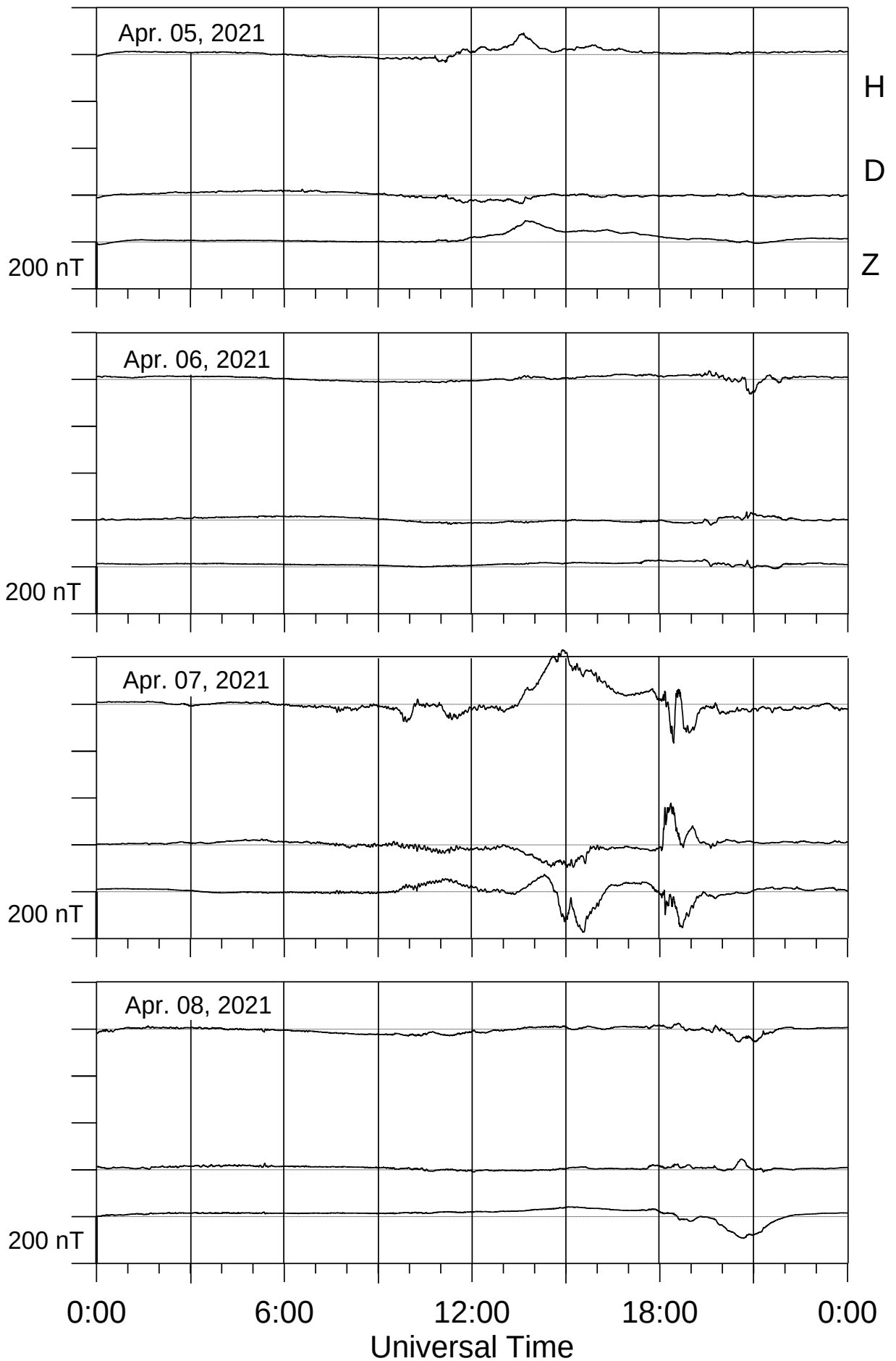
LOPARSKAYA MAGNETOGRAMS

April - June 2020

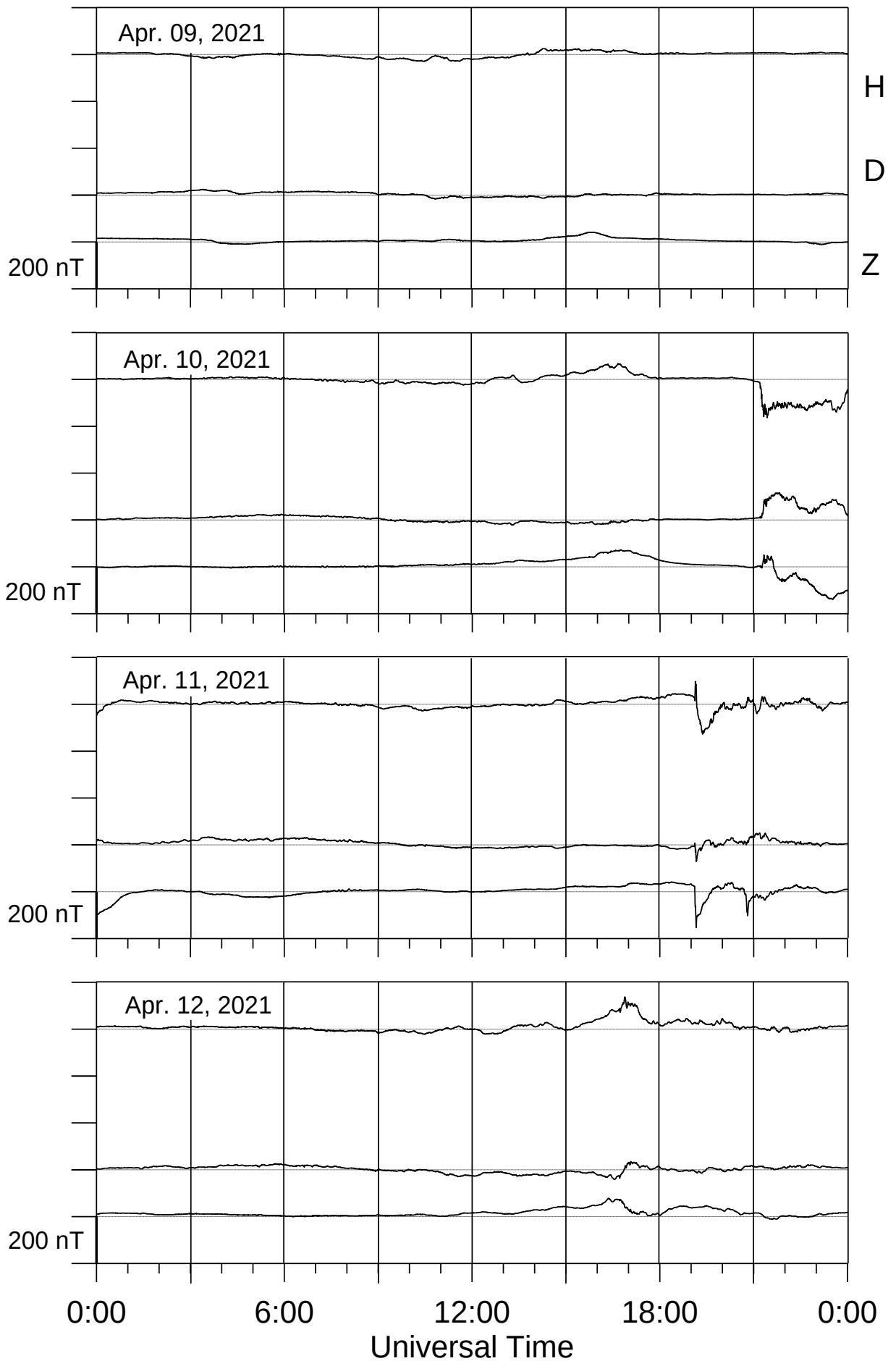
Loparskaya magnetometer



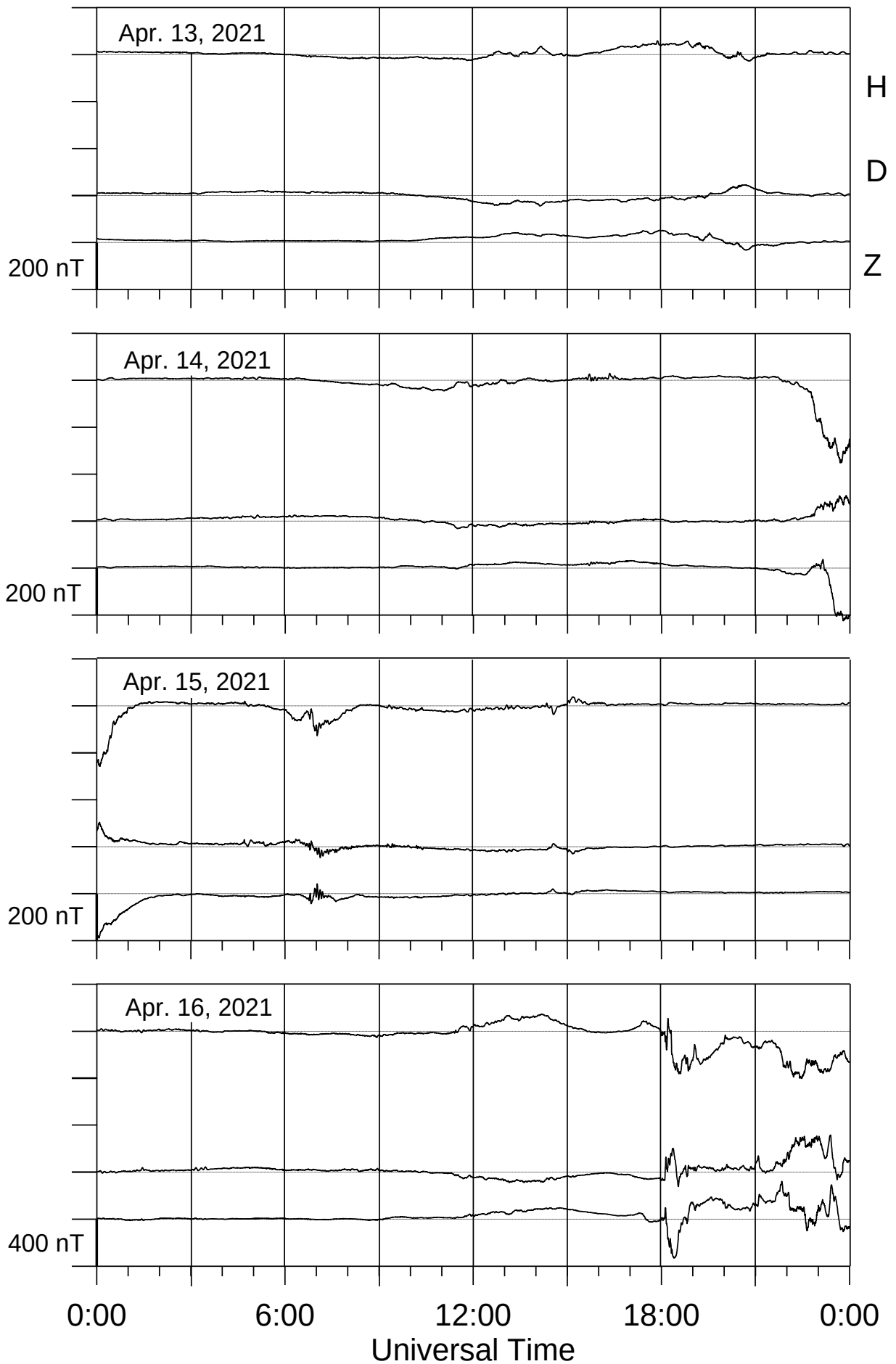
Loparskaya magnetometer



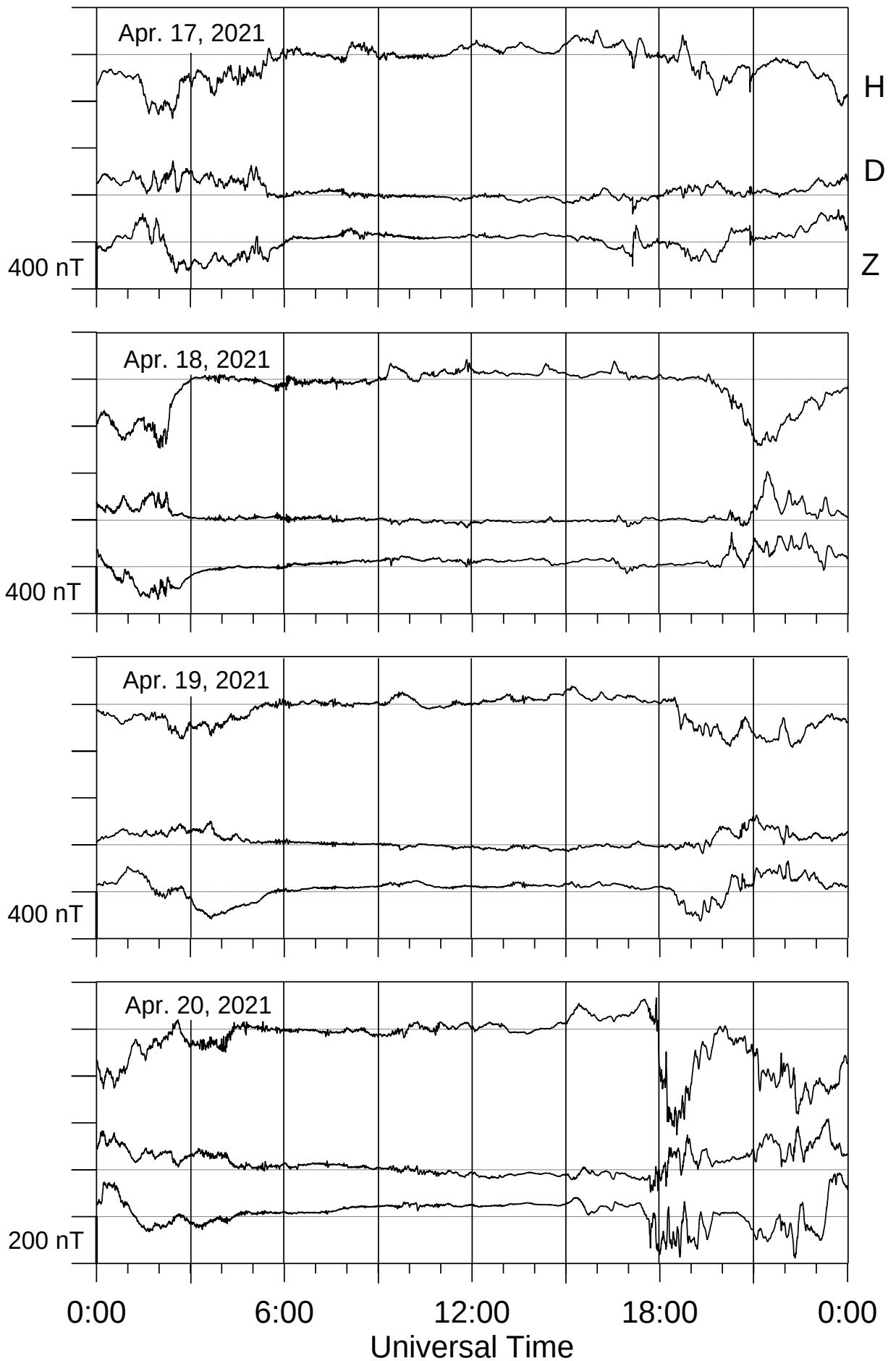
