British Geological Survey

MONTHLY MAGNETIC BULLETIN

Port Stanley Observatory

March 2023

Port Stanley Observatory magnetic data

1.   Introduction

Port Stanley Observatory was installed by the British Geological Survey (BGS) with financial support from a consortium of oil companies and became operational in February 1994.

This bulletin is published to provide rapid access to the provisional geomagnetic observatory results. The information is freely available for personal, academic, educational and non-commercial research or use. Magnetic observatory data are presented as a series of plots of one-minute, hourly and daily values, followed by tabulations of monthly values. The operation of the observatory and presentation of data are described in the rest of this section.

Enquiries about the data should be addressed to:

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2.   Position

Port Stanley Observatory, one of the geomagnetic observatories maintained and operated by the British Geological Survey (BGS), is situated on a site at Sapper Hill near Port Stanley in the Falkland Islands. In 2013 it was necessary to establish a new position for the observatory absolute pillar due to degradation in the quality of absolute observations caused by anthropogenic noise. Following an overlap period of at least six months, the observatory results relate to the new position from 1 January 2014:

Old observatory co-ordinates are (Feb 1994 to Dec 2013):
Geographic: 51° 42'15"S   302° 06'24"E
Height above mean sea level: 135 m

New observatory co-ordinates are (Jan 2014 to present):
Geographic: 51° 42'18.0"S 302° 06'25.2"E
Geomagnetic: 42° 40'26.4"S 012° 24'25.2"E
Height above mean sea level: 130 m

The geographical coordinates are measured by a handheld GPS device, which uses WGS84 as the the reference coordinate system. The height above MSL is determined from the best available contour maps. The geomagnetic co-ordinates are approximations, calculated using the 13th generation International Geomagnetic Reference Field (IGRF) at epoch 2022.5. On-line access to models (including IGRF), charts and navigational data are available at geomag.bgs.ac.uk/data_service/models_compass/home

3. The observatory operation

3.1 GDAS

The observatory operates under the control of the Geomagnetic Data Acquisition System (GDAS), which was developed by BGS staff, installed and became operational in August 2002. The data acquisition software, running on QNX operated computers, controls the data logging and the communications.

There are two sets of sensors used for making magnetic measurements. A tri-axial linear-core fluxgate magnetometer, manufactured by the Danish Meteorological Institute, is used to measure the variations in the horizontal (H) and vertical (Z) components of the field. The third sensor is oriented perpendicular to these, and measures variations, which are proportional to the changes in declination (D). Measurements are made at a rate of 1 Hz.

In addition to the fluxgate sensors there is a proton precession magnetometer (PPM) making measurements of the absolute total field intensity (F) at a rate of 0.1Hz.

The raw unfiltered data are retrieved automatically via Internet connections to the BGS office in Edinburgh in near real-time. The fluxgate data are filtered to produce one-minute values using a 61-point cosine filter and the total field intensity samples are filtered using a 7-point cosine filter. The one-minute values provide input for various data products, available on-line at geomag.bgs.ac.uk/data_service/home

3.2 Absolute observations

The GDAS fluxgate magnetometers accurately measure variations in the components of the geomagnetic field, but not the absolute magnitudes. Two sets of absolute measurements of the field are made manually twice per month. A fluxgate sensor mounted on a theodolite is used to determine D and inclination (I); the GDAS PPM measurements, with a site difference correction applied, are used for F. The absolute observations are used in conjunction with the GDAS variometer measurements to produce a continuous record of the absolute values of the geomagnetic field elements as if they had been measured at the observatory reference pillar.

4. Observatory results

The data presented in the bulletin are in the form of plots and tabulations described in the following sections.

4.1 Absolute observations

The absolute observation measurements made during the month are tabulated. Also included are the corresponding baseline values, which are the differences between the absolute measurements and the variometer measurements of D, H and Z (in the sense absolute-variometer). These are also plotted (markers) along with the derived preliminary daily baseline values (line) throughout the year. Daily mean differences between the measured absolute F and the F computed from the baseline corrected H and Z values are

plotted in the fourth panel (in the sense measured-derived). The bottom panel shows the daily mean temperature in the fluxgate chamber.

4.2   Summary magnetograms

Small-scale magnetograms are plotted which allow the month's data to be viewed at a glance. They are plotted 16 days to a page and show the one-minute variations in *D*, *H* and *Z*. The scales are shown on the right-hand side of the page. On disturbed days the scales are multiplied by a factor, which is indicated above the panel for that day. The variations are centred on the monthly mean value, shown on the left side of the page.

4.3   Magnetograms

The daily magnetograms are plotted using one-minute values of *D*, *H* and *Z* from the fluxgate sensors, with any gaps filled using back-up data. The magnetograms are plotted to a variable scale; scale bars are shown to the right of each plot. The absolute level (the monthly mean value) is indicated on the left side of the plots.

4.4   Hourly mean value plots

Hourly mean values of *D*, *H* and *Z* for the past 12 months are plotted in 27-day segments corresponding to the Bartels solar rotation number. Magnetic disturbances associated with active regions and/or coronal holes on the Sun may recur after 27 days: the same is true for geomagnetically quiet intervals. Plotting the data in this way highlights this recurrence. Diurnal variations are also clear in these plots and the amplitude changes throughout the year highlight the seasonal changes. Longer term secular variation is also illustrated.

4.5   Daily and monthly mean values

Daily mean values of *D*, *H*, *Z* and *F* are plotted throughout the year. In addition, a table of monthly mean values of all the geomagnetic elements is provided. These values depend on accurate specification of the fluxgate sensor baselines. It is anticipated that these provisional values will not be altered by more than a few nT or tenths of arcminutes before being made definitive at the end of the year.

5.   Conditions of use

The data presented in this bulletin are provided for personal, academic, educational, non-commercial research or other non-commercial use and are not for sale or distribution to third parties without written permission from BGS.

Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: 'The results presented in this paper rely on the data collected at Port Stanley magnetic observatory, operated by the British Geological Survey.'

Commercial users can contact the geomagnetism team for information on the range of applications and services offered. Full contact details are available at
geomag.bgs.ac.uk/contactus/staff

Port Stanley Observatory

Absolute observations

Date	Day Number	Declination			Inclination		Total field		Horizontal intensity		Vertical intensity		Observer
		Time (UT)	Absolute (°)	Baseline (°)	Time (UT)	Absolute (°)	Site difference (nT)	Absolute corrected (nT)	Absolute (nT)	Baseline (nT)	Absolute (nT)	Baseline (nT)	
01-Mar-23	60	16:44	2.5463	99999.0	16:49	-50.5187	-9.3	27941.1	17765.7	18114.6	-21565.9	-21673.4	NB
01-Mar-23	60	16:54	2.5538	99999.0	17:05	-50.5108	-9.3	27940.2	17768.1	18114.0	-21562.7	-21673.9	NB
10-Mar-23	69	21:01	2.4738	2.9417	21:08	-50.4617	-9.3	27934.6	17783.0	18117.3	-21543.2	-21671.5	NB
10-Mar-23	69	21:14	2.4638	2.9400	21:20	-50.4612	-9.3	27935.8	17783.9	18116.8	-21543.9	-21672.0	NB
20-Mar-23	79	21:08	2.4471	2.9400	21:14	-50.4542	-9.3	27942.0	17790.5	99999.0	-21546.5	99999.0	NB
20-Mar-23	79	21:19	2.4421	2.9400	21:24	-50.4558	-9.3	27942.0	17789.9	99999.0	-21547.0	99999.0	NB
31-Mar-23	90	14:18	2.3513	99999.0	14:23	-50.5179	-9.3	27922.8	17754.4	18115.4	-21551.5	-21672.4	NB
31-Mar-23	90	14:29	2.3596	2.9350	14:35	-50.5183	-9.3	27922.9	17754.2	18115.5	-21551.7	-21672.5	NB

Port Stanley   2023

Declination : Absolute - Variometer (markers) and Baseline Applied (line)

2.94 — 5min

Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)

18115 — 20nT

Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)

-21673 — 20nT

Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)

9.3 — 20nT

Temperature Inside Variometer Hut

23.3 — .... 20° C
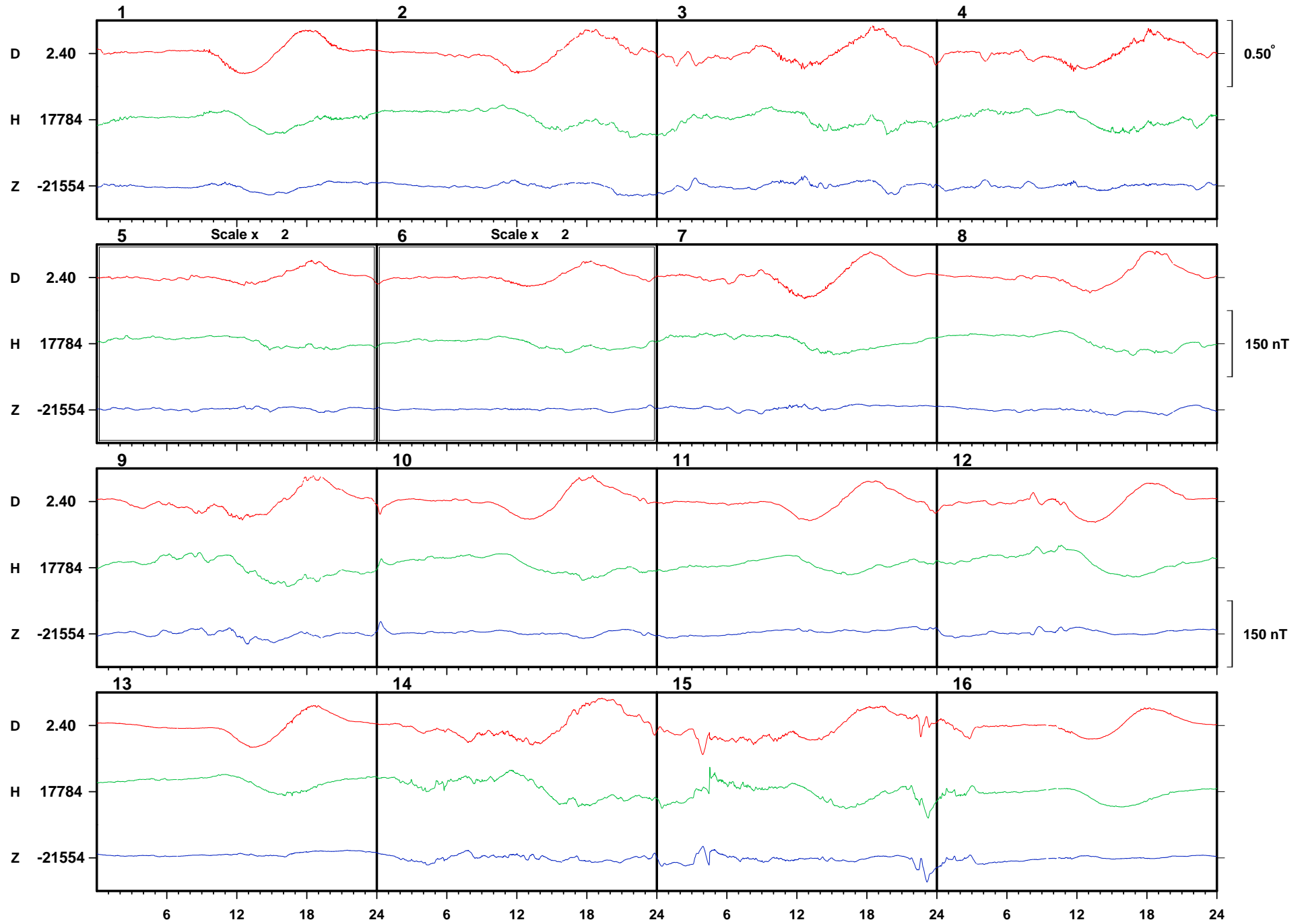
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
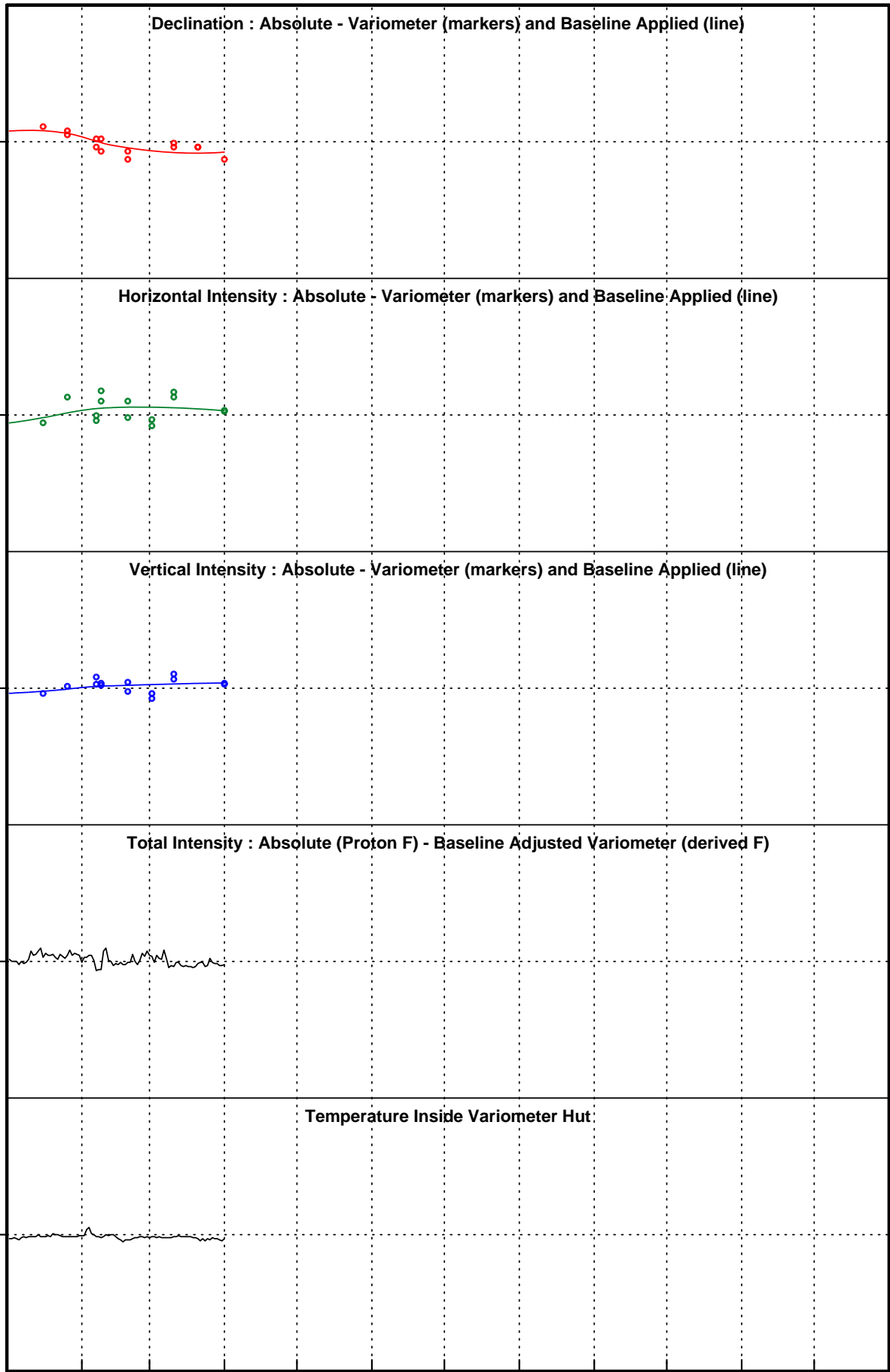
Falkland Islands   **March**   **2023**
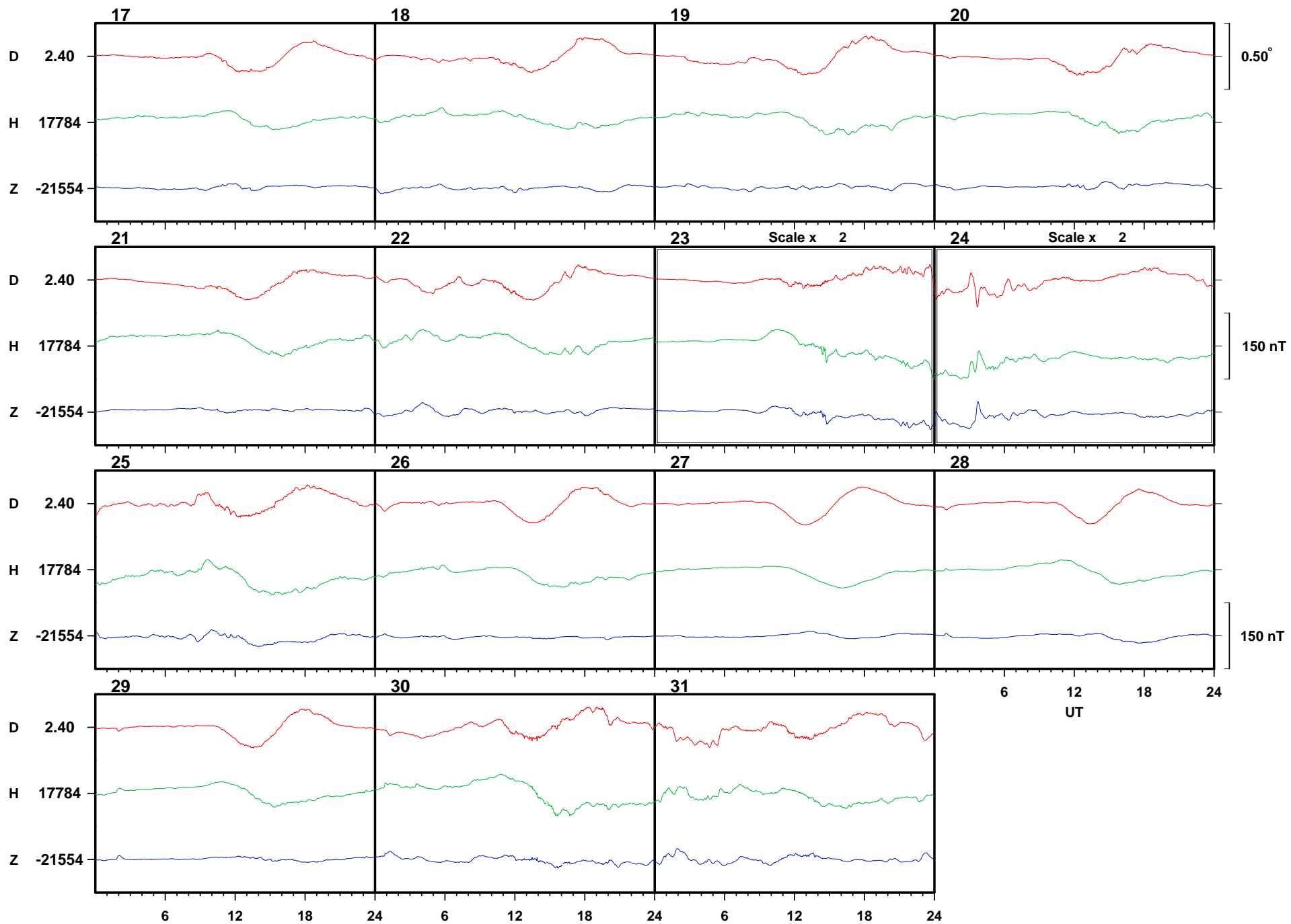
Falkland Islands   March   2023