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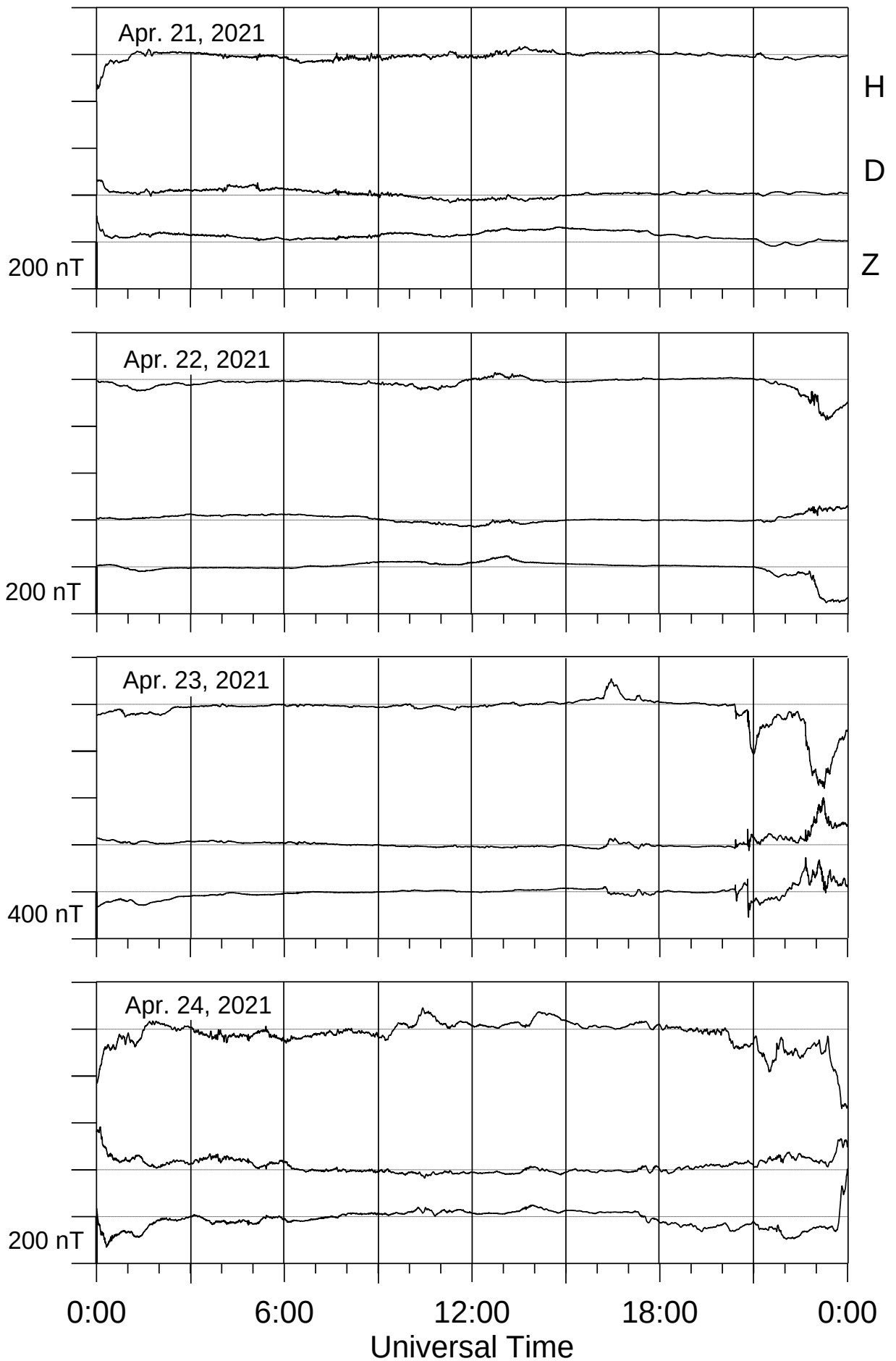
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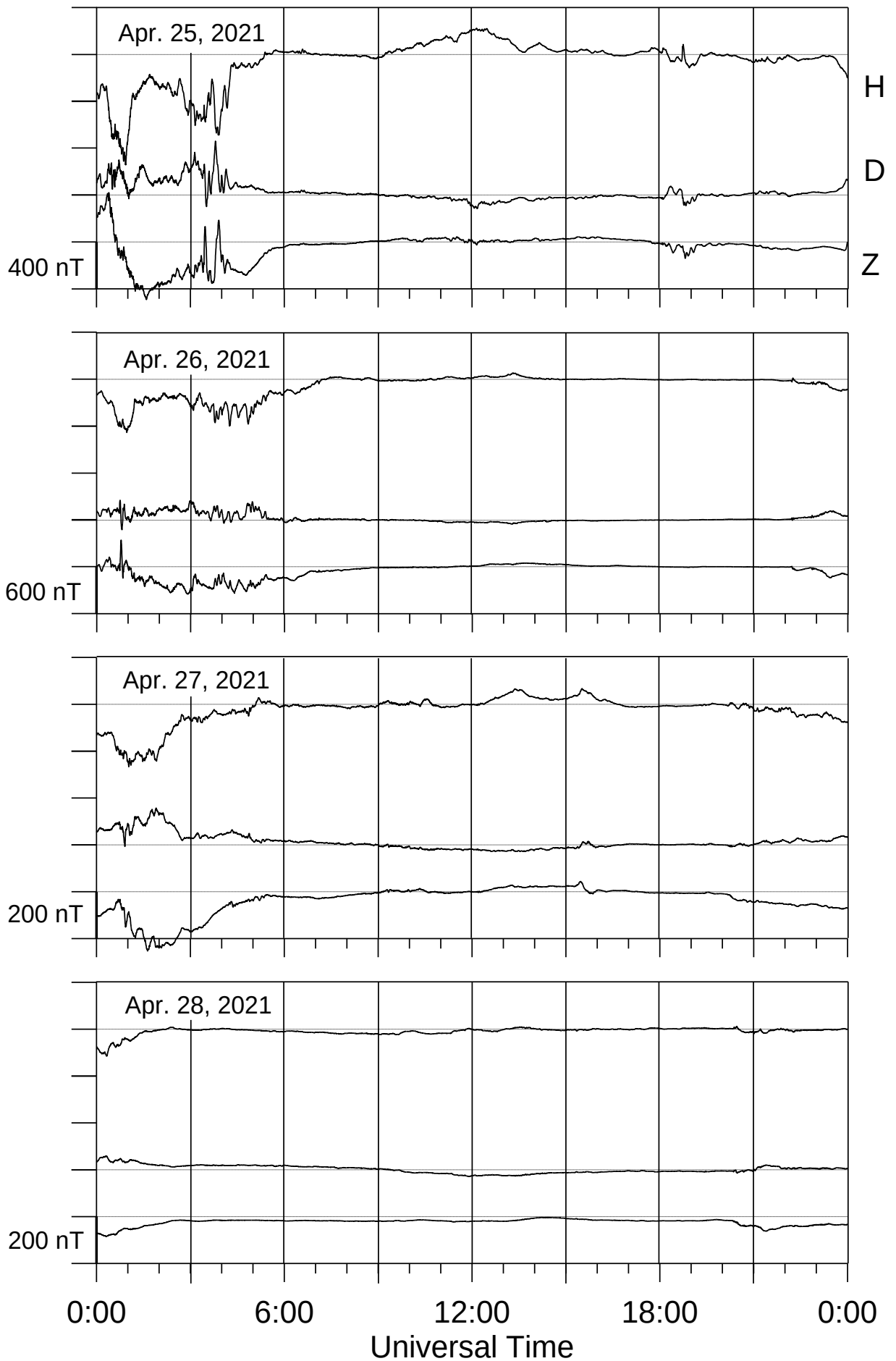
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