Falkland Islands

Date: 01-03-2023

Day number: 060

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT
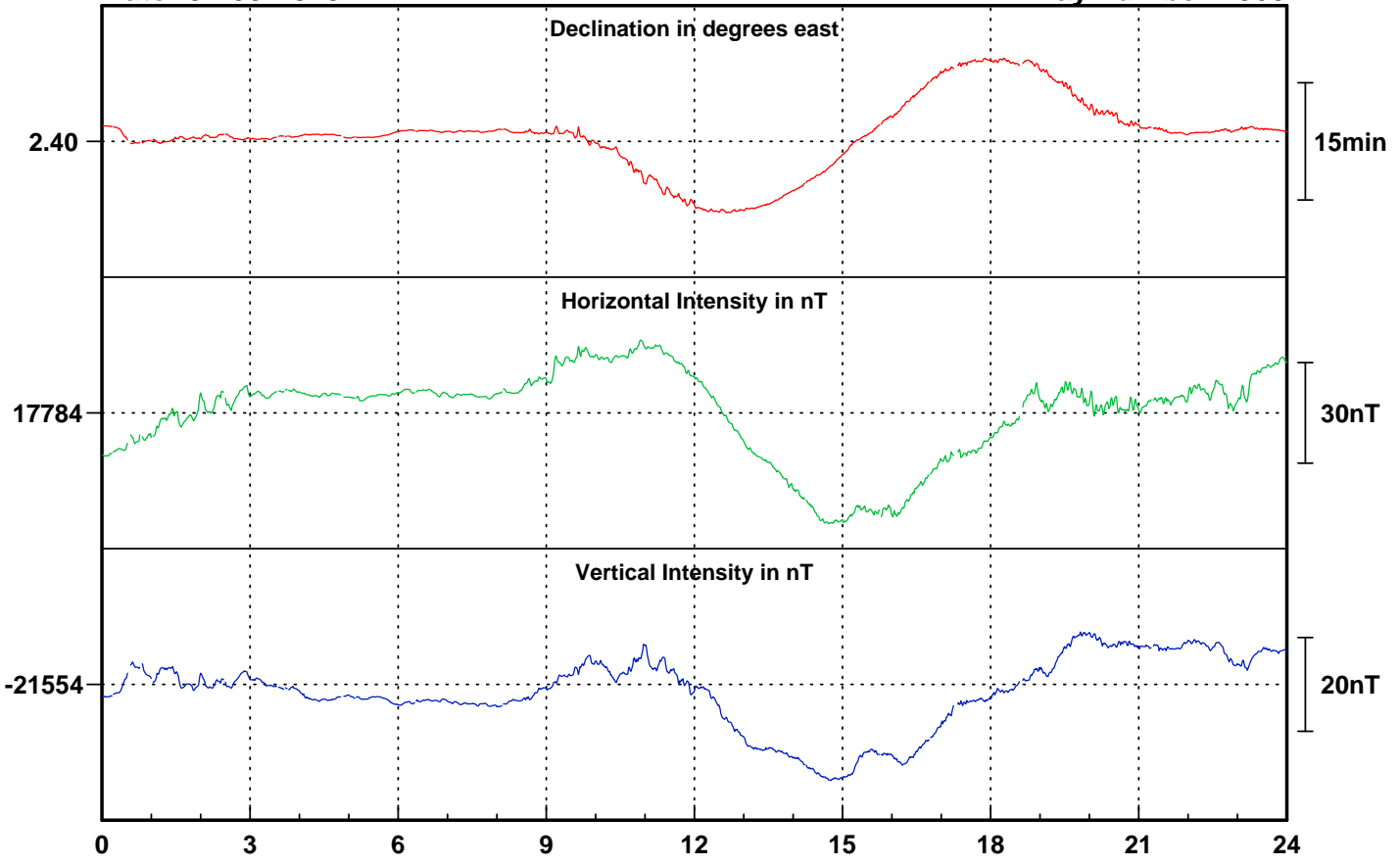
Date: 02-03-2023

Day number: 061

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

Hour (UT)
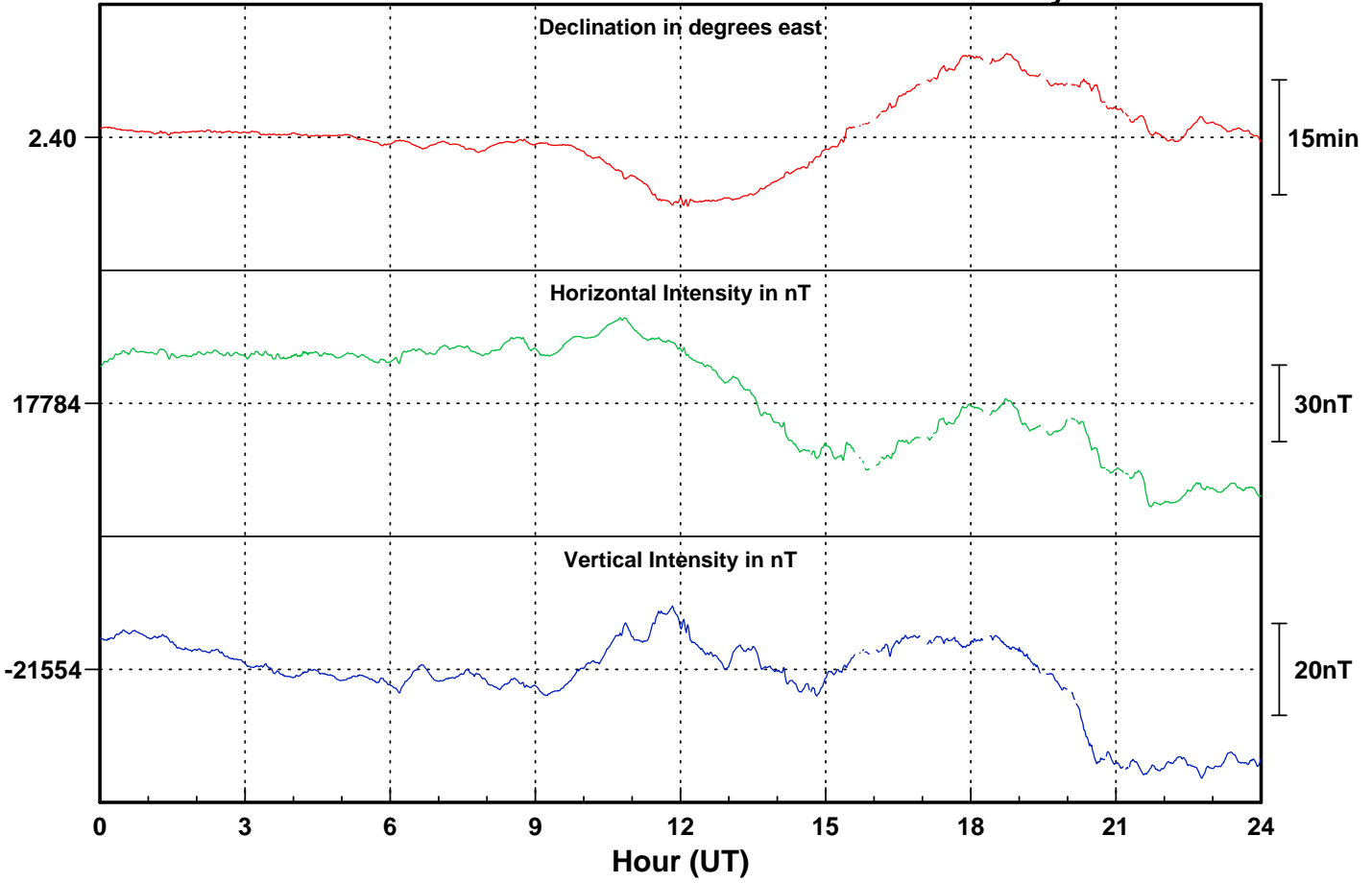
Falkland Islands

Date: 03-03-2023   **Day number: 062**
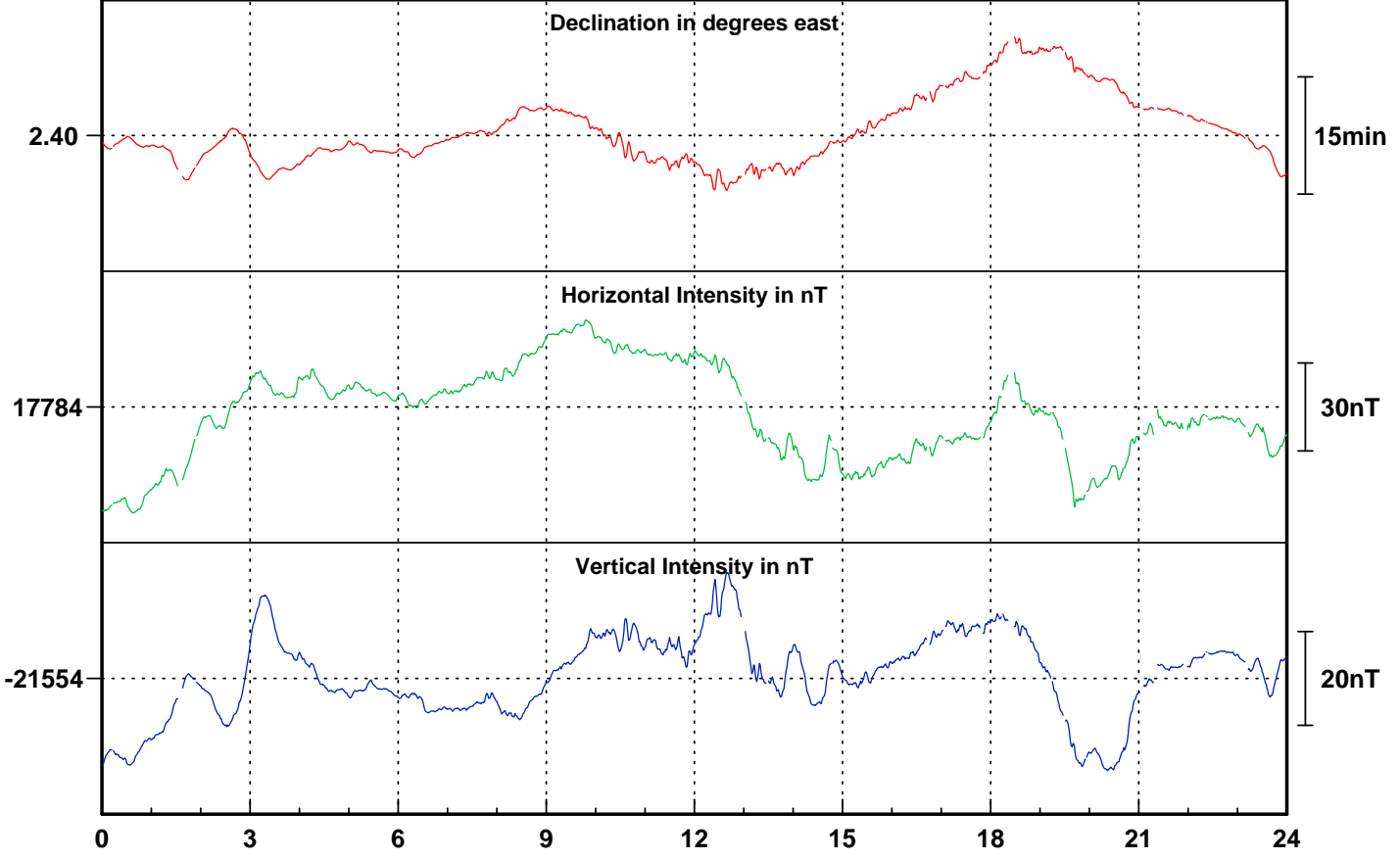
Date: 04-03-2023   **Day number: 063**

Hour (UT)

Falkland Islands

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT
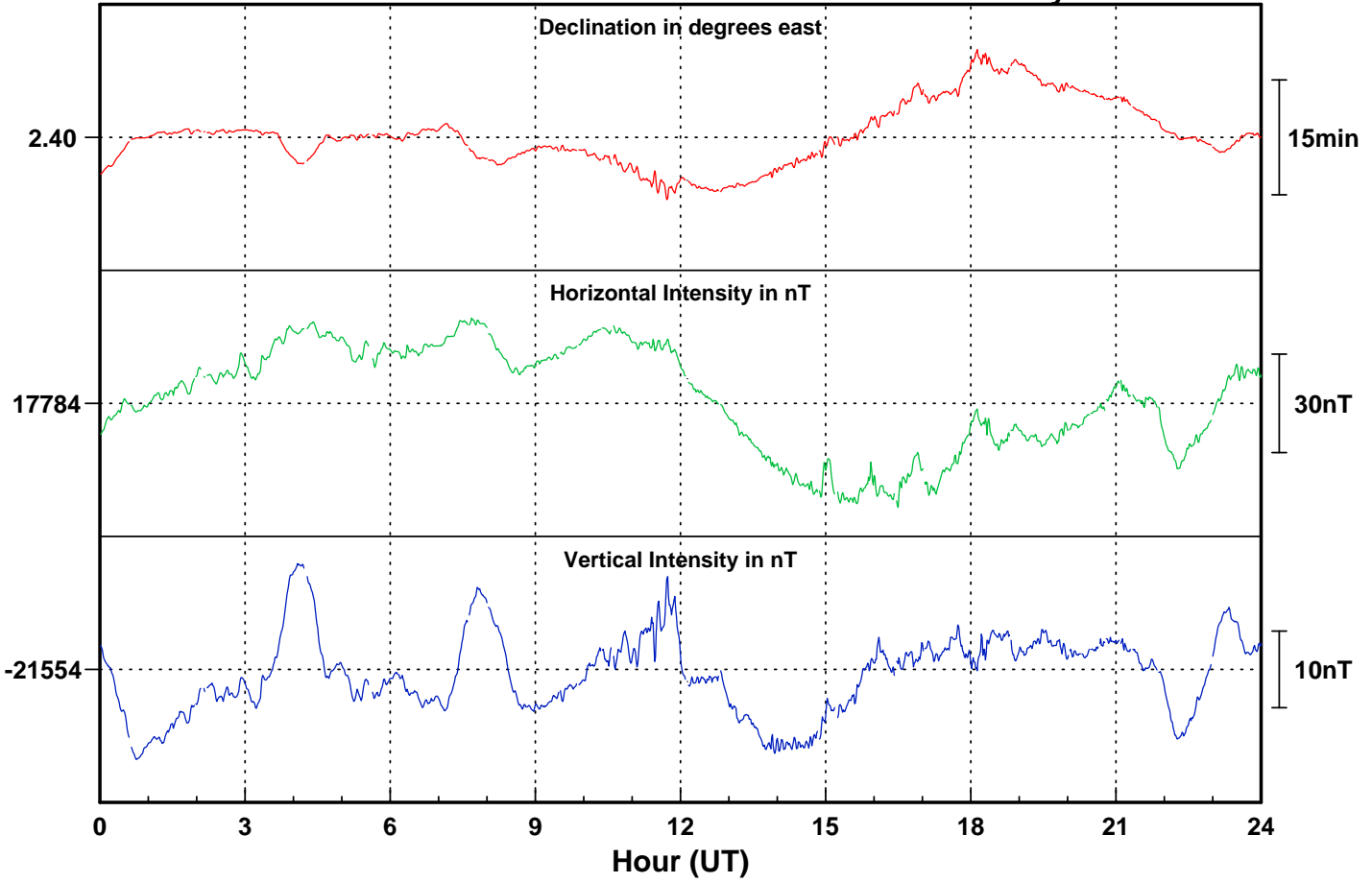
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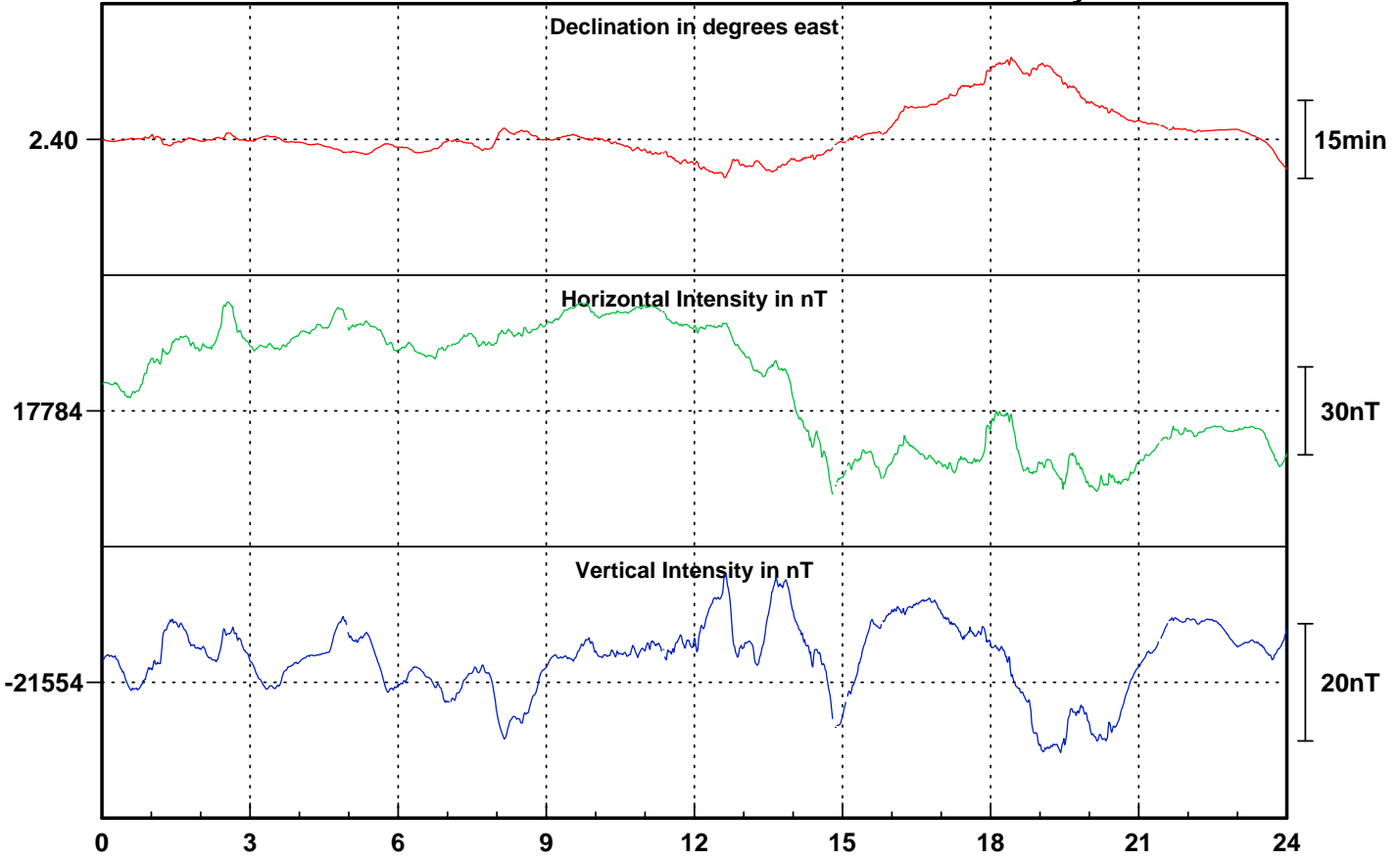
Date: 06-03-2023   Day number: 065
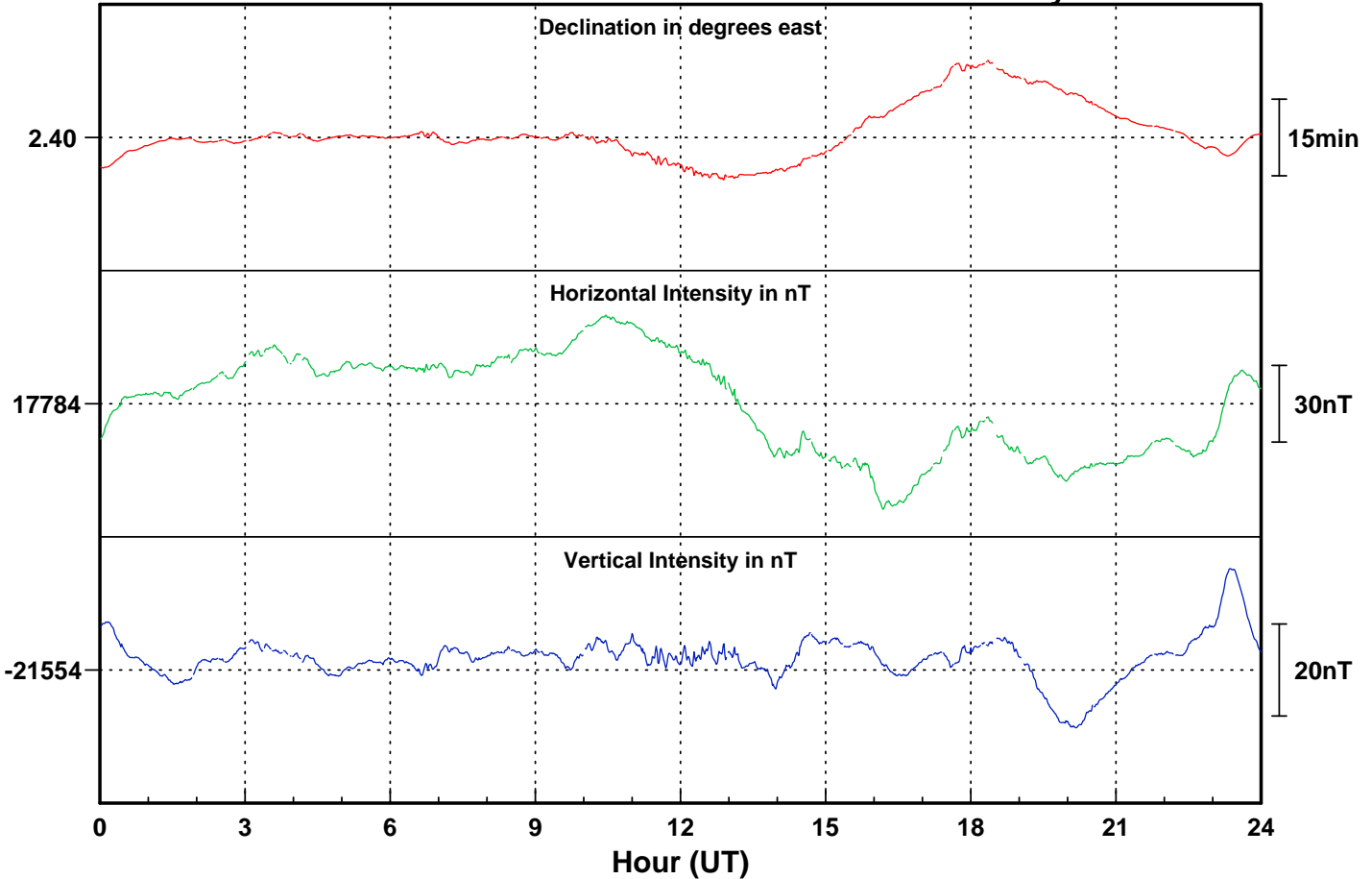
Declination in degrees east
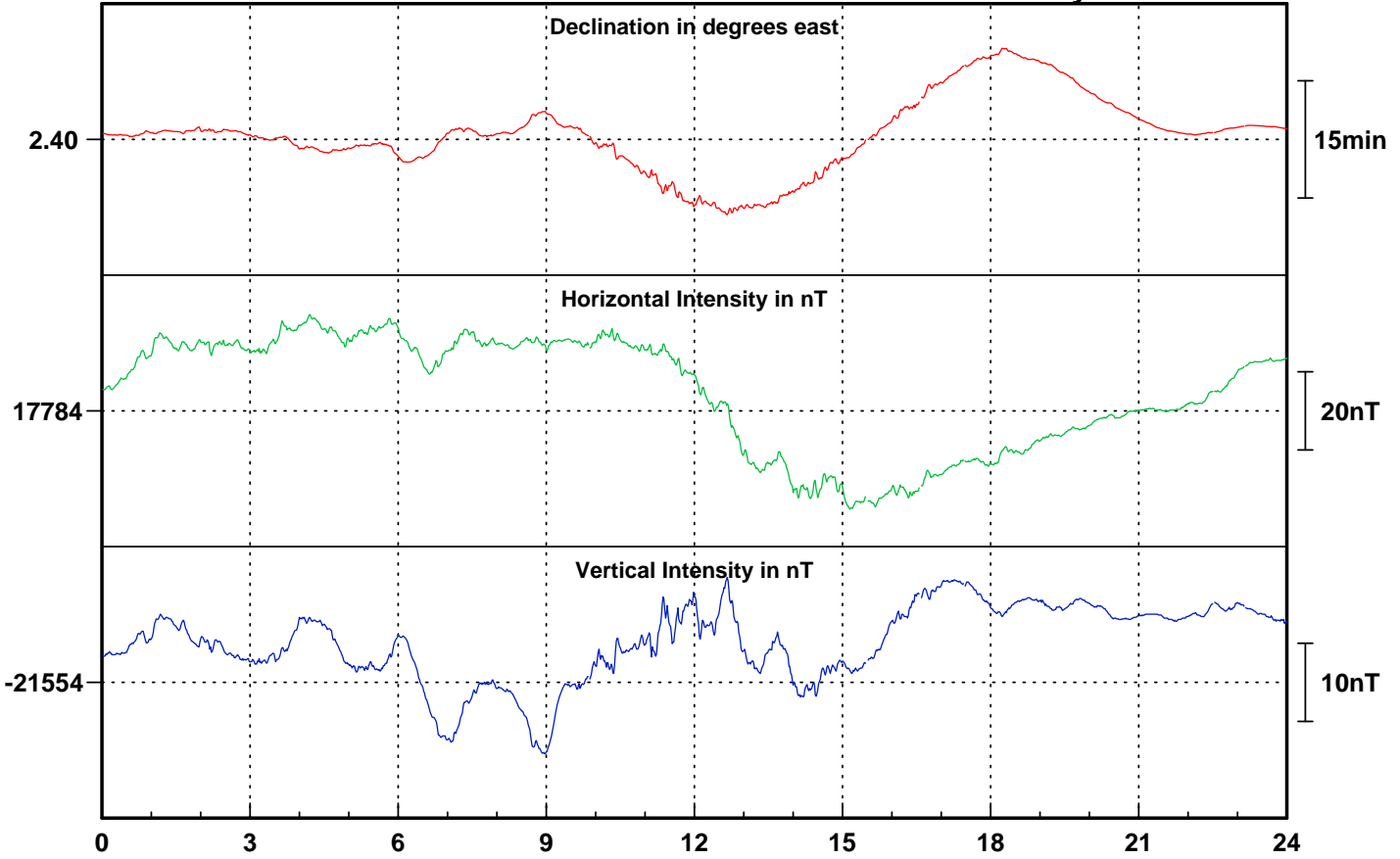
2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

20nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

20nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Date: 09-03-2023

Day number: 068

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT
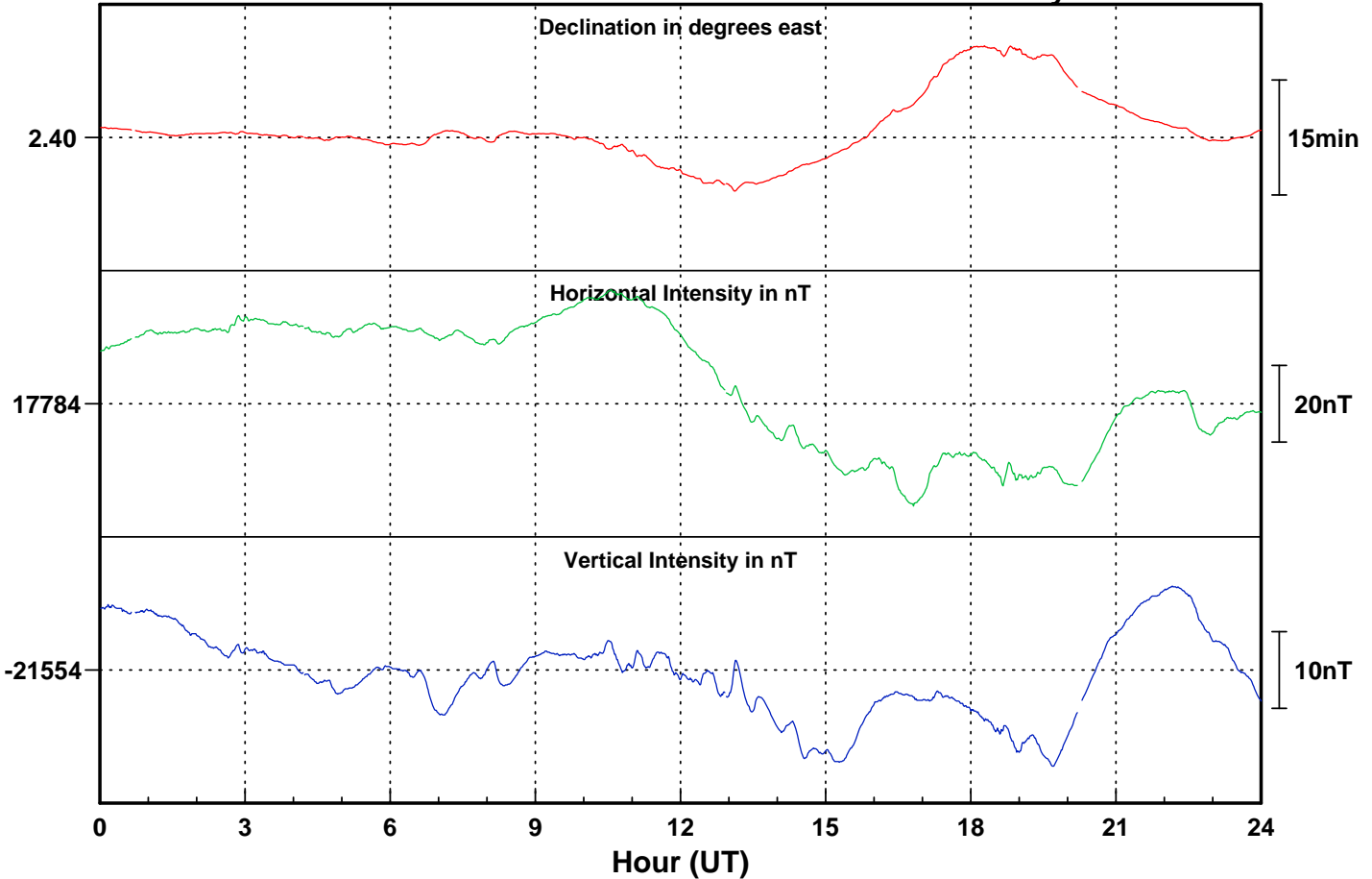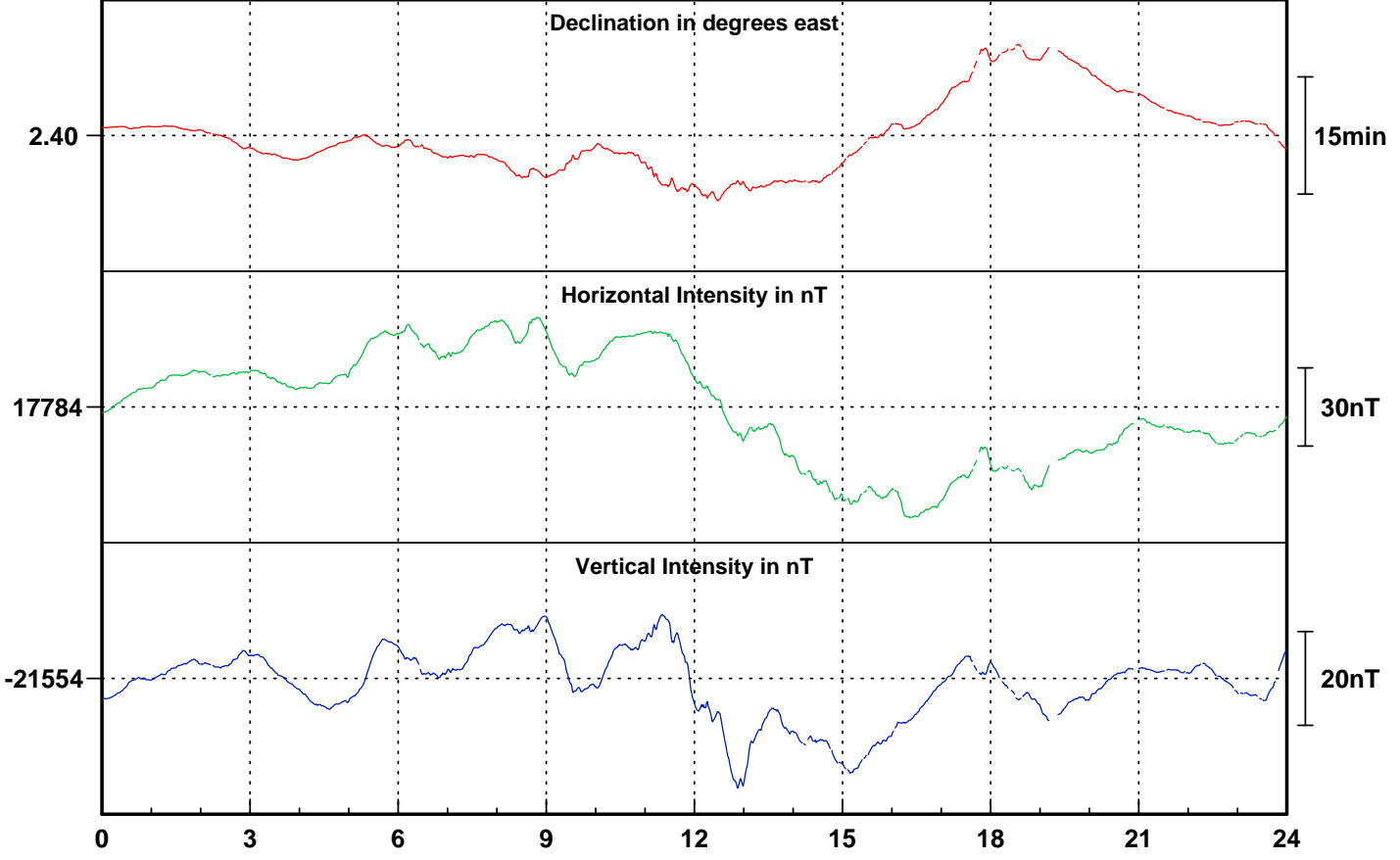
Date: 10-03-2023