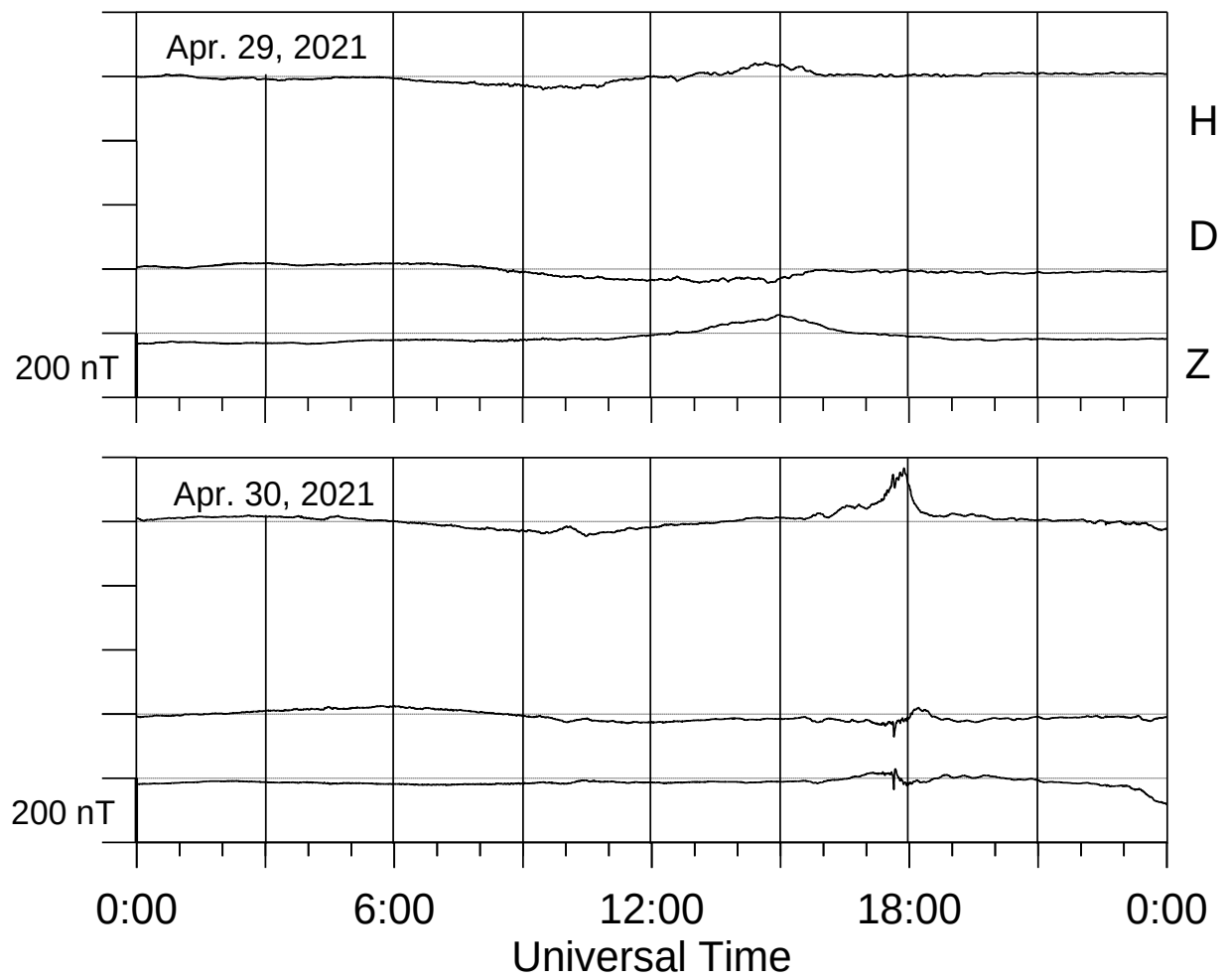
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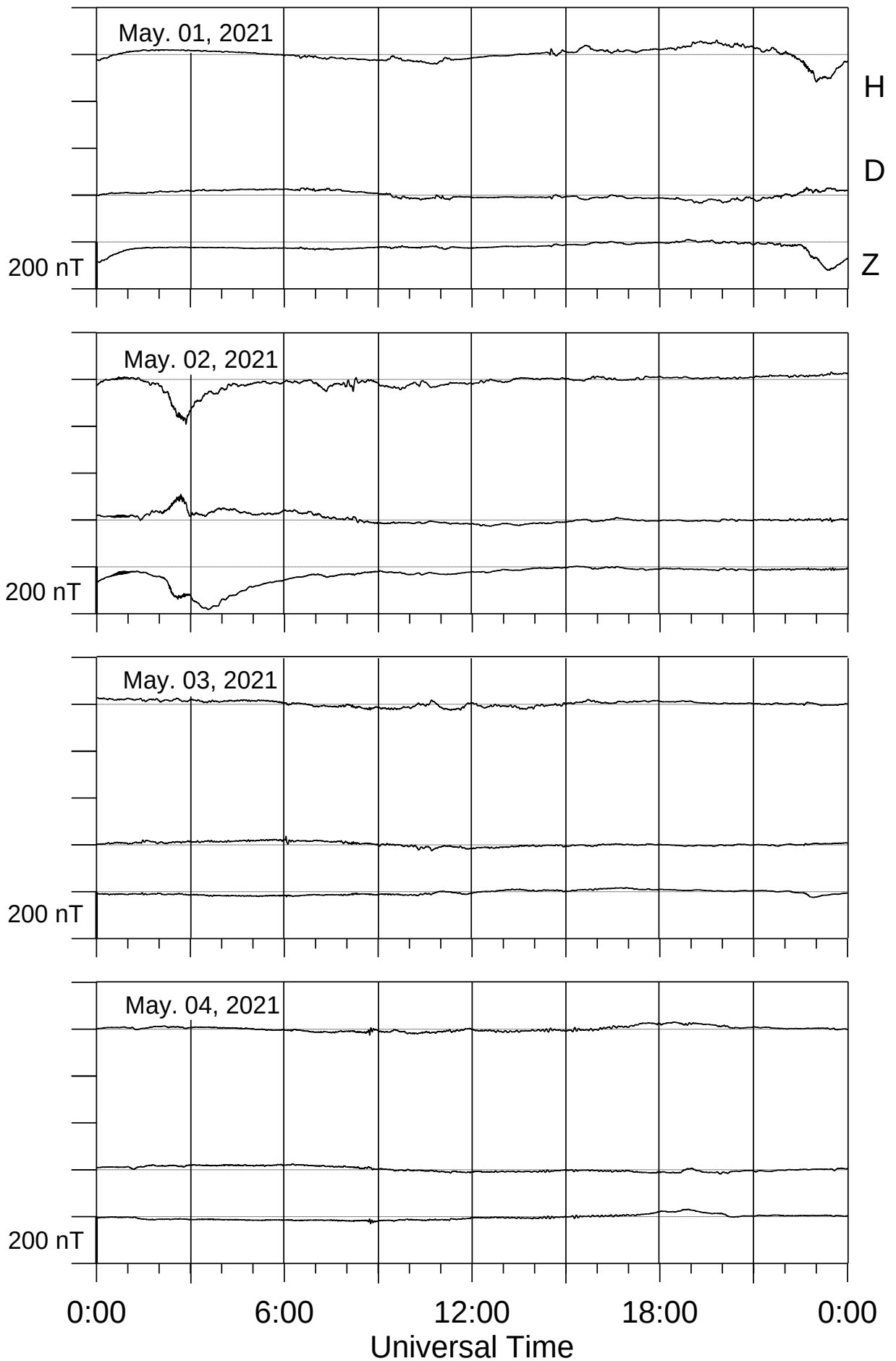
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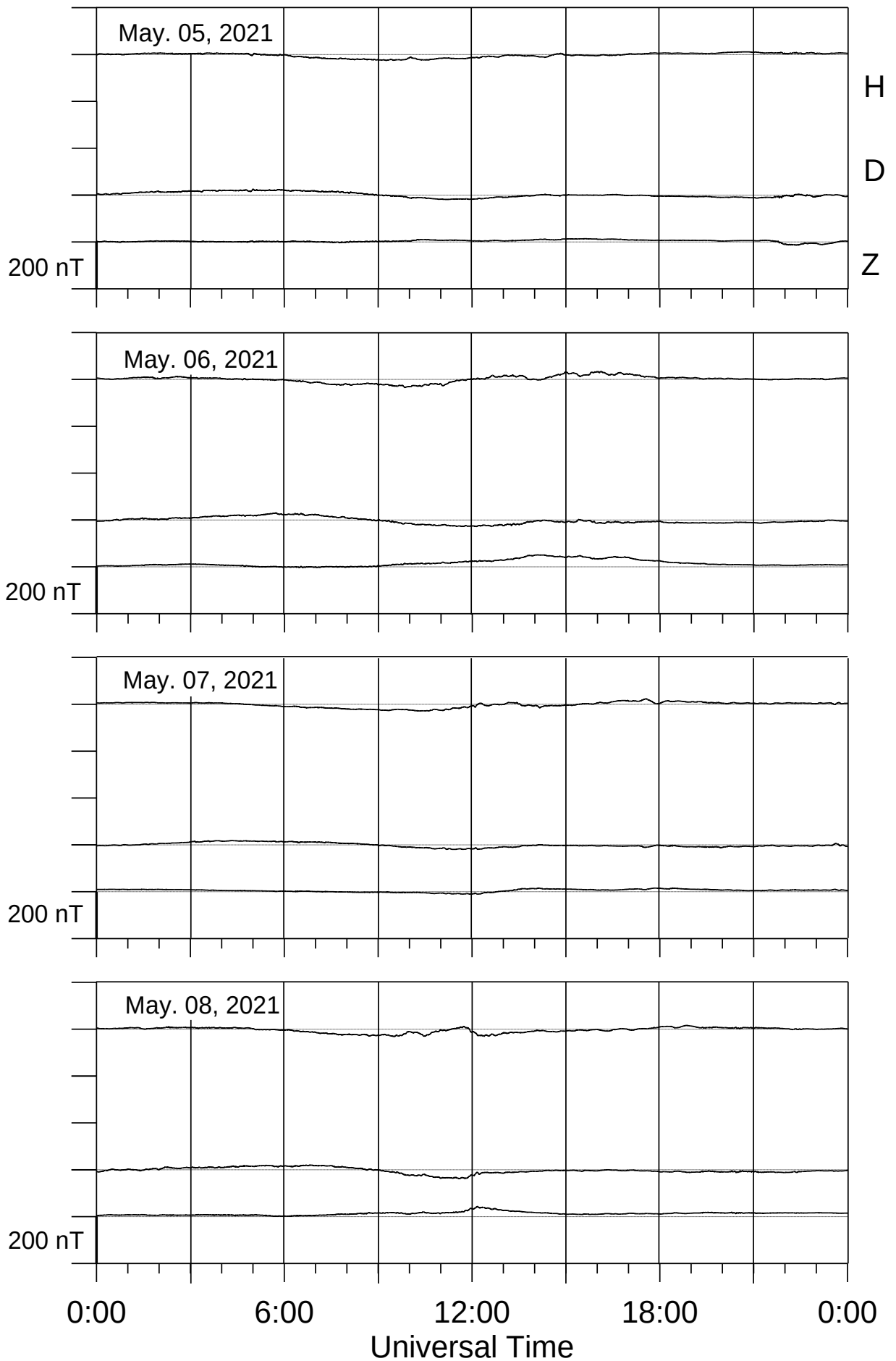
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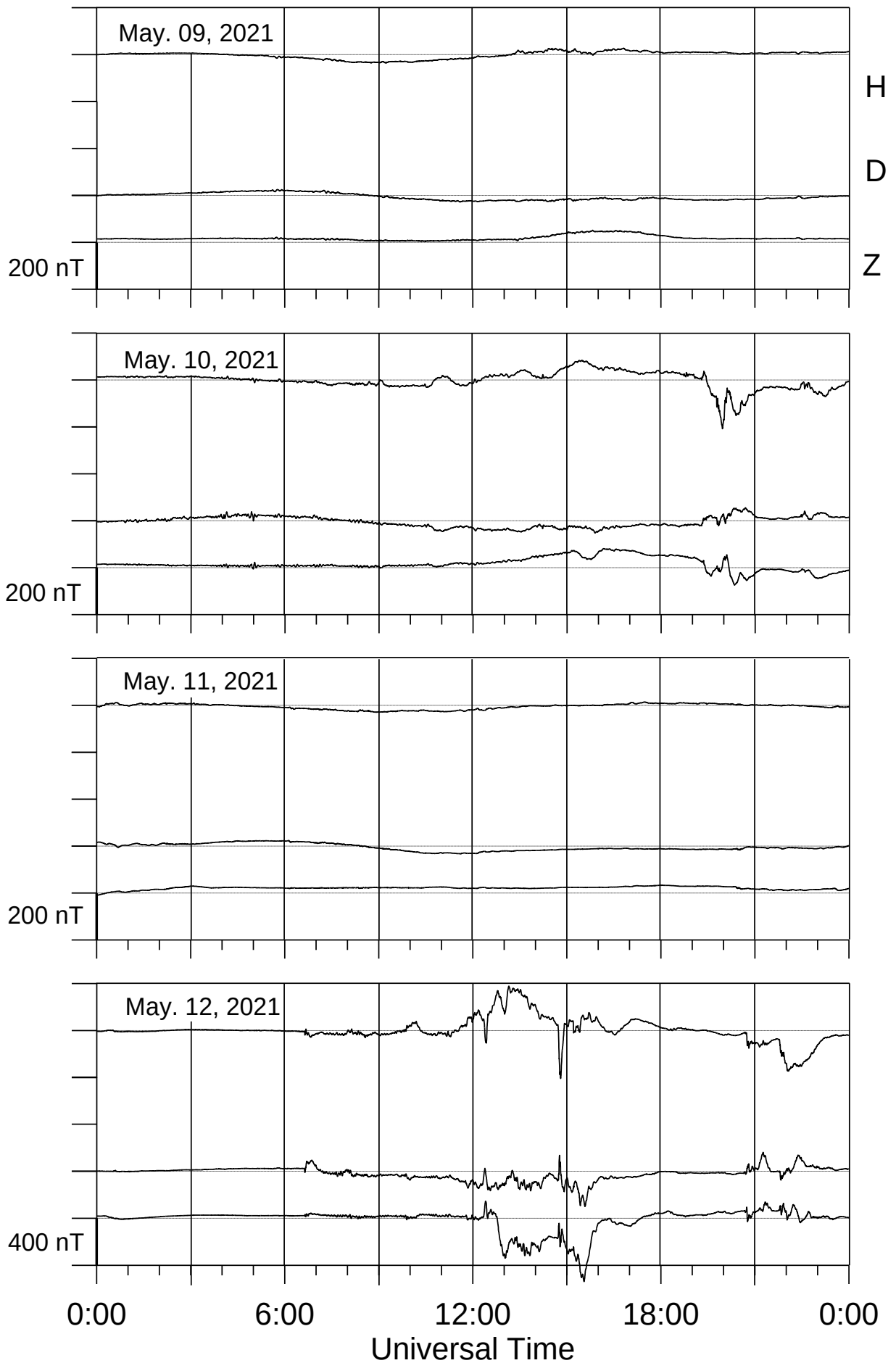
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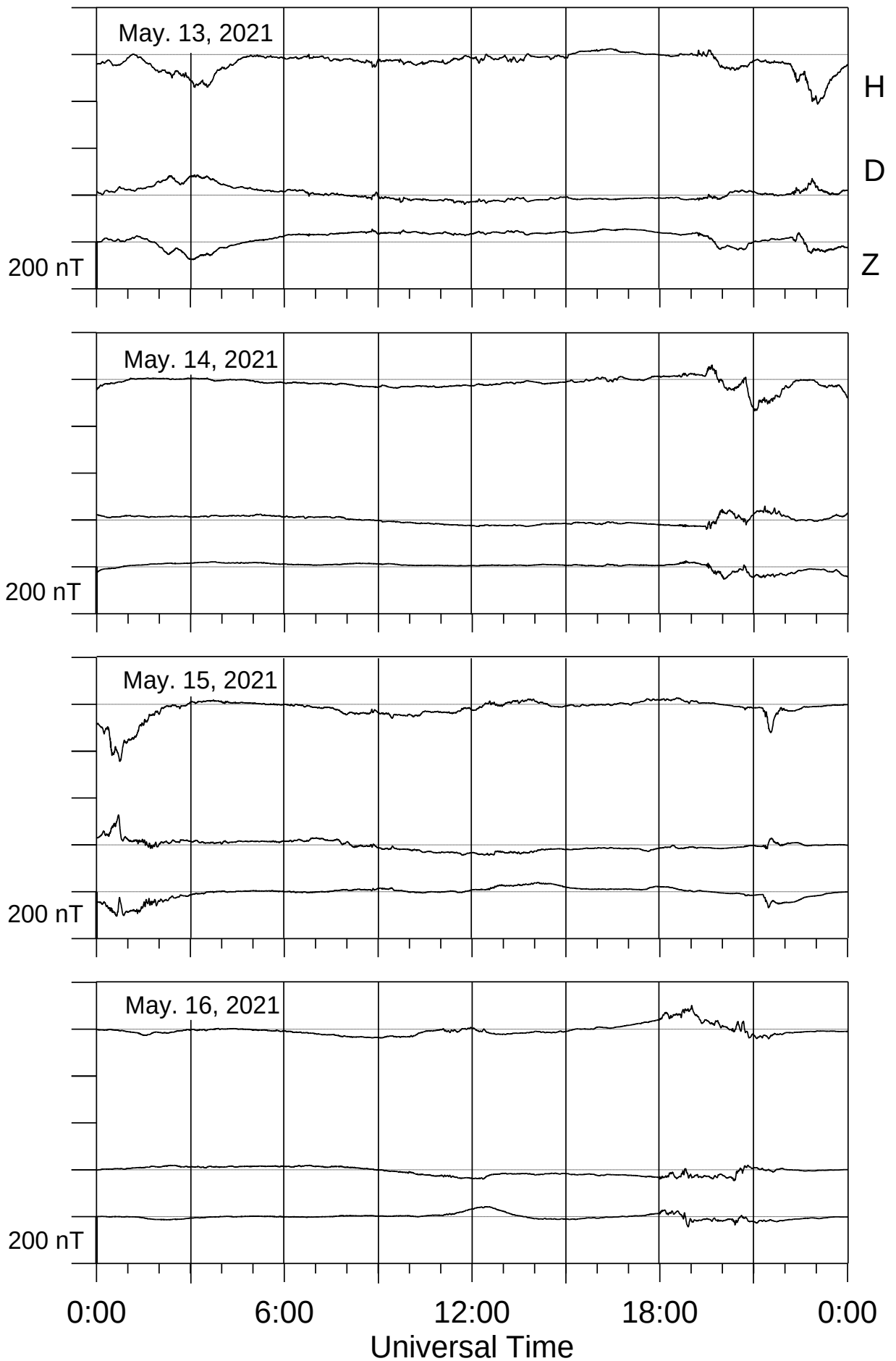
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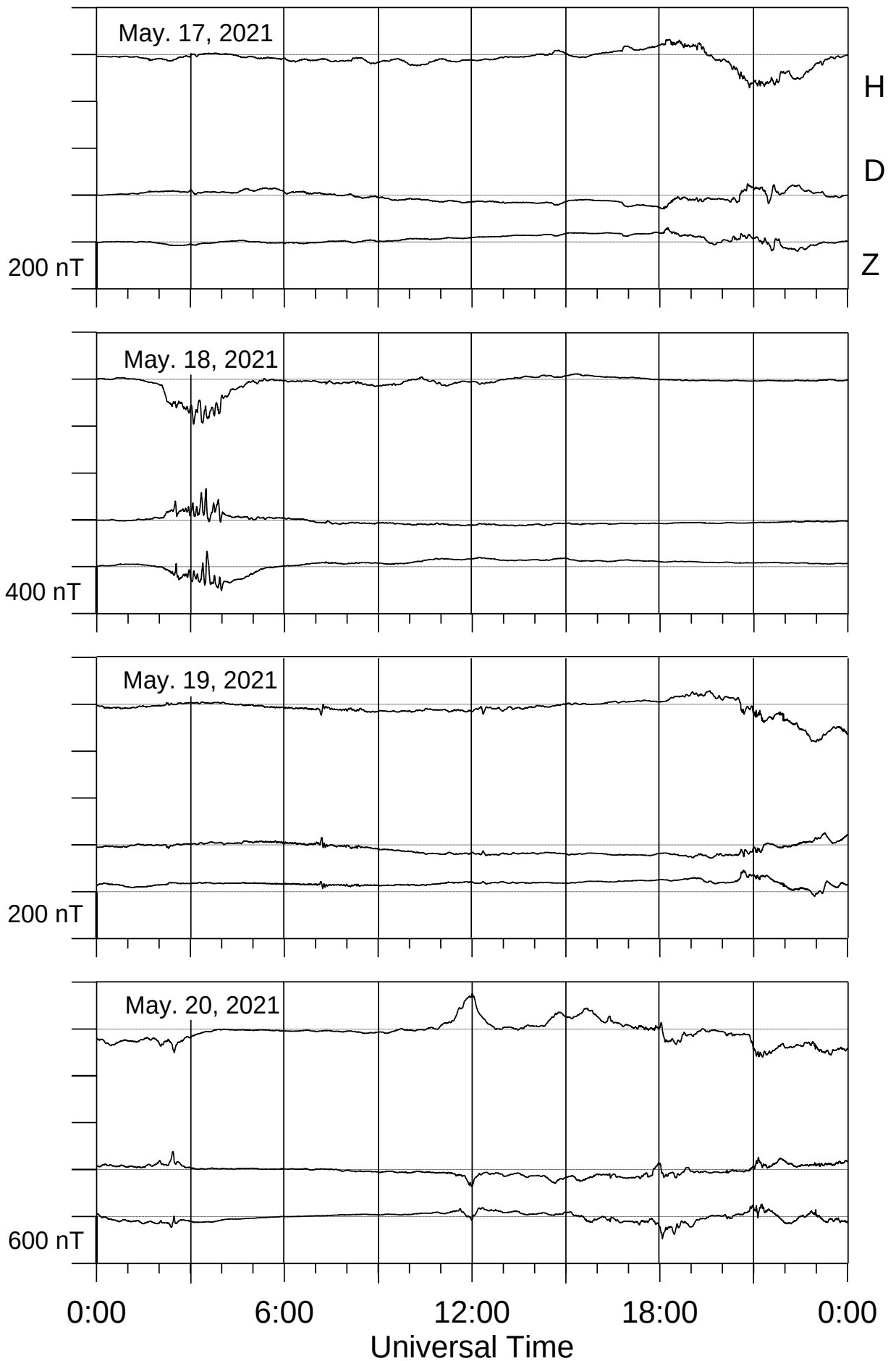