Day number: 069

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

Hour (UT)

Falkland Islands

Date: 11-03-2023   Day number: 070

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

20nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24
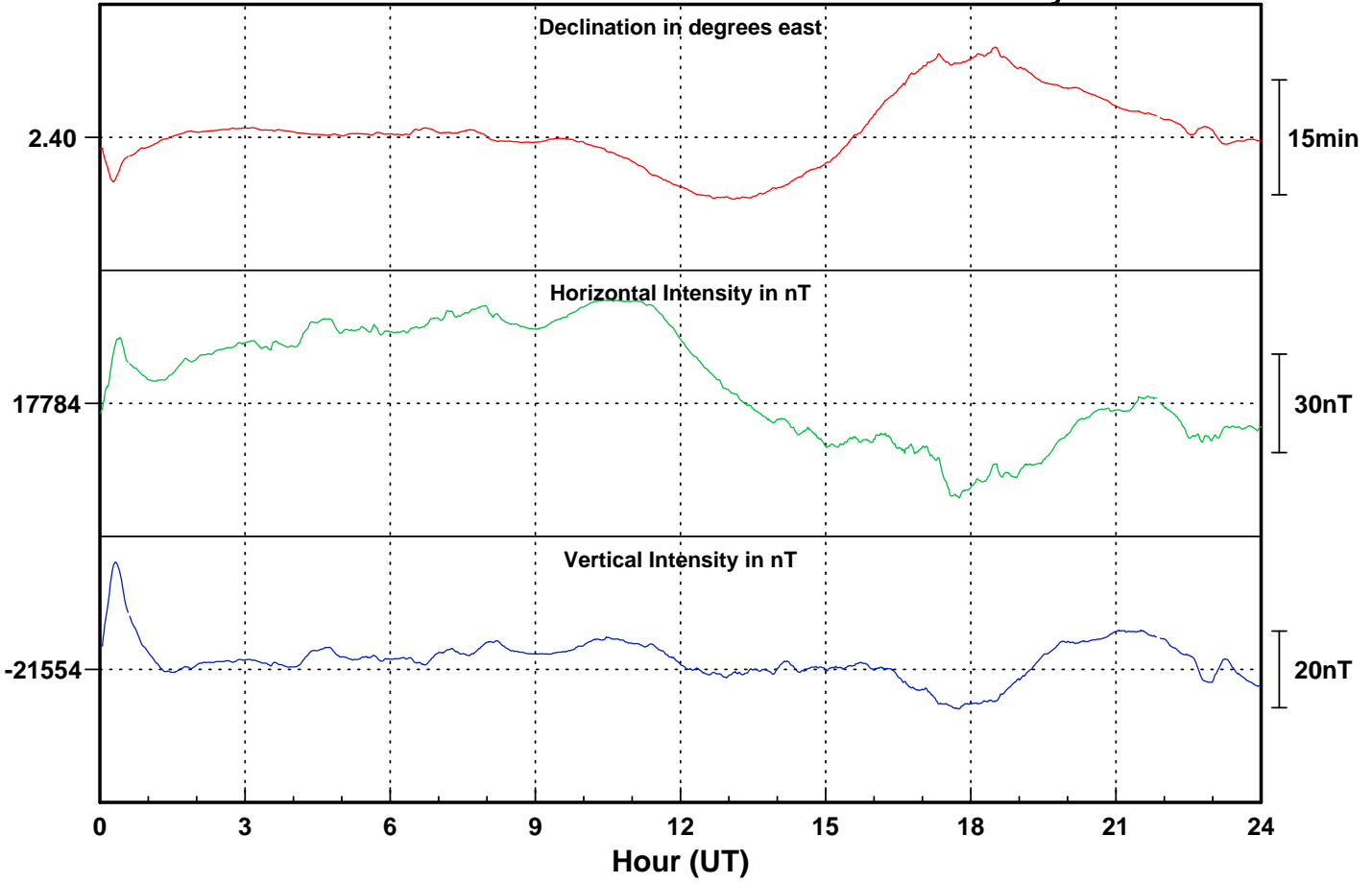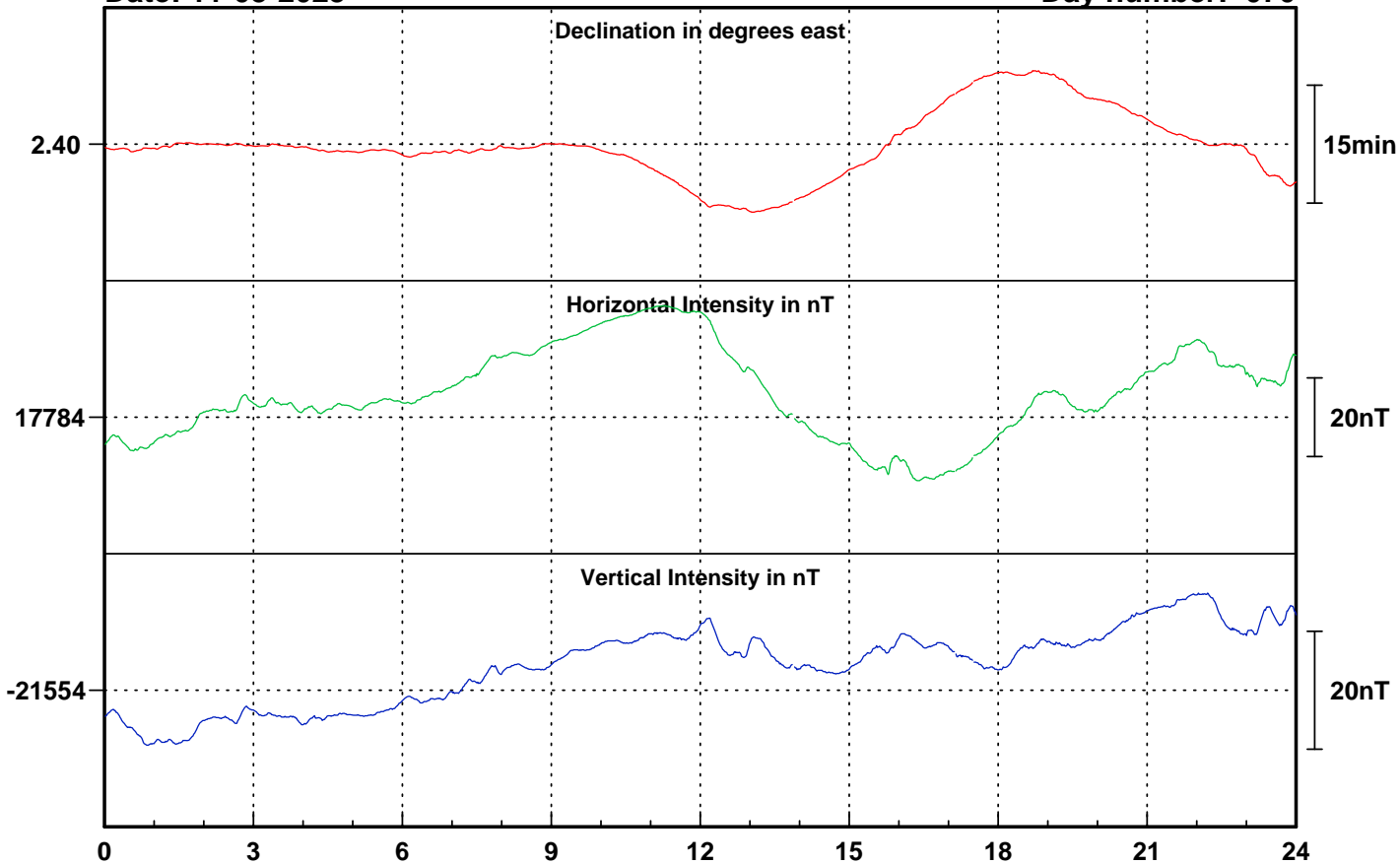
Date: 12-03-2023   Day number: 071

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

40nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Date: 13-03-2023   Day number: 072

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24
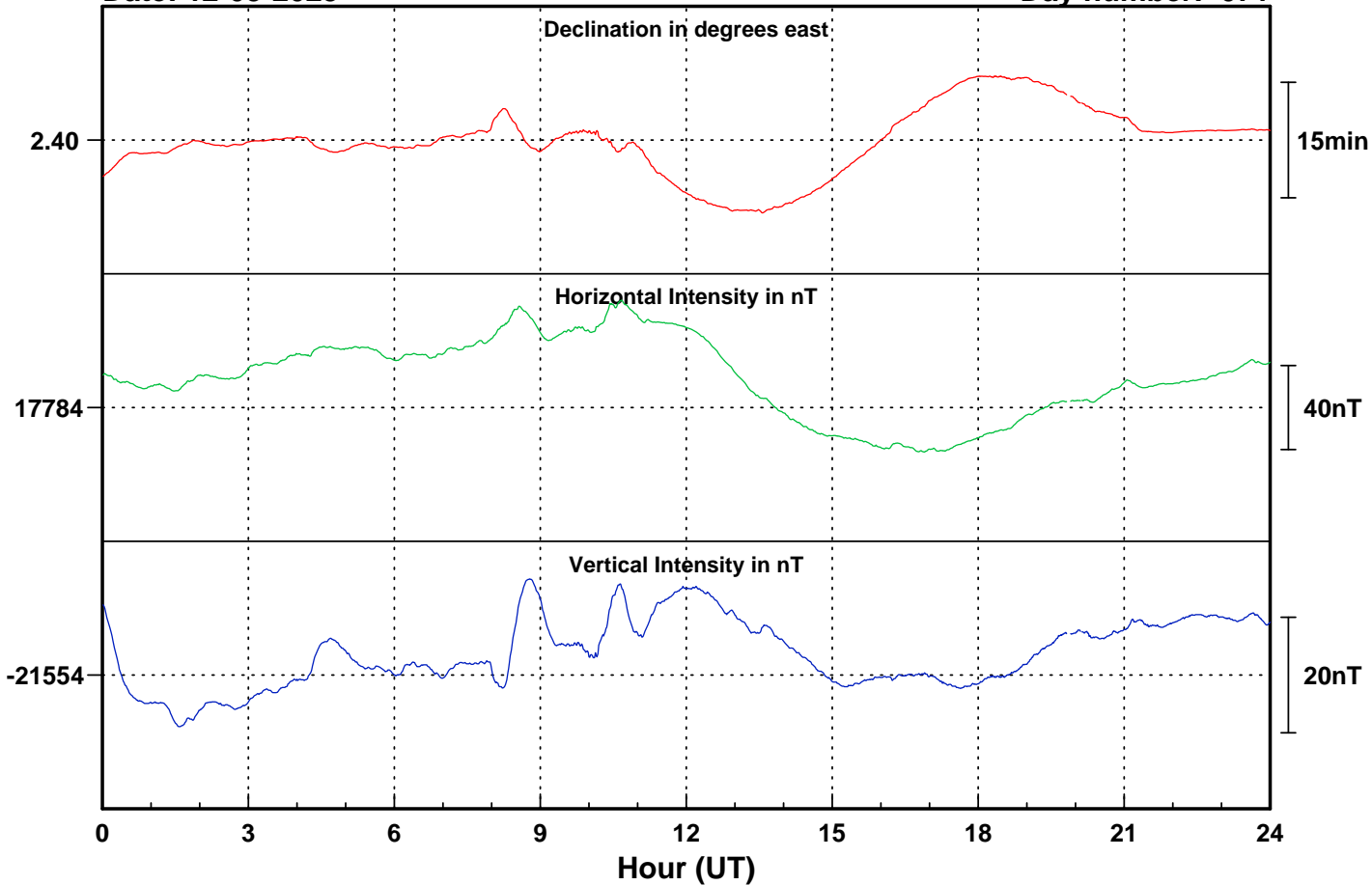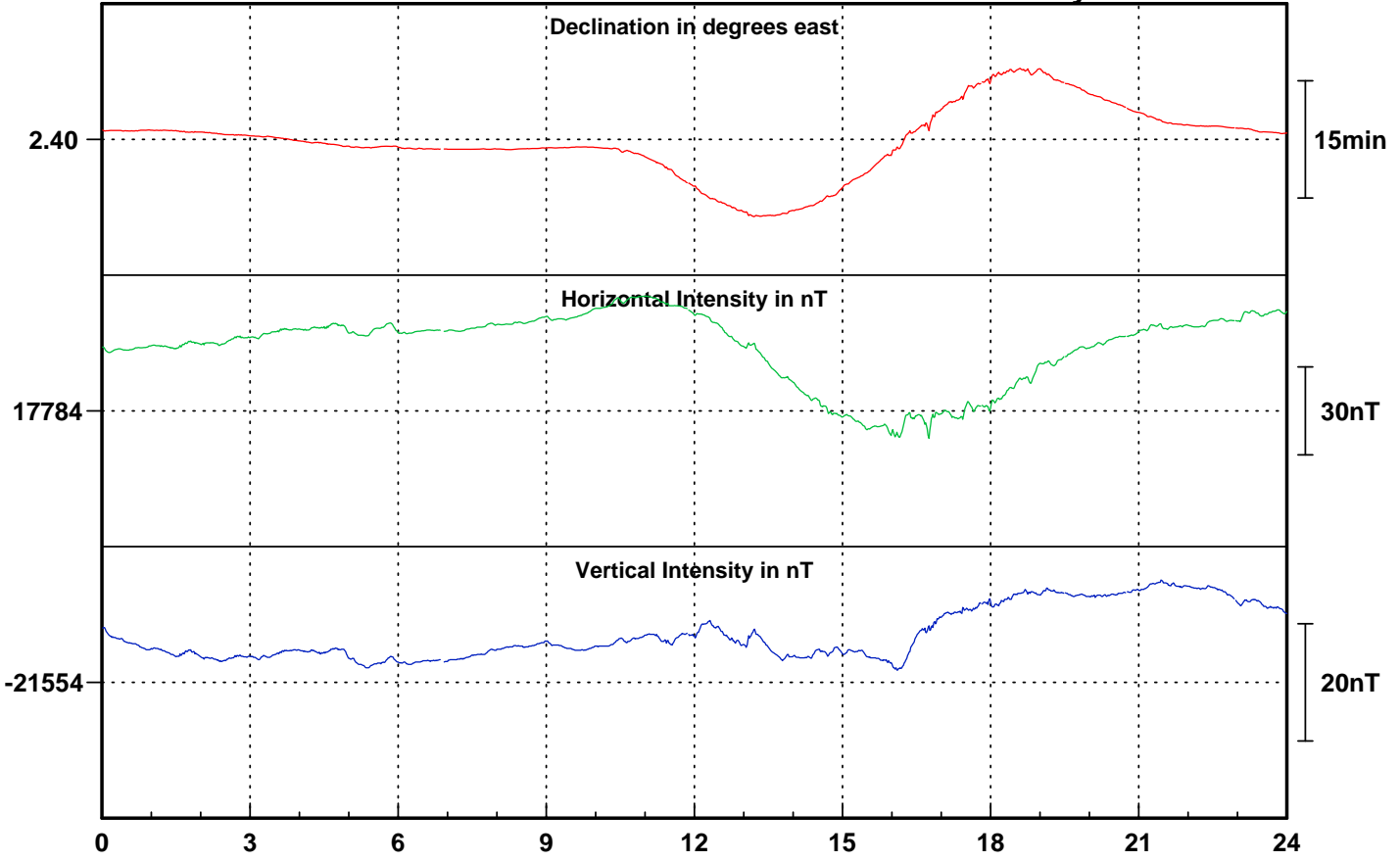
Date: 14-03-2023   Day number: 073
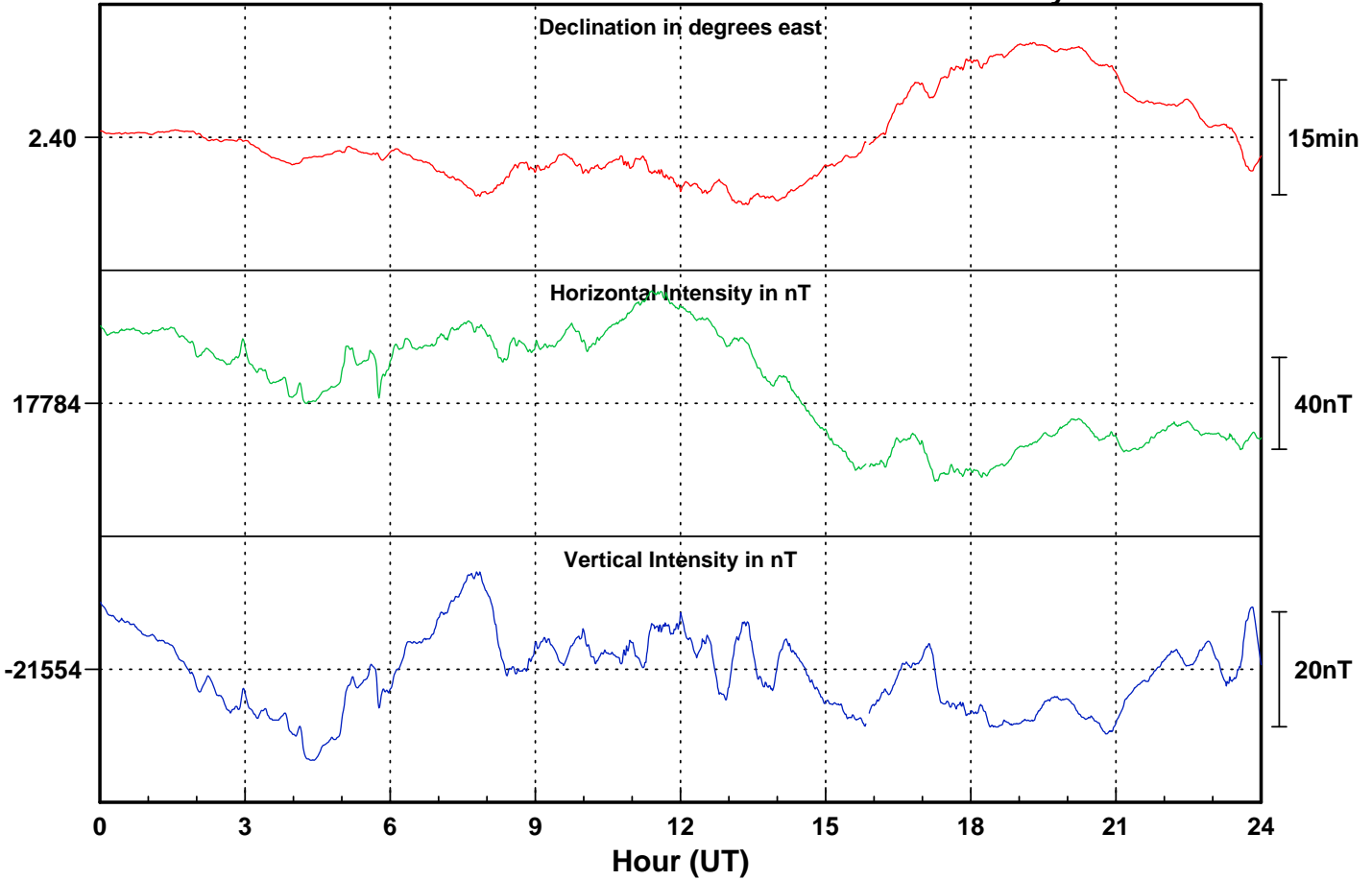
Declination in degrees east
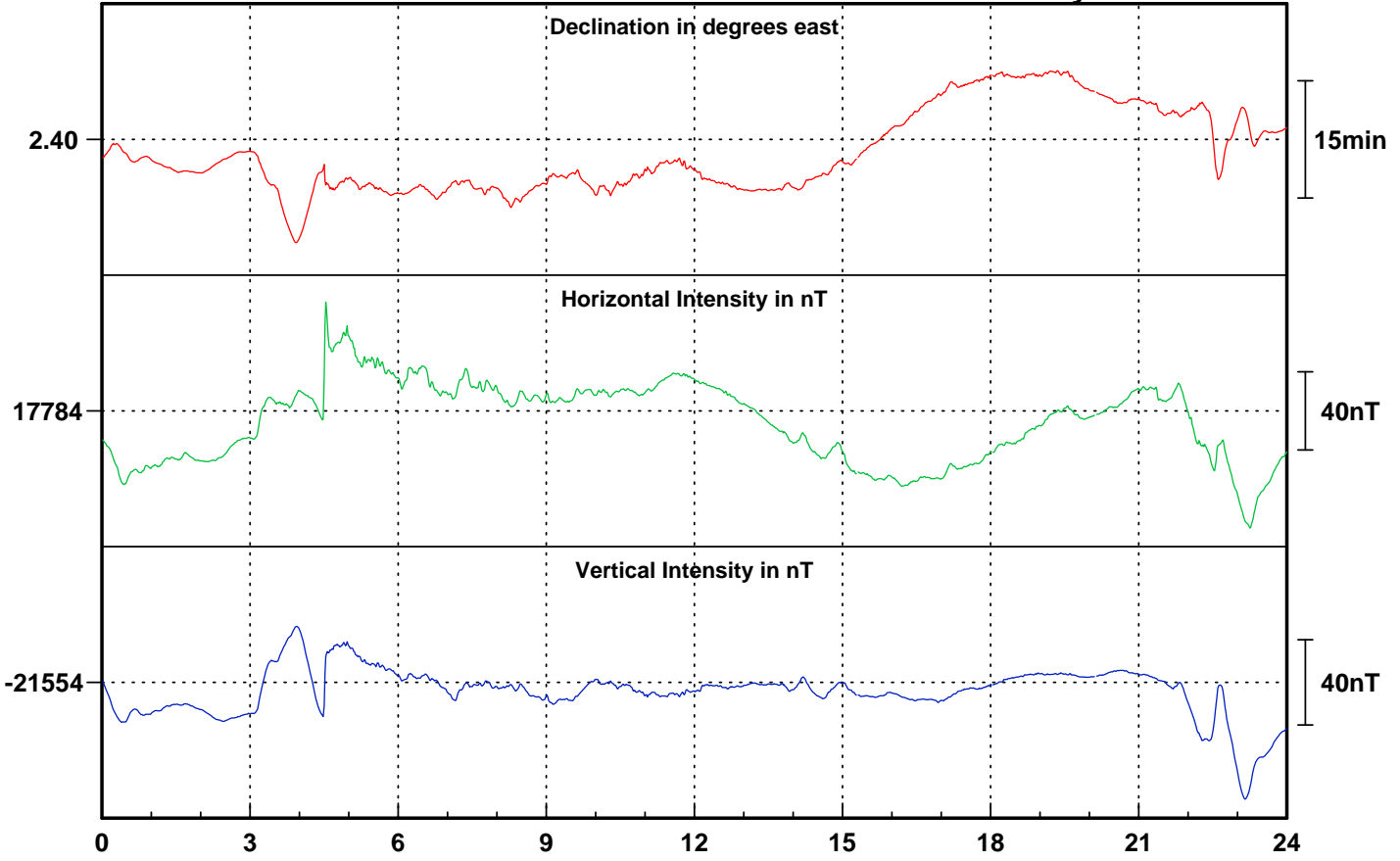
2.40