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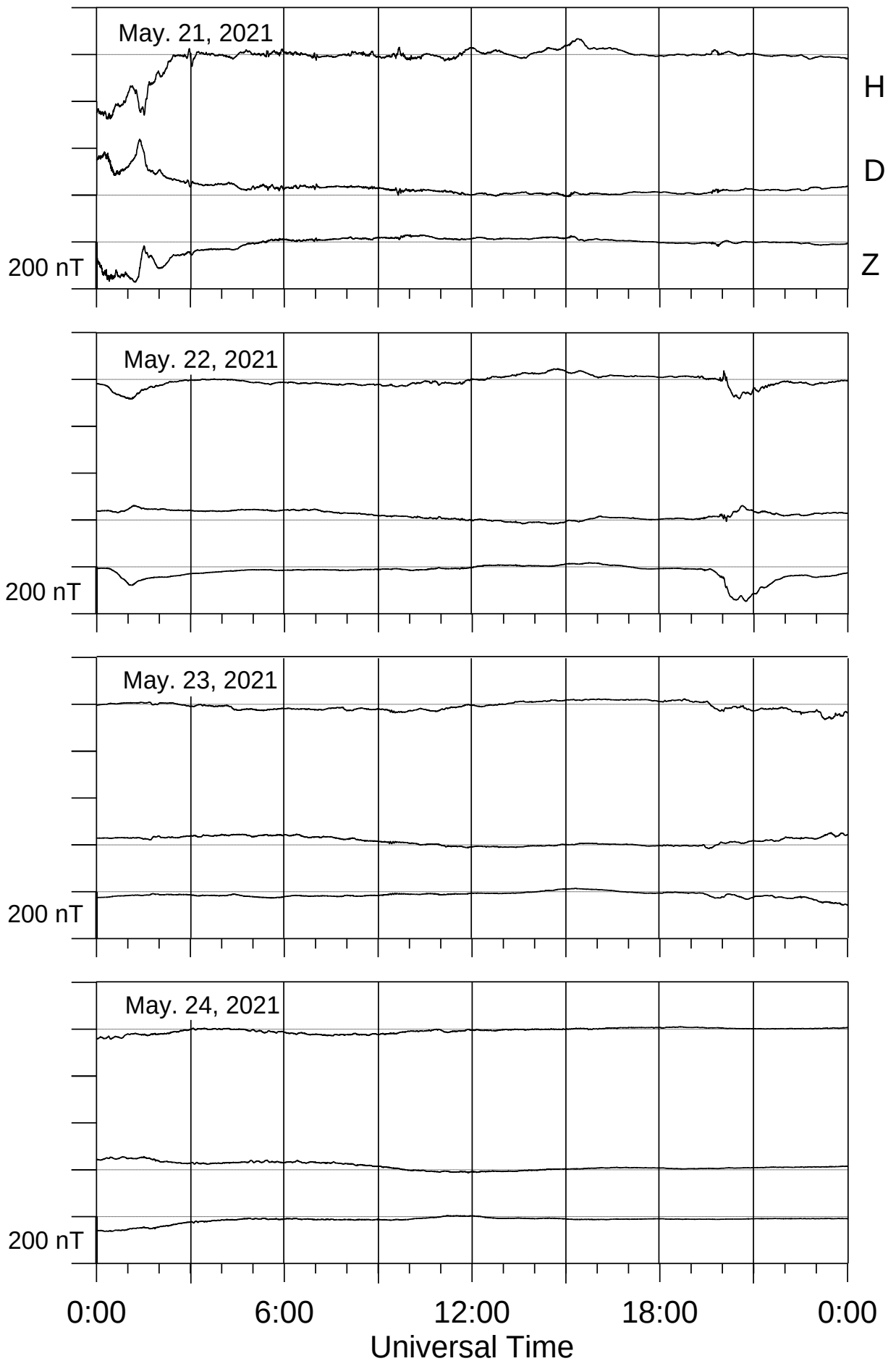
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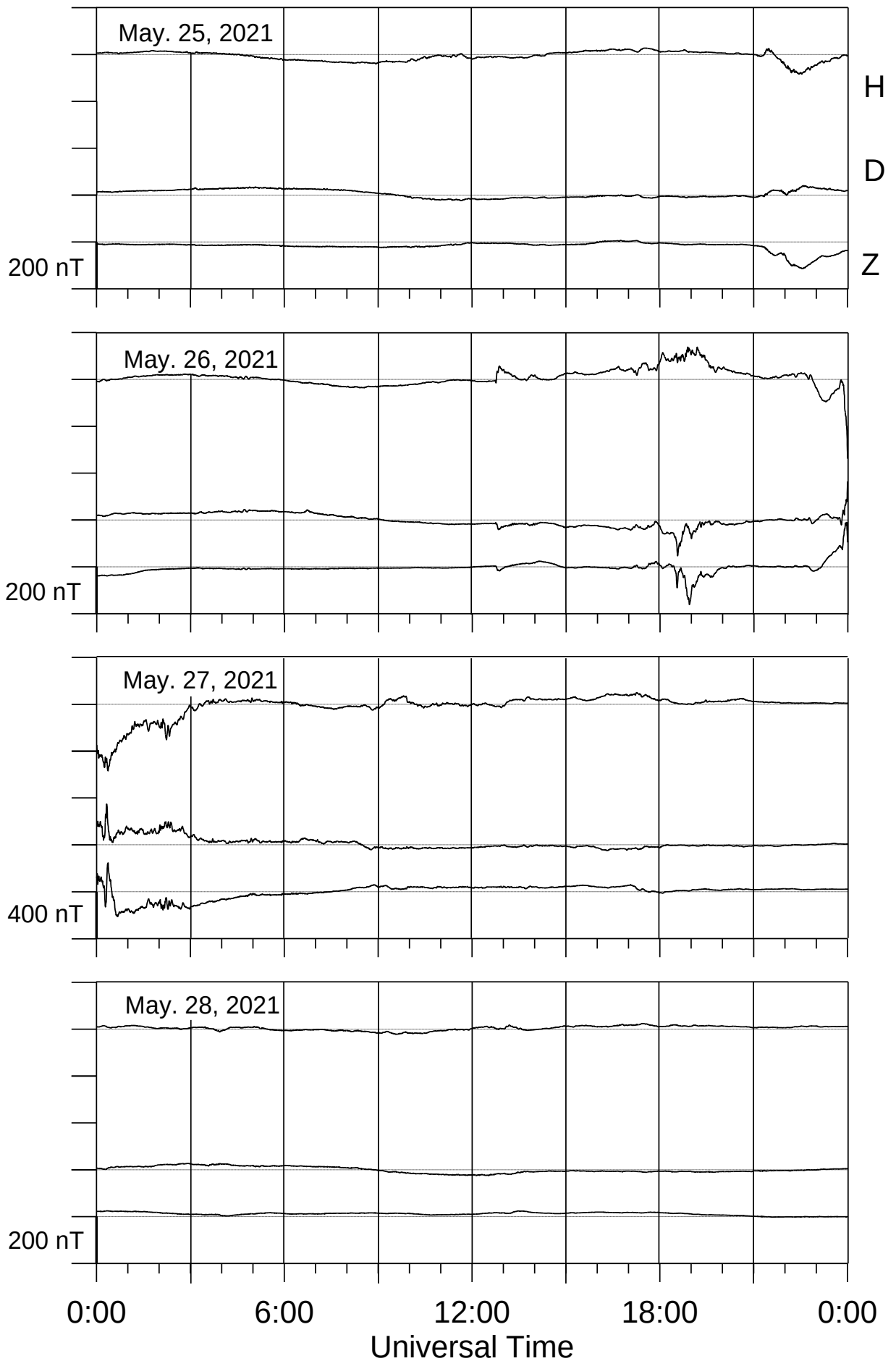
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