15min

Horizontal Intensity in nT

17784

40nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

40nT

Vertical Intensity in nT

-21554

40nT

0 3 6 9 12 15 18 21 24

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

0 3 6 9 12 15 18 21 24

Hour (UT)

Falkland Islands

Date: 17-03-2023   **Day number: 076**

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

20nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24
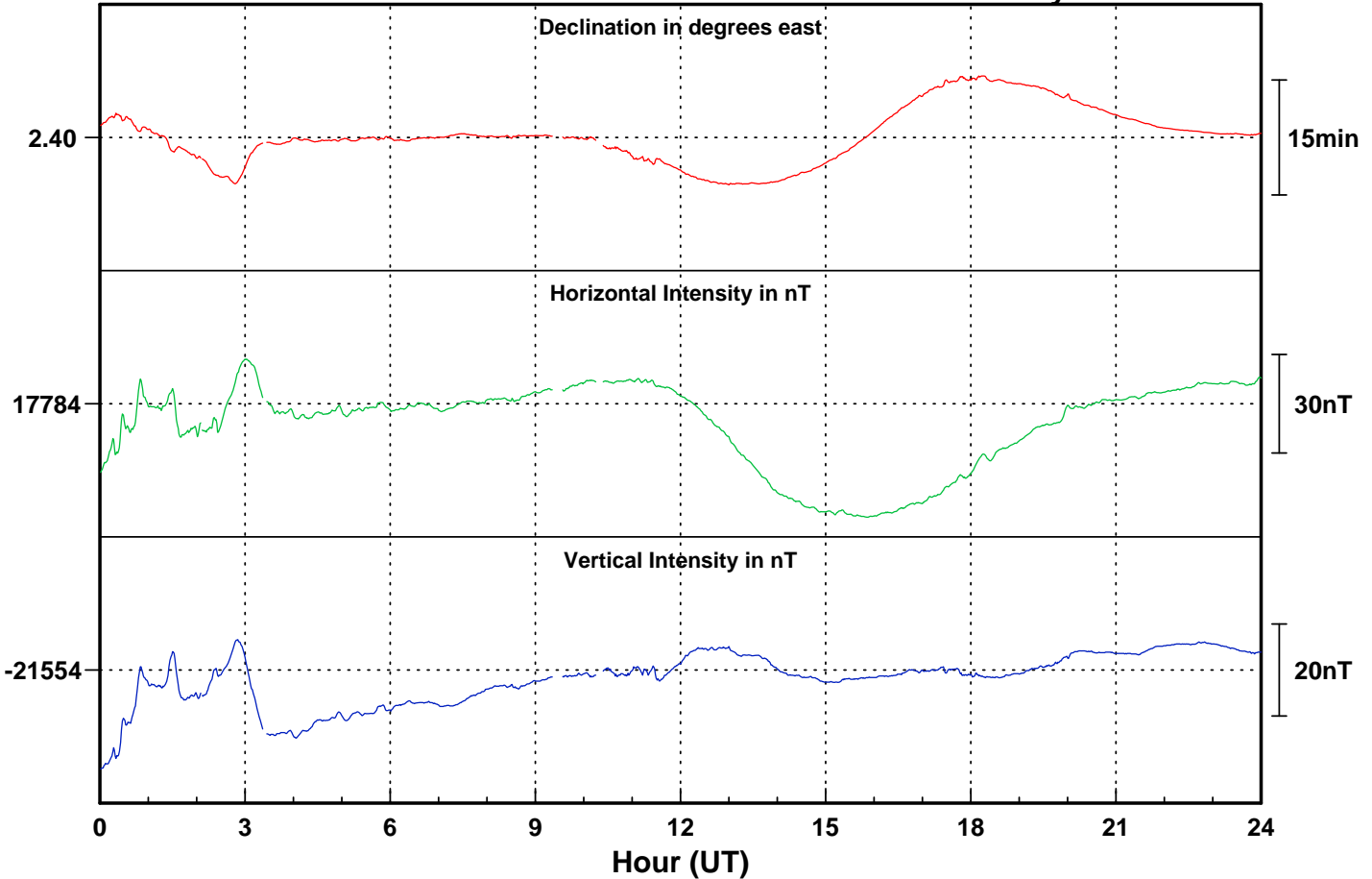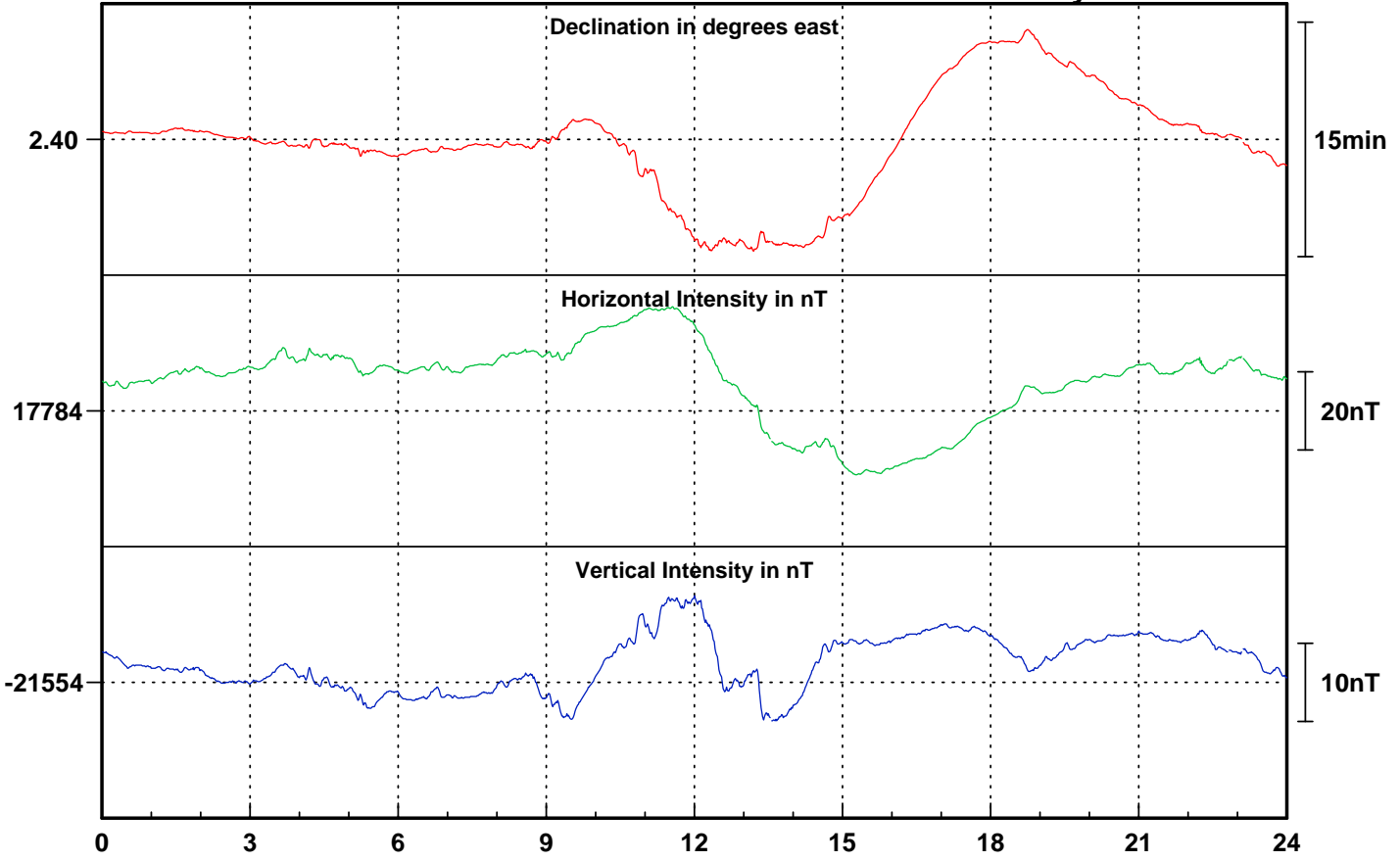
Date: 18-03-2023   **Day number: 077**

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Date: 19-03-2023   Day number: 078

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

20nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24
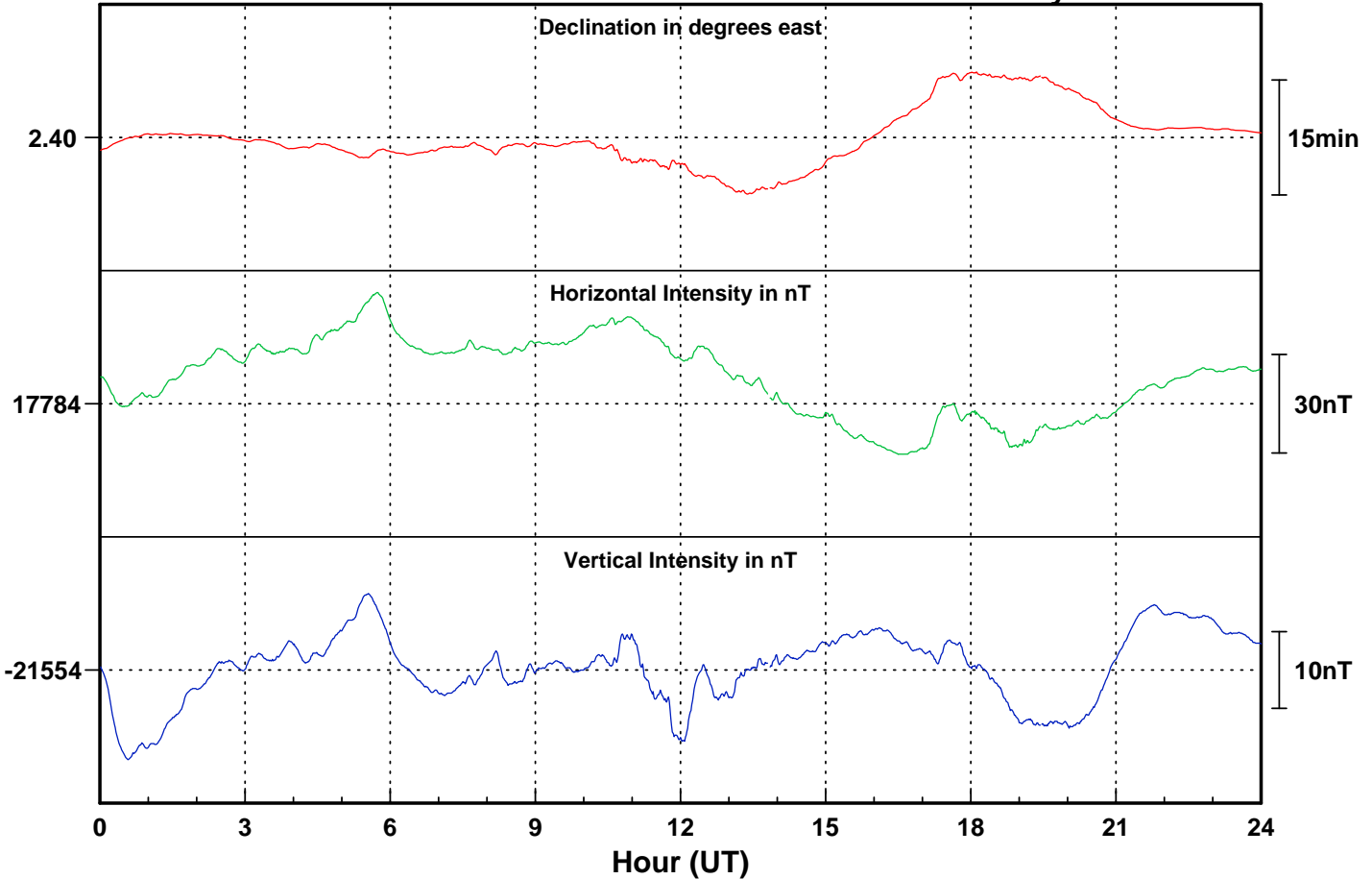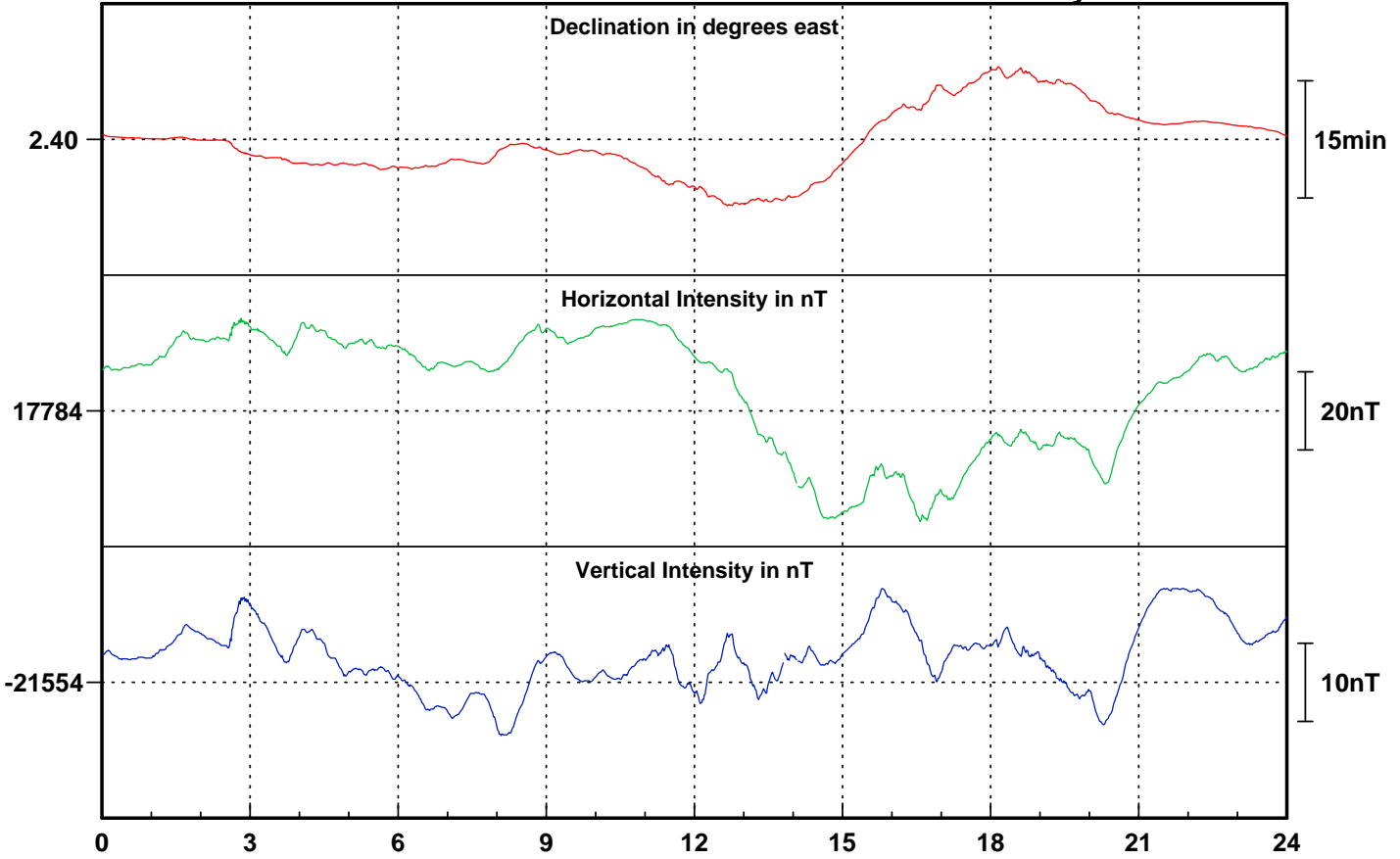
Date: 20-03-2023   Day number: 079

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

20nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24
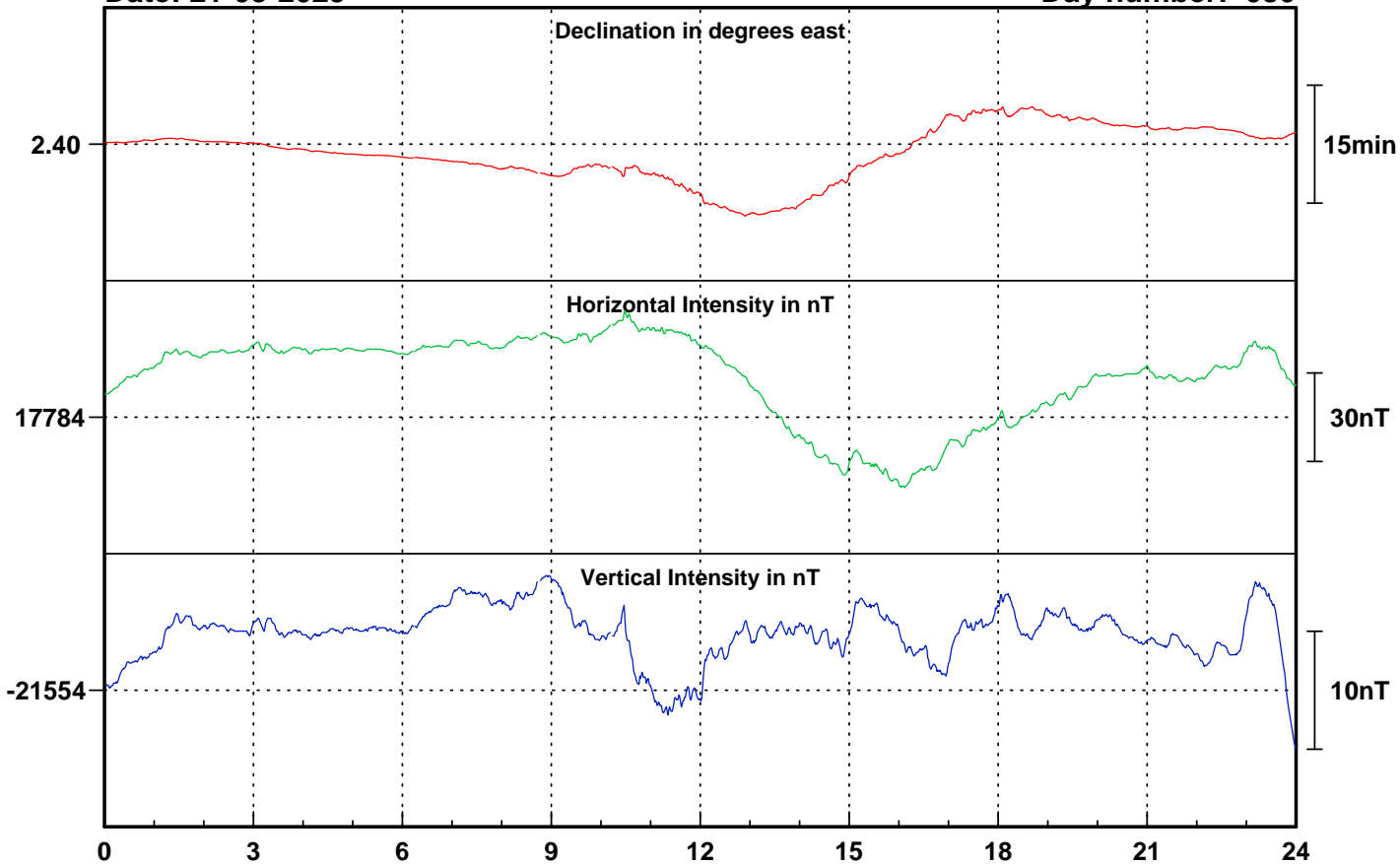
Date: 22-03-2023

Day number: 081

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Date: 23-03-2023

Day number: 082

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

100nT

Vertical Intensity in nT

-21554

60nT

0 3 6 9 12 15 18 21 24
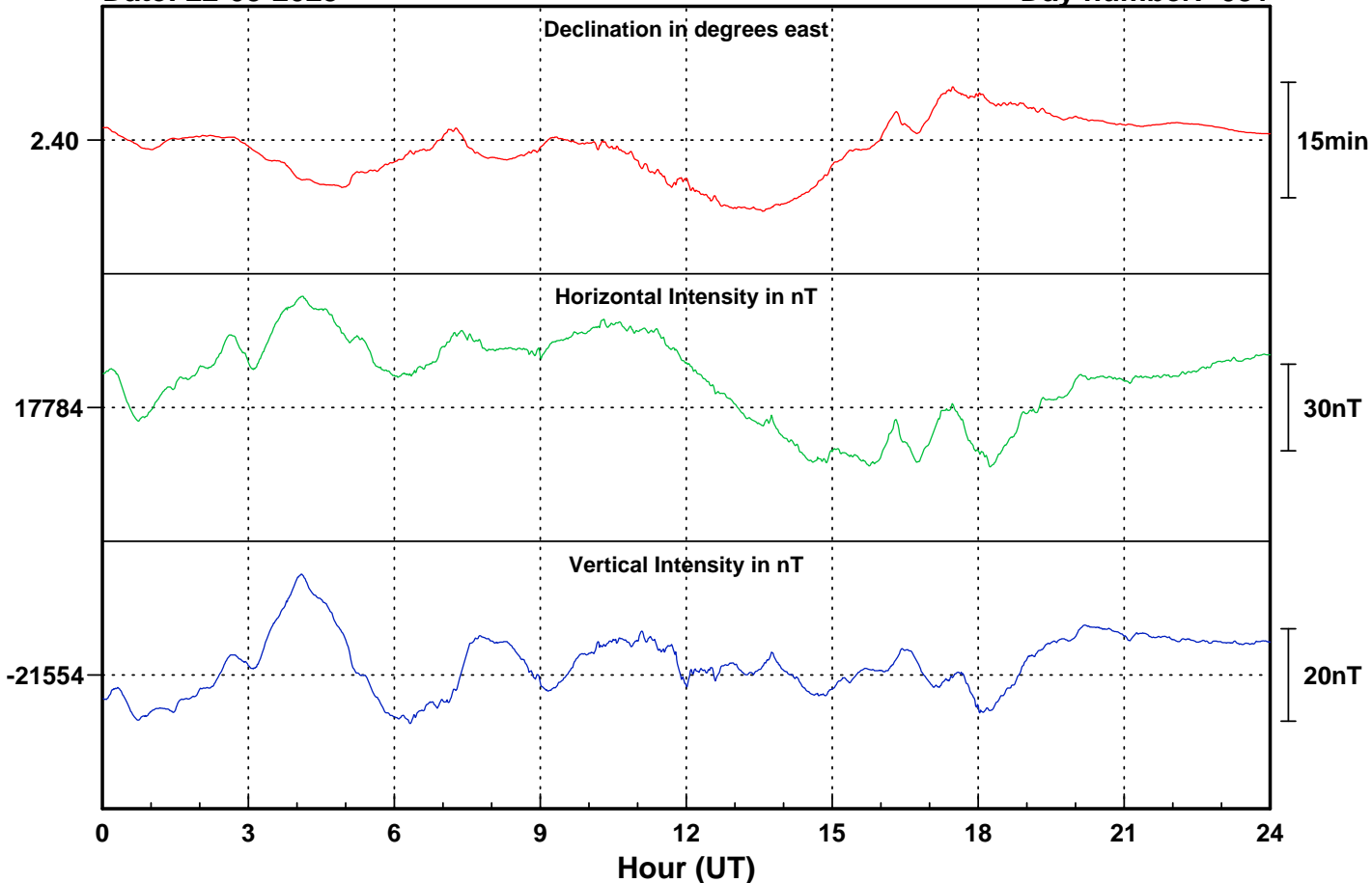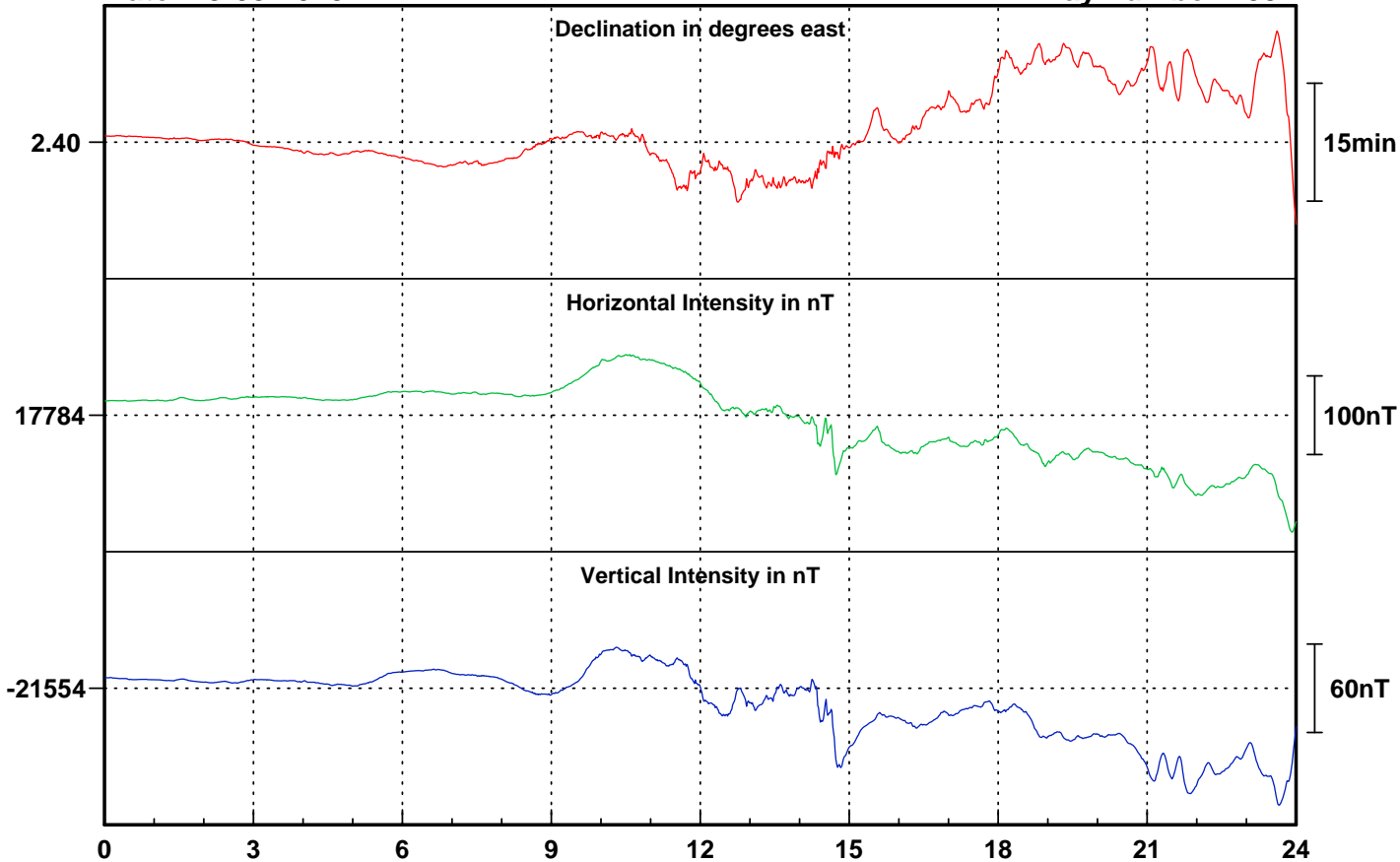
Date: 24-03-2023

Day number: 083

Declination in degrees east
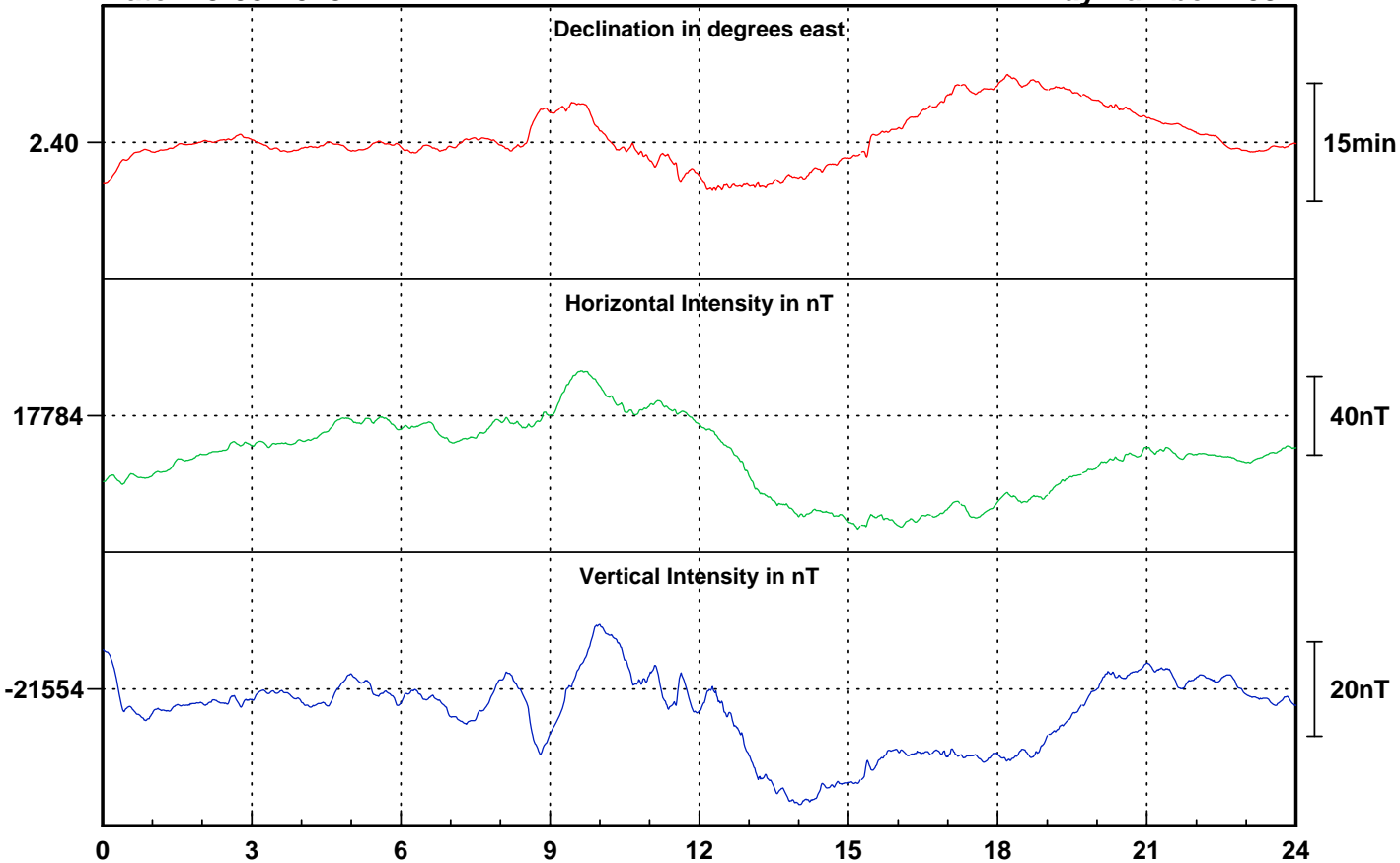
2.40

30min

Horizontal Intensity in nT

17784

100nT

Vertical Intensity in nT

-21554

60nT

0 3 6 9 12 15 18 21 24

Hour (UT)