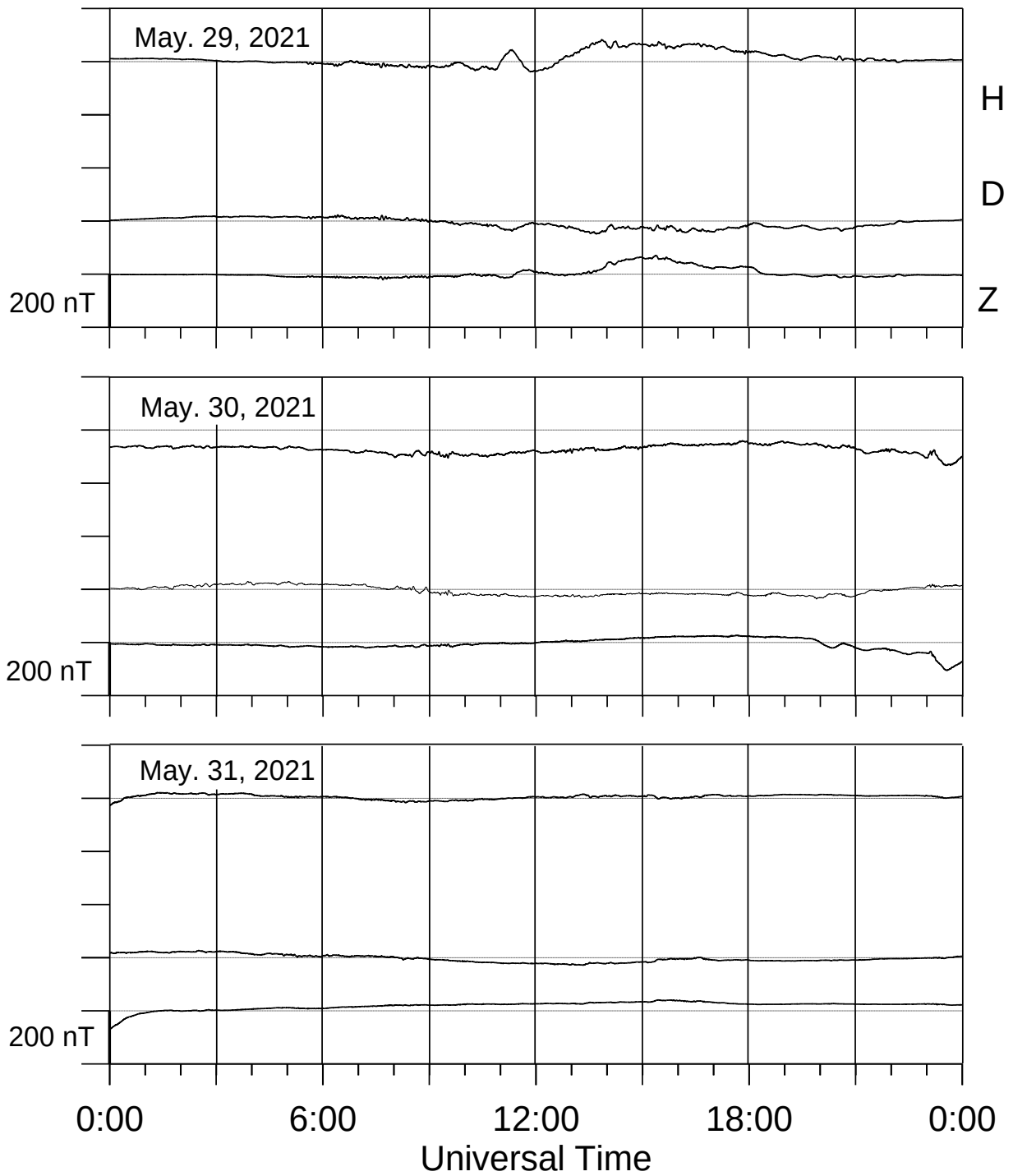
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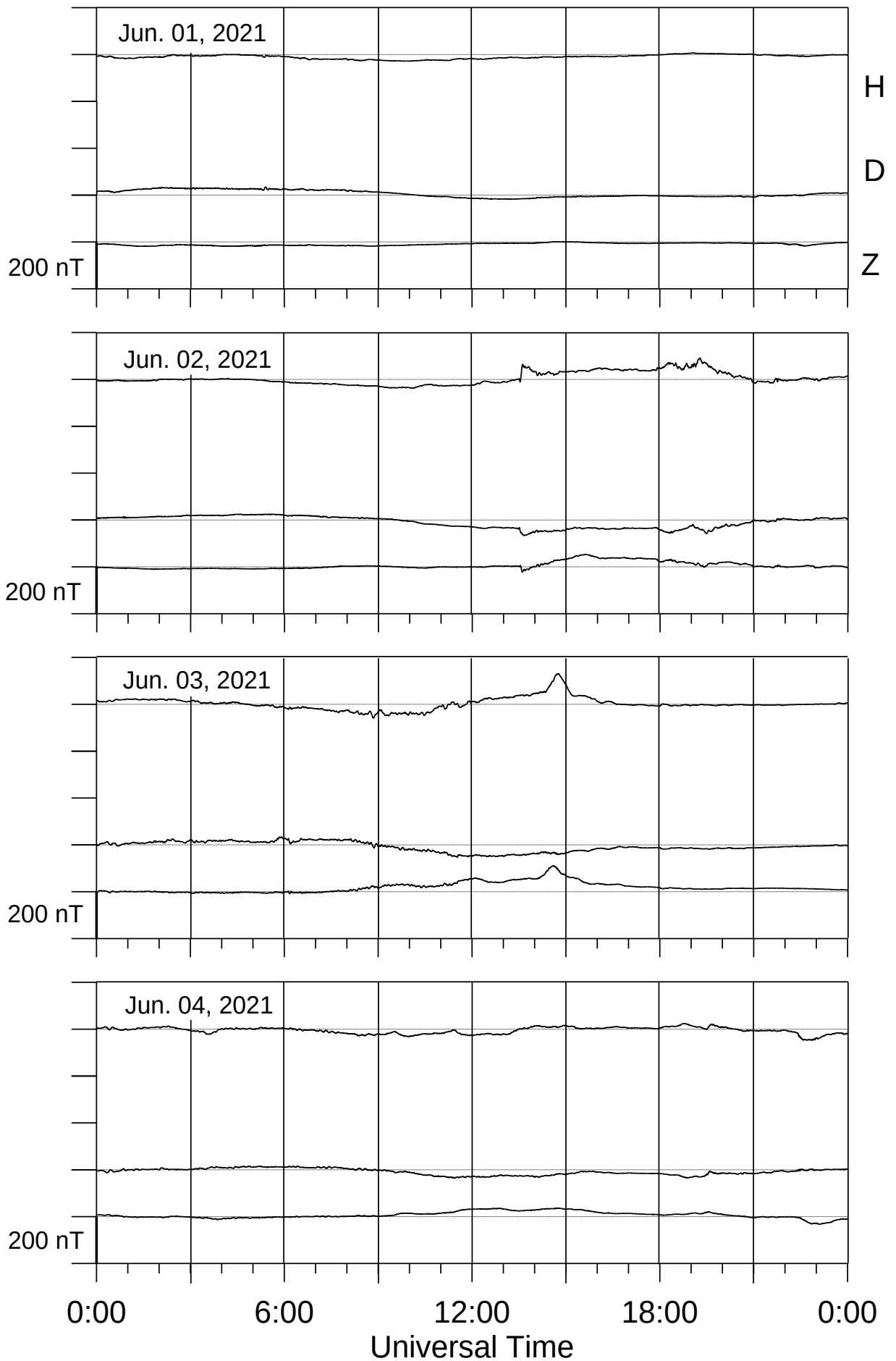
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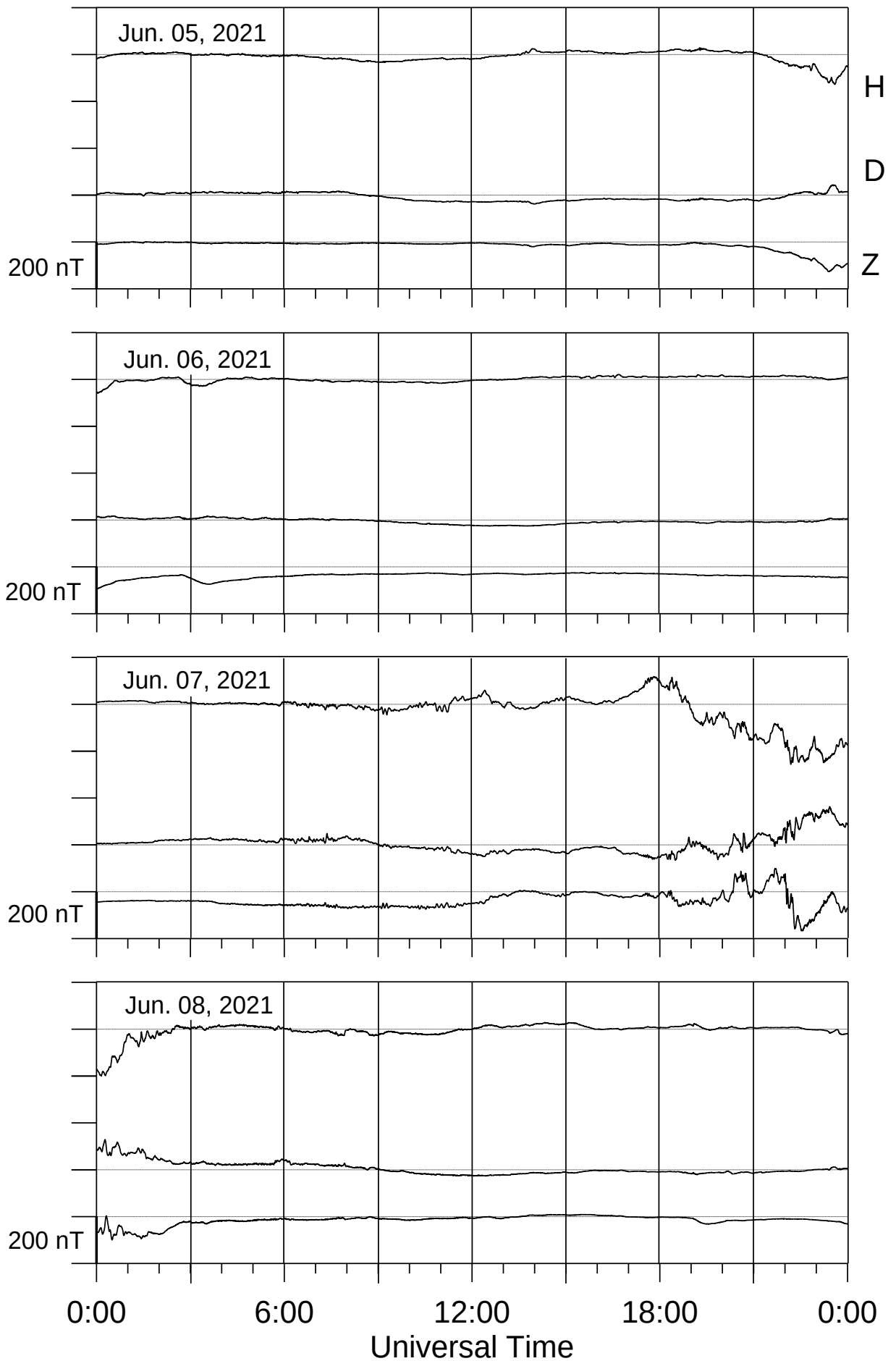
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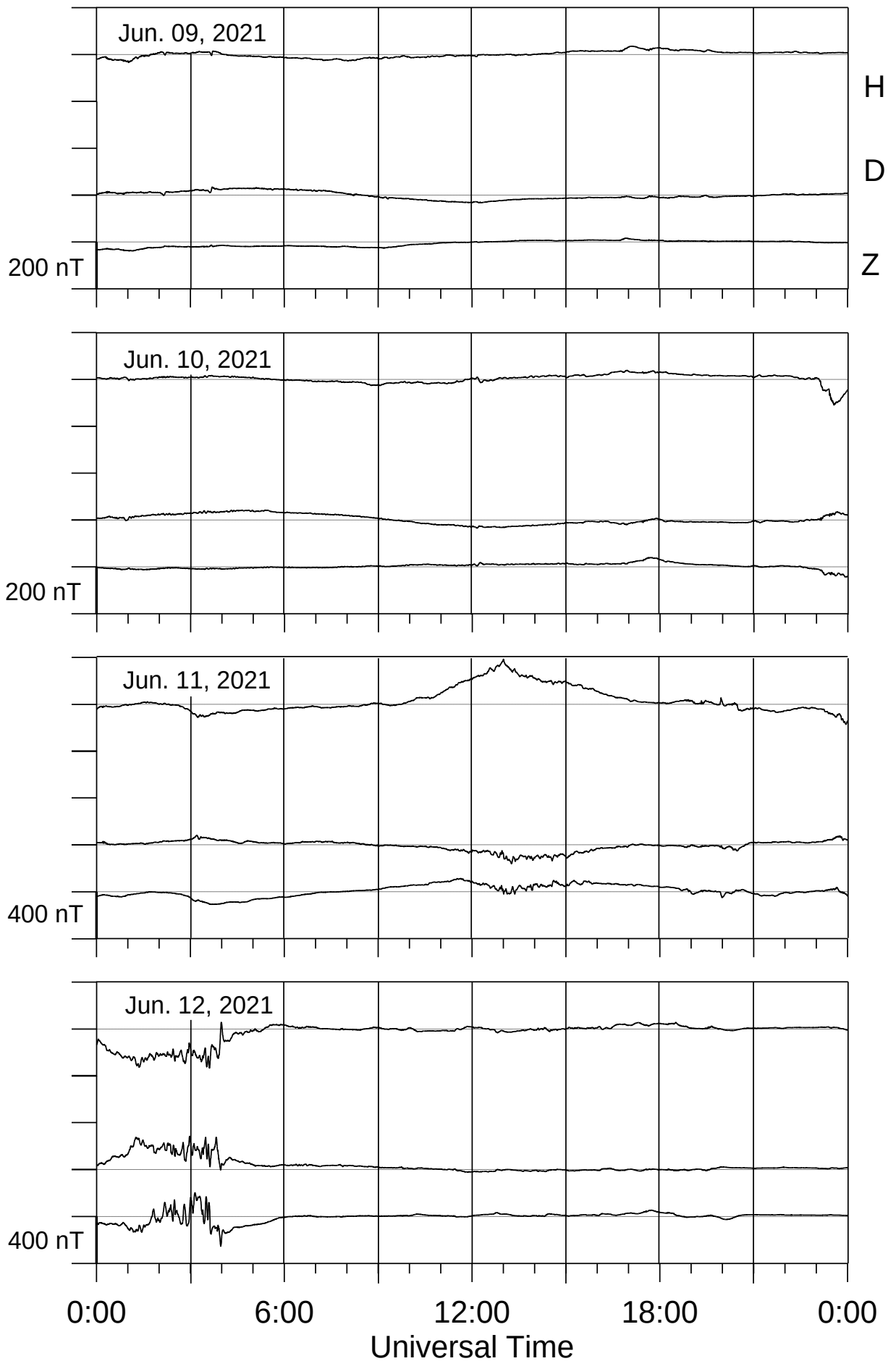
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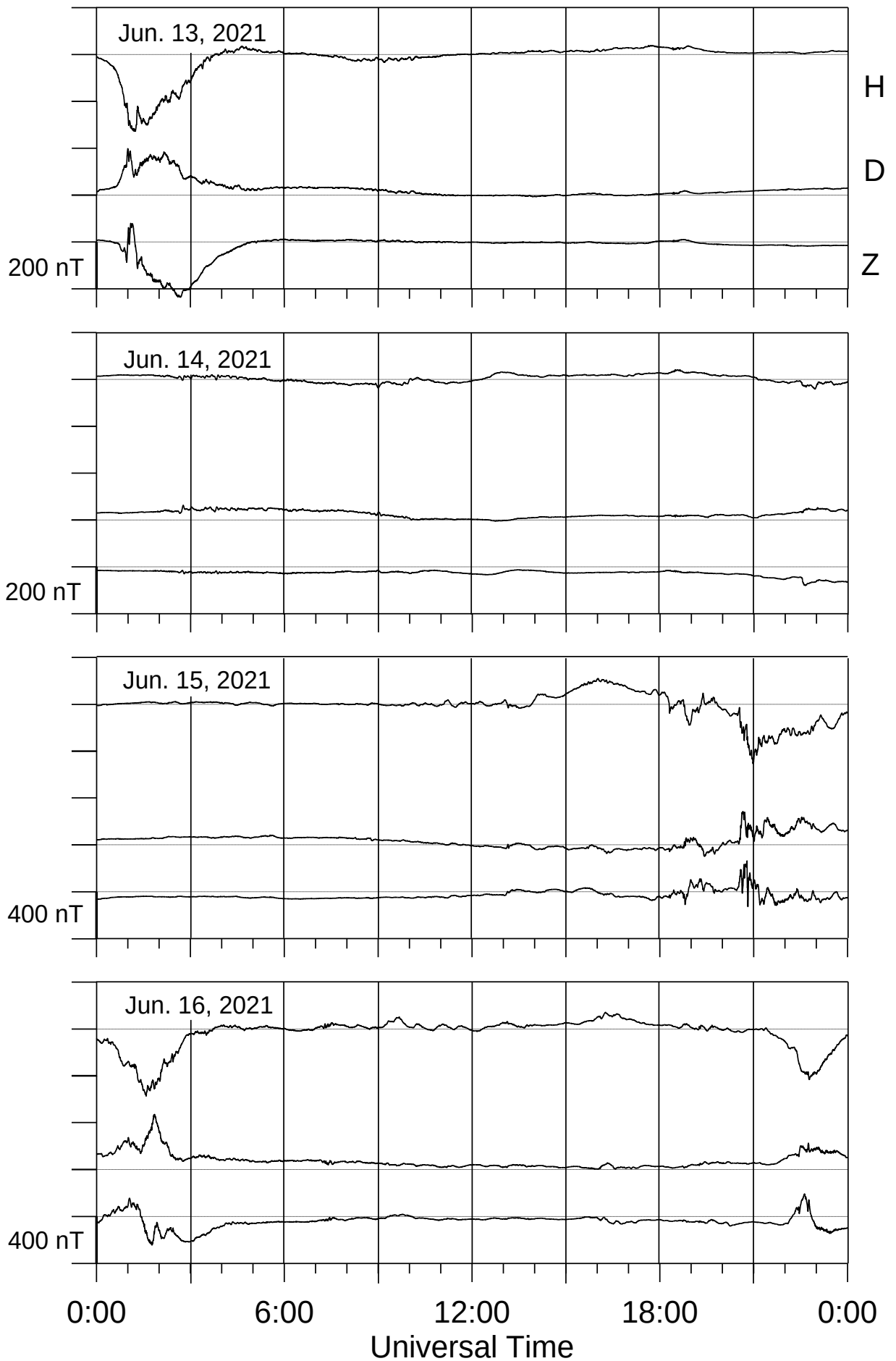
Loparskaya magnetometer



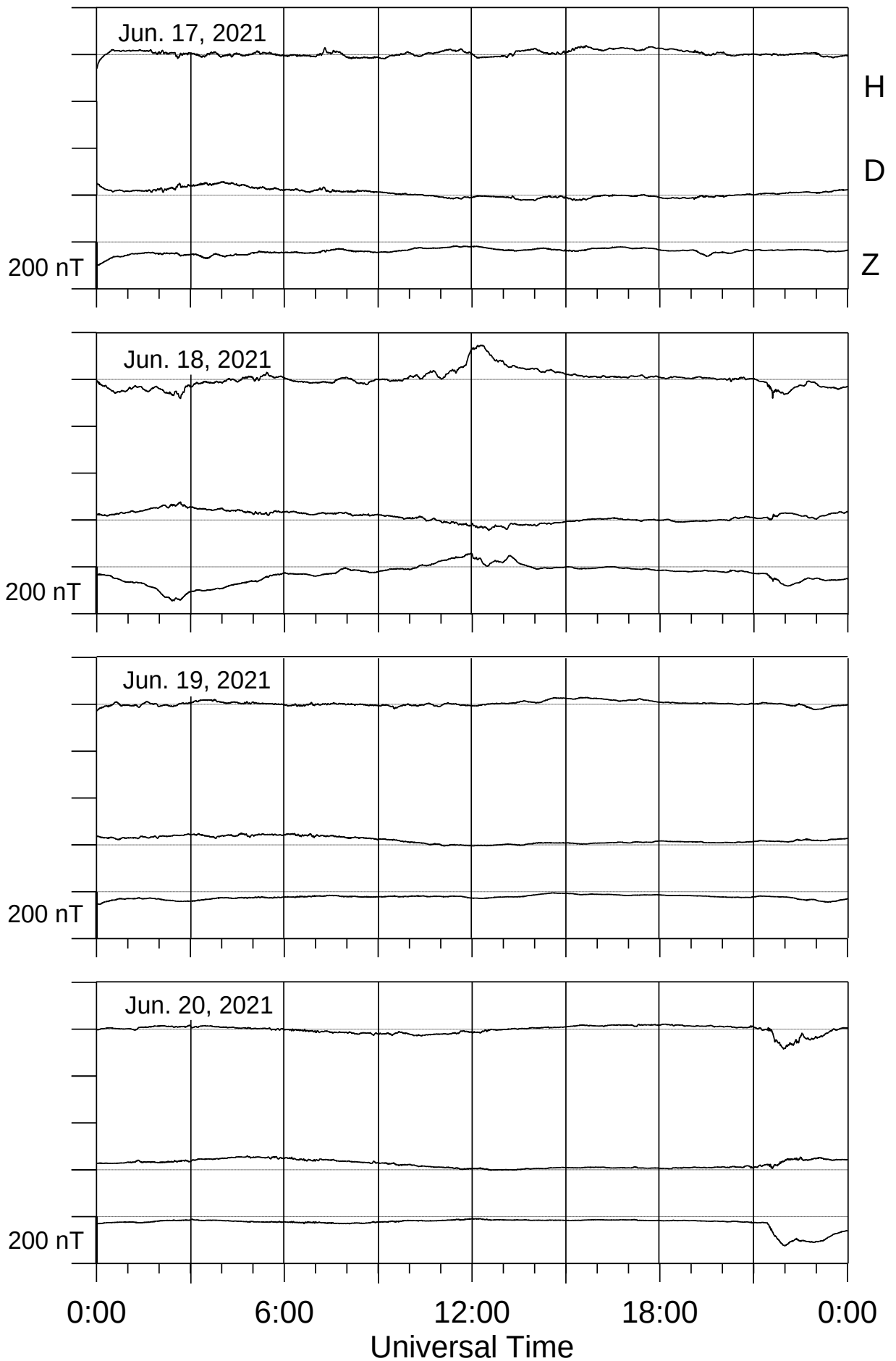