Falkland Islands

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

40nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24

Hour (UT)

Falkland Islands

Date: 27-03-2023

Day number: 086

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

10nT
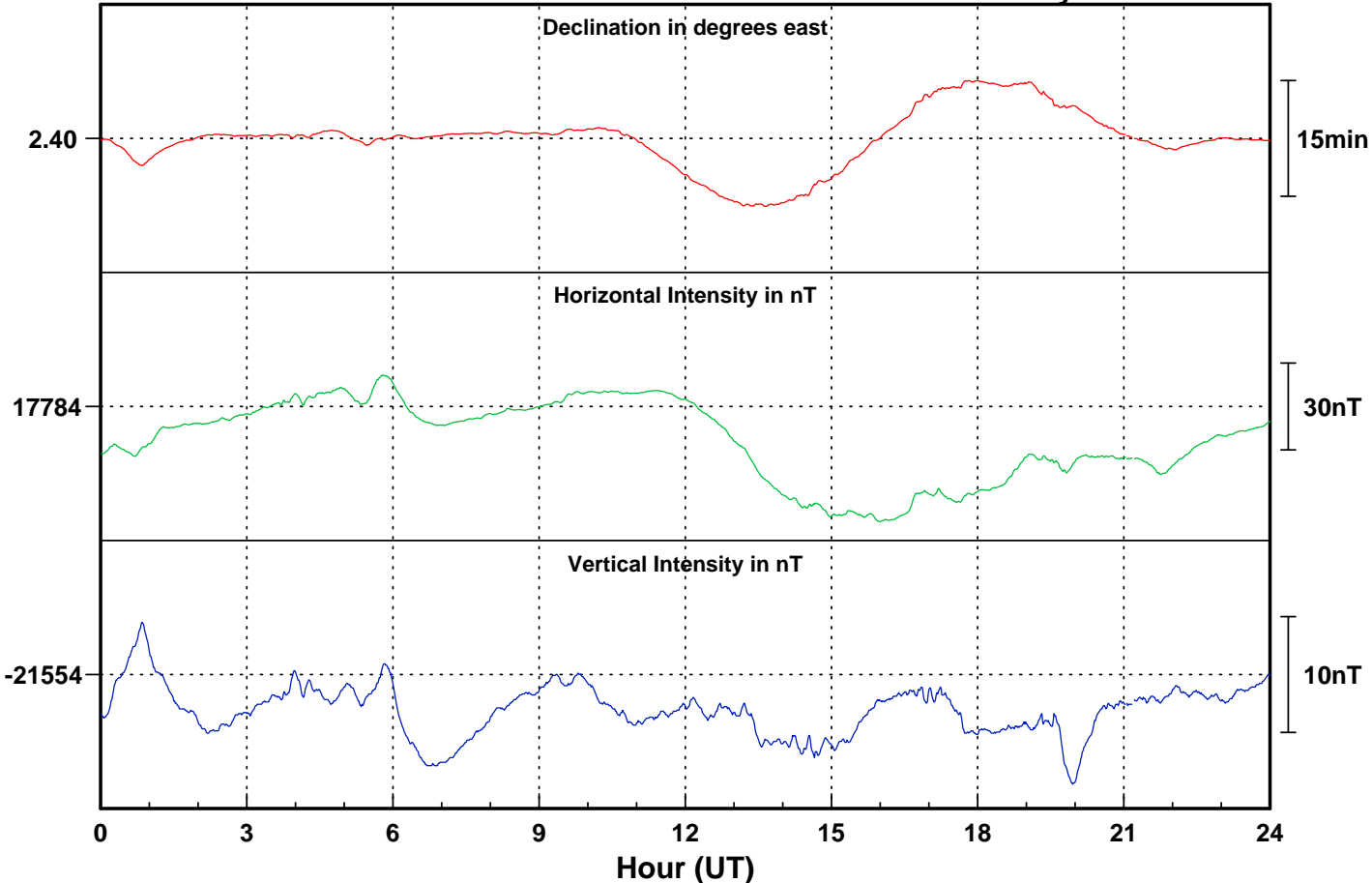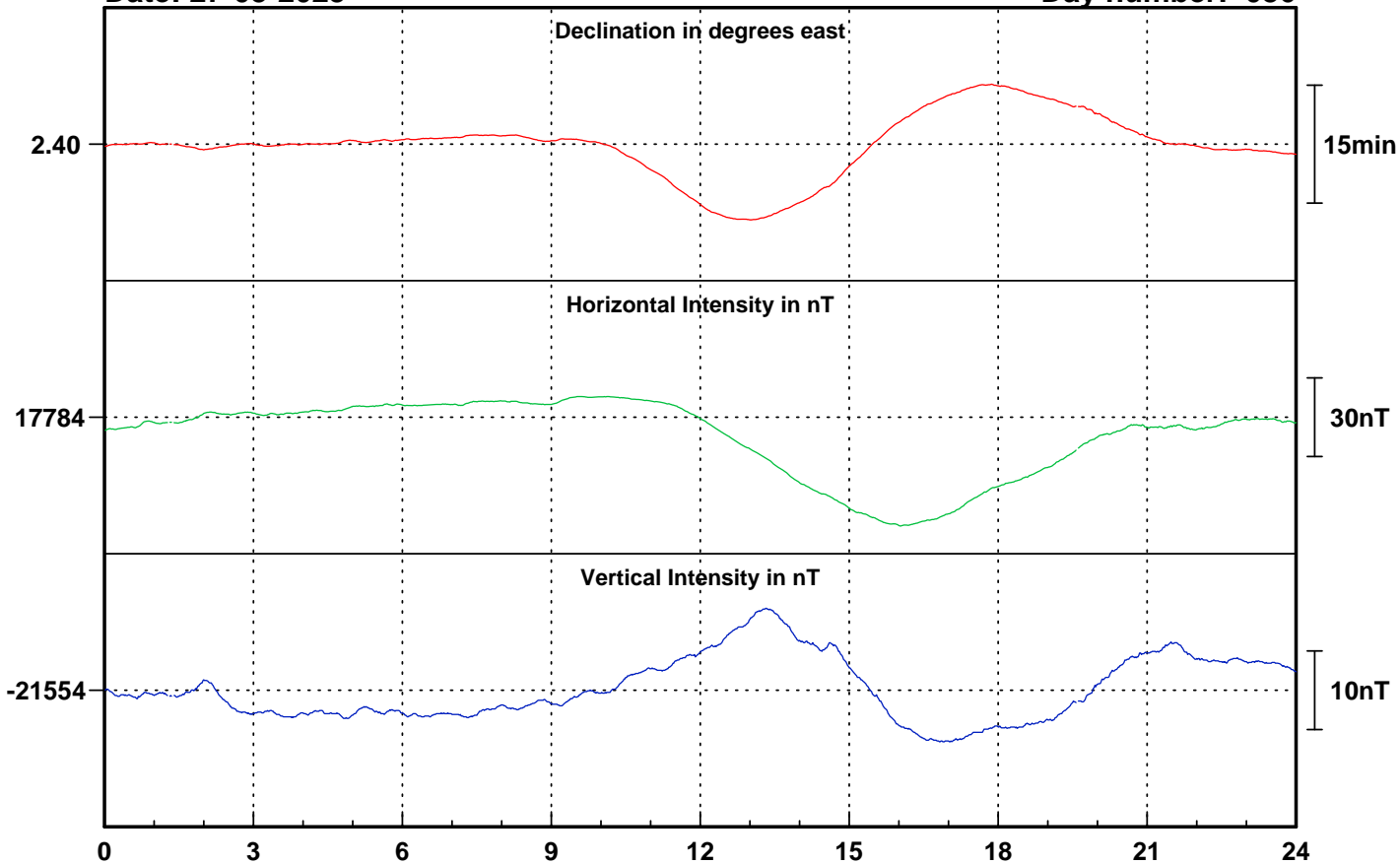
Date: 28-03-2023

Day number: 087

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

20nT

Hour (UT)

Falkland Islands

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

30nT

Vertical Intensity in nT

-21554

10nT

0   3   6   9   12   15   18   21   24
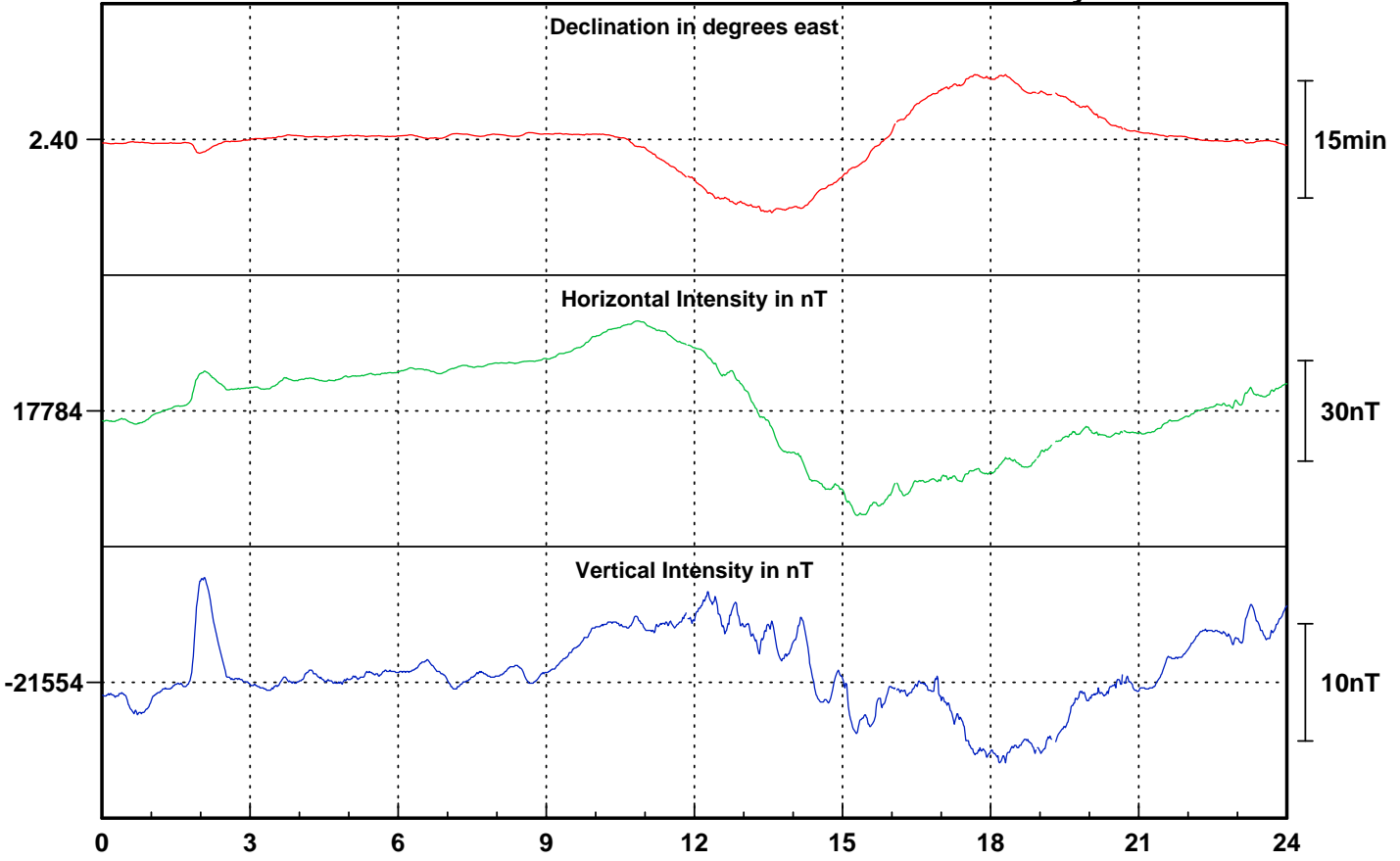
Date: 30-03-2023   Day number: 089

Declination in degrees east

2.40

15min

Horizontal Intensity in nT

17784

40nT

Vertical Intensity in nT

-21554

20nT

0   3   6   9   12   15   18   21   24

Hour (UT)
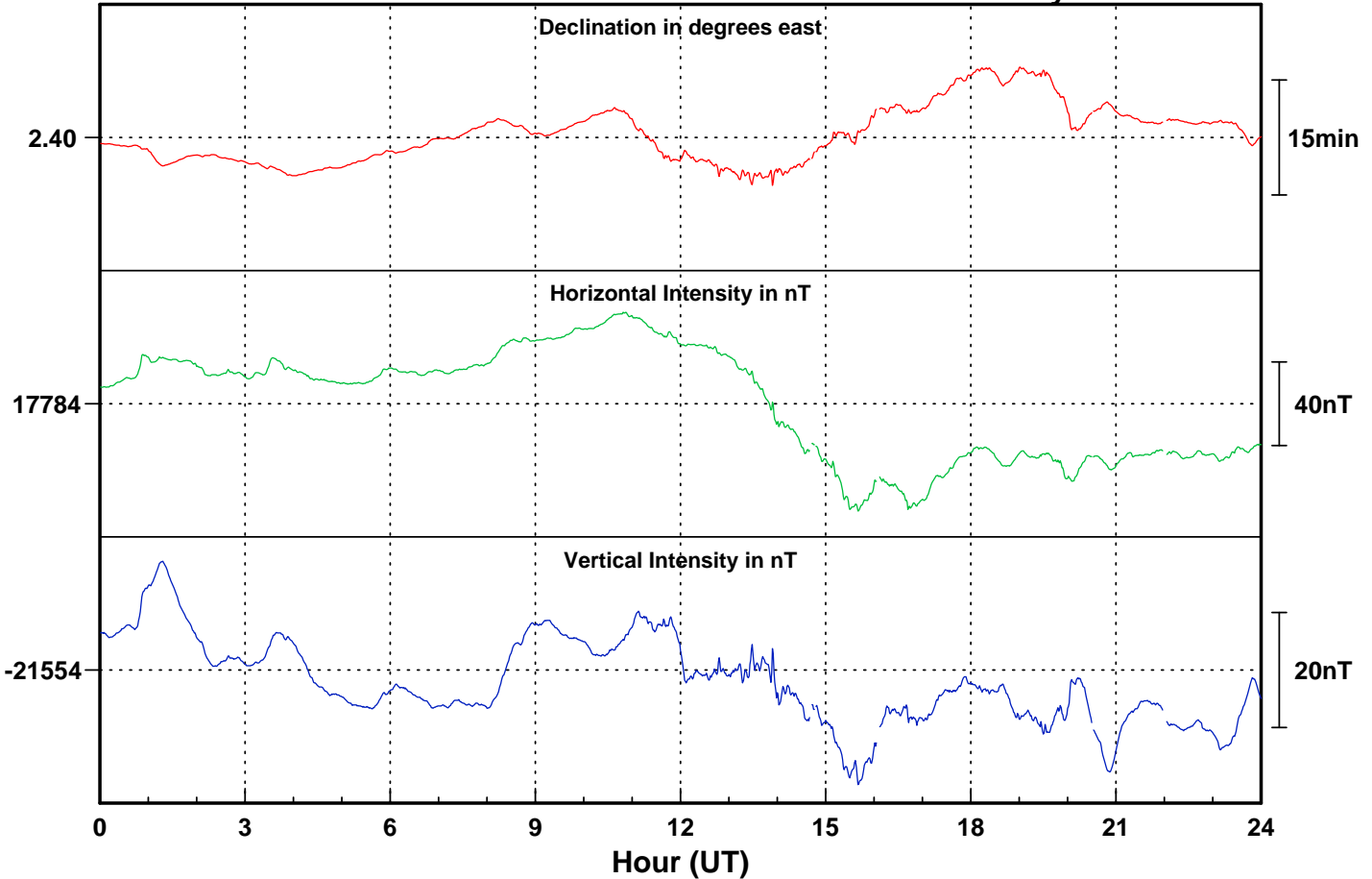
Falkland Islands
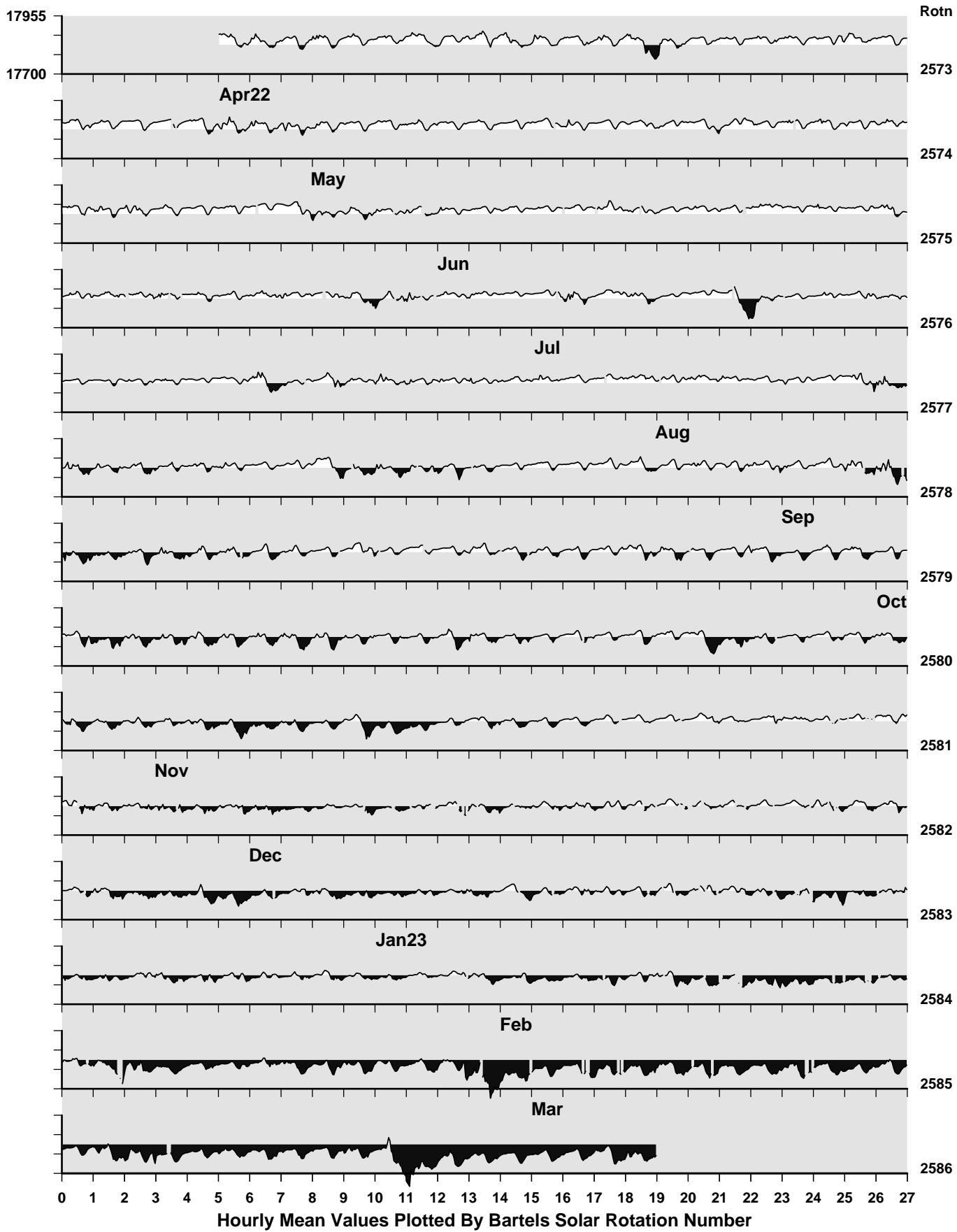
Date: 31-03-2023