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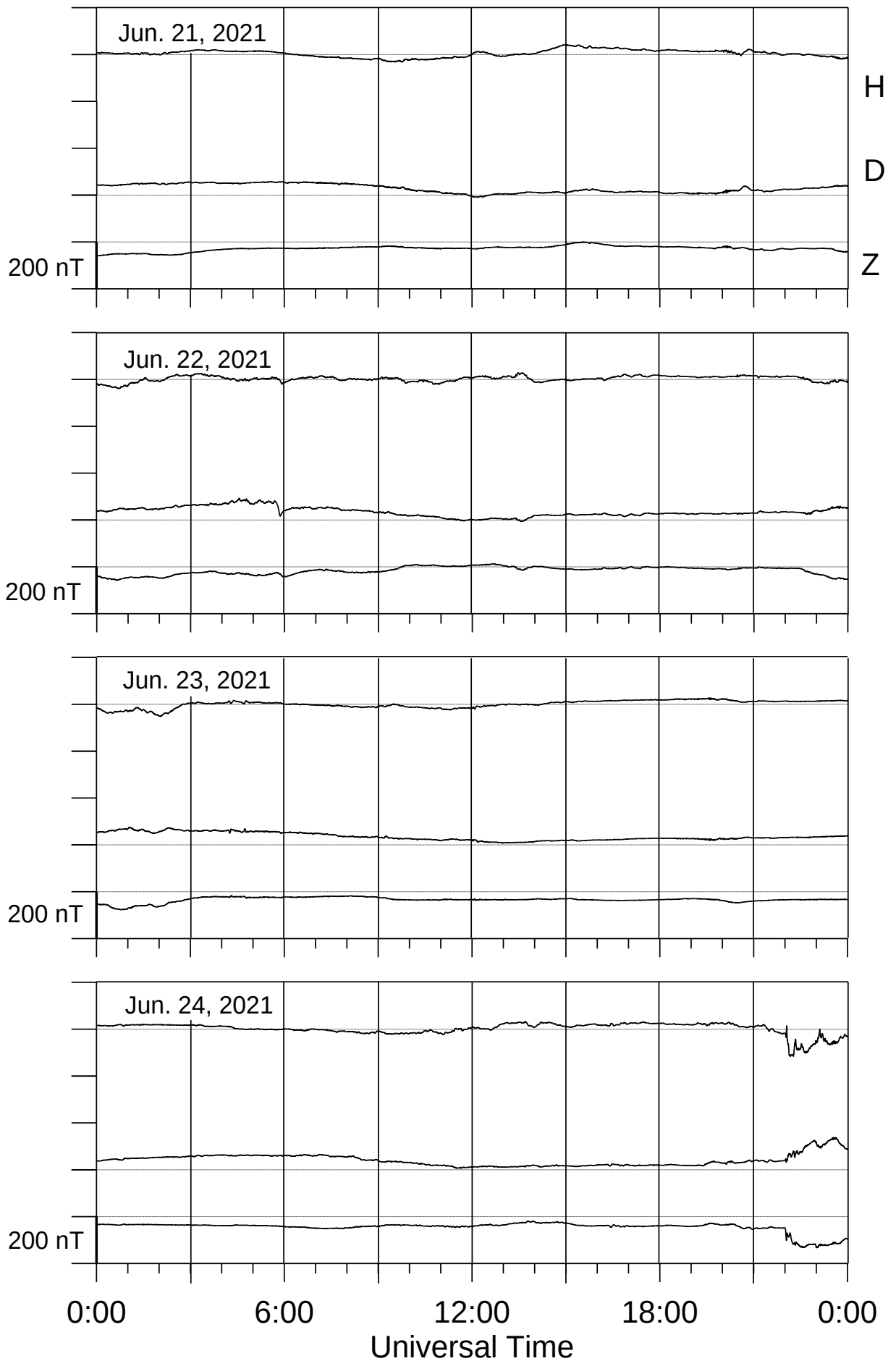
Loparskaya magnetometer



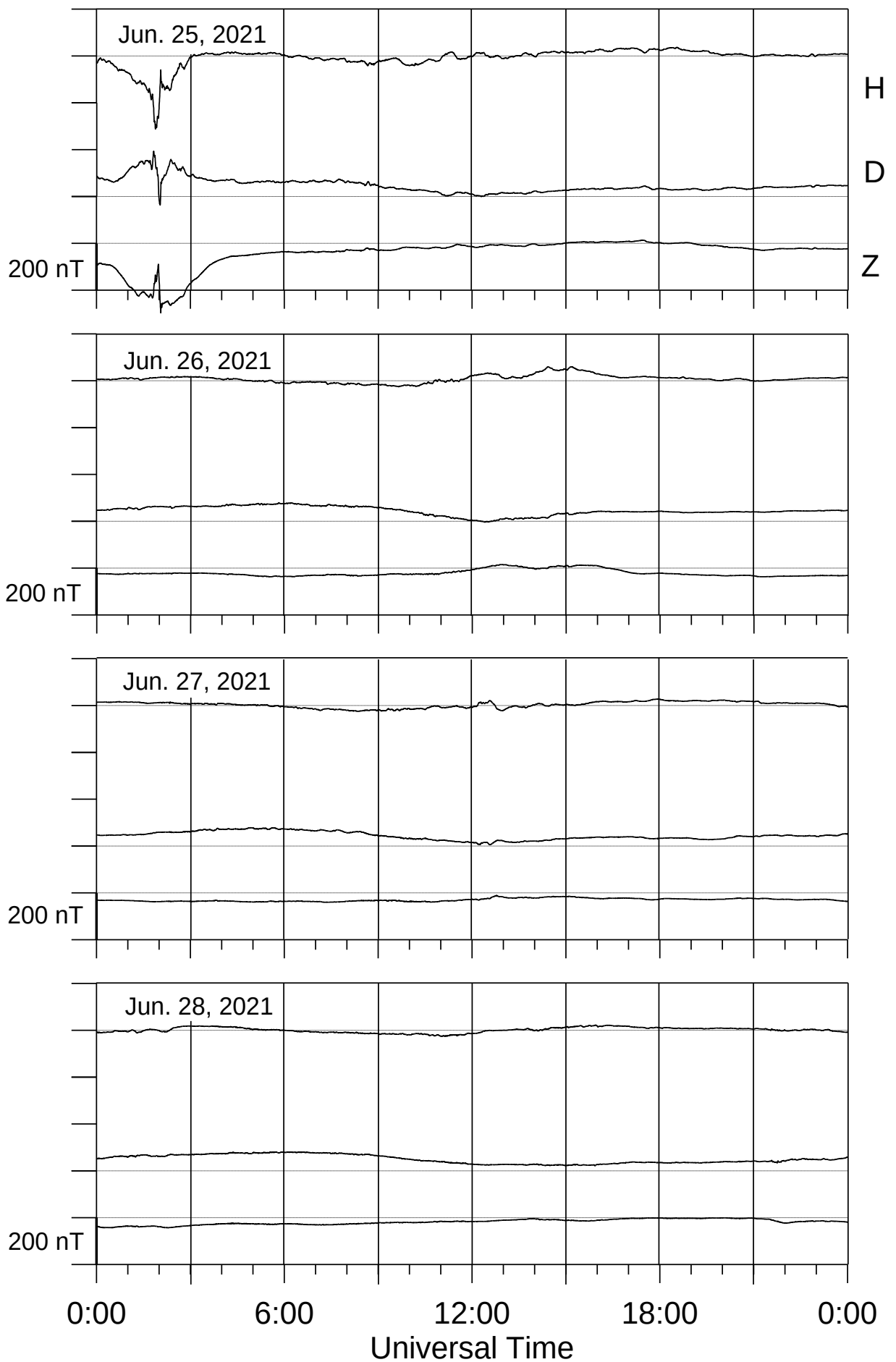
Loparskaya magnetometer



Loparskaya magnetometer



Loparskaya magnetometer



Loparskaya magnetometer