Day number: 090
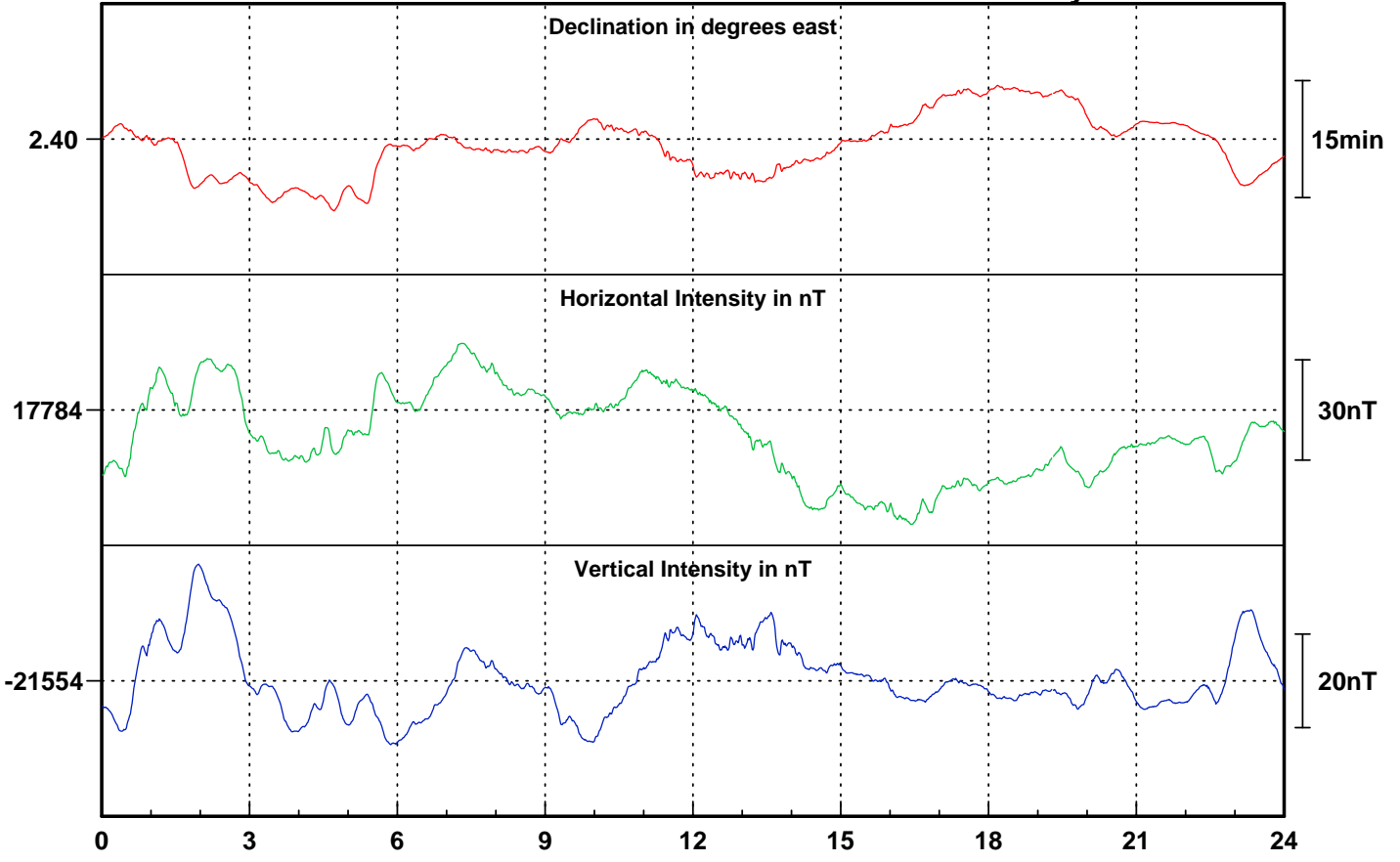
Falkland Islands Observatory: Declination (degrees)
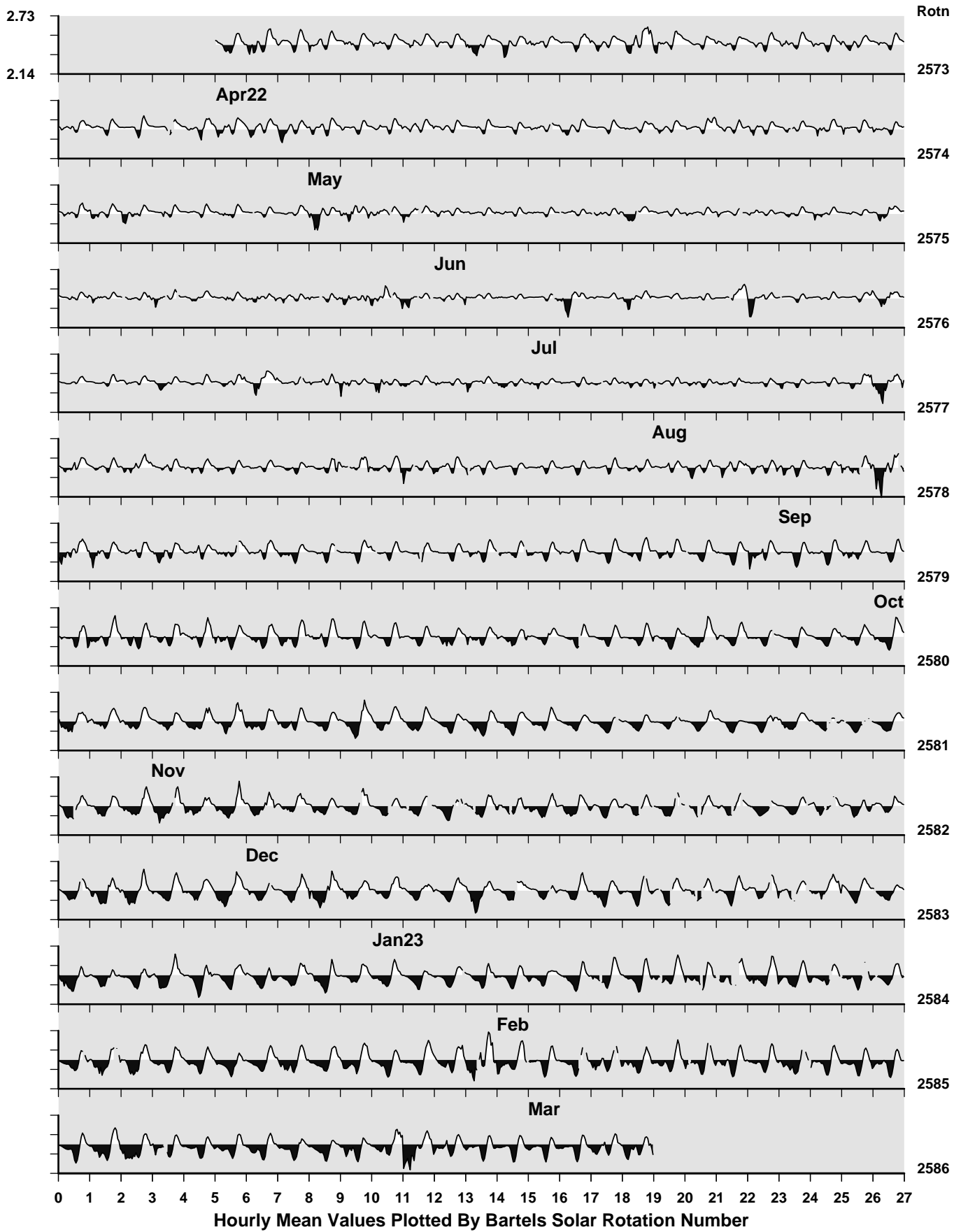
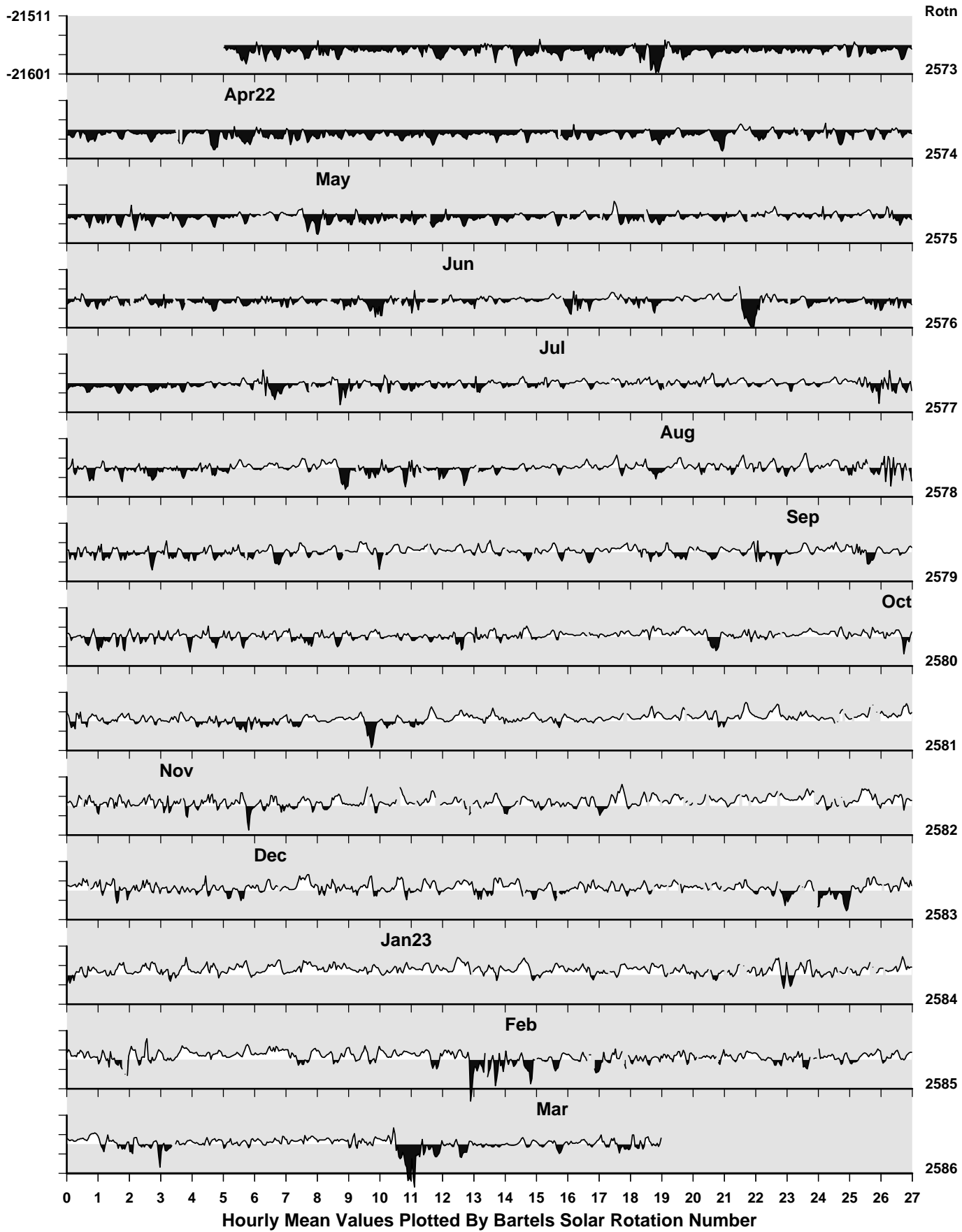**Hourly Mean Values Plotted By Bartels Solar Rotation Number**

Falkland Islands Observatory: Horizontal Intensity (nT)

Hourly Mean Values Plotted By Bartels Solar Rotation Number

Falkland Islands Observatory: Vertical Intensity (nT)

Hourly Mean Values Plotted By Bartels Solar Rotation Number

Falklands Is Observatory   2023

Daily Mean Declination (deg)

2.41

10min

Daily Mean Horizontal Intensity (nT)

17802

100nT

Daily Mean Vertical Intensity (nT)

-21551

50nT

Daily Mean Total Intensity (nT)

27953

75nT

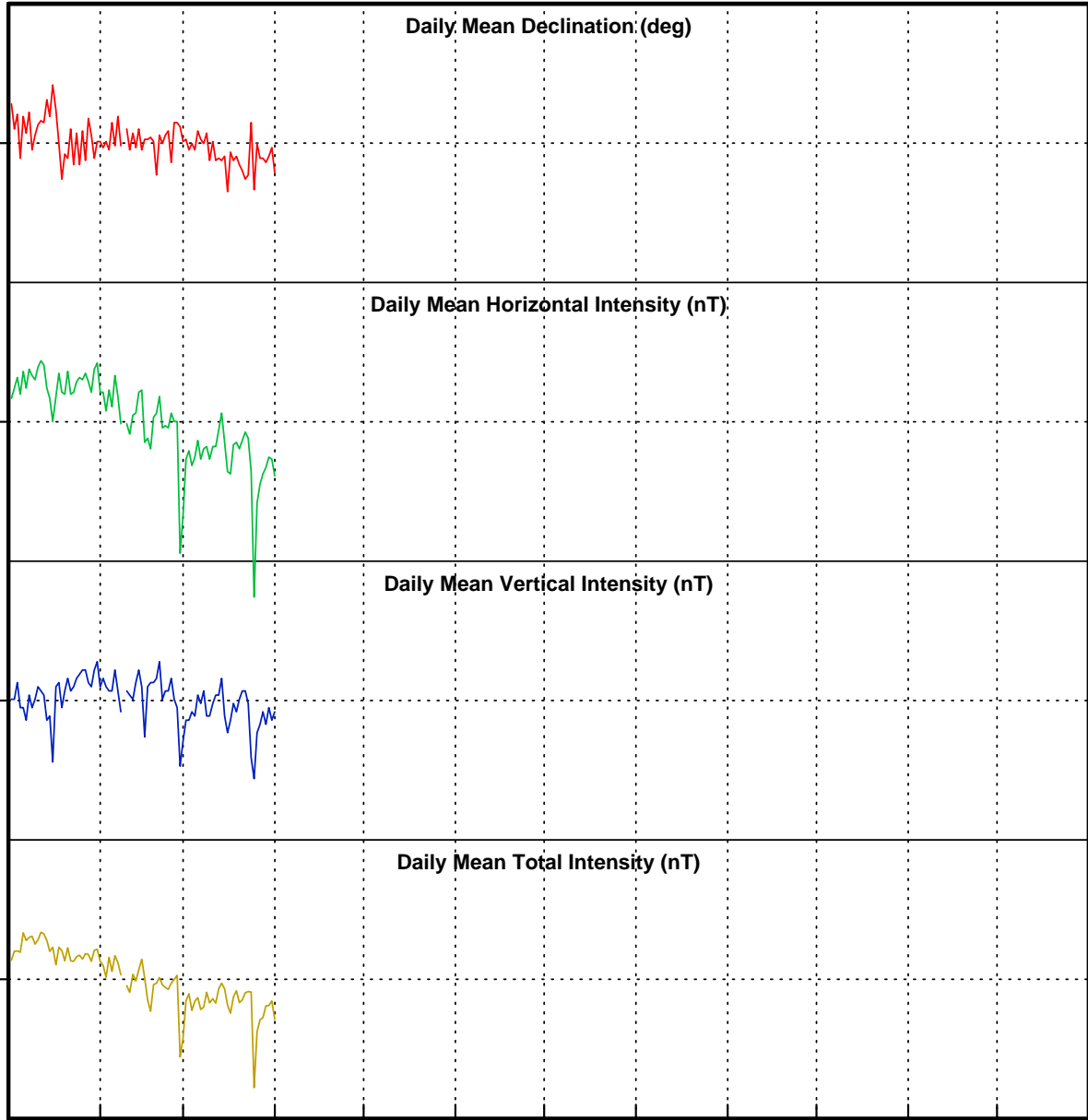Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec

Monthly mean values for Port Stanley Observatory 2023

Month	D	H	I	X	Y	Z	F
January	2° 25.3′	17821 nT	-50° 24.6′	17805 nT	753 nT	-21550 nT	27963 nT
February	2° 25.0′	17801 nT	-50° 26.5′	17785 nT	751 nT	-21550 nT	27951 nT
March	2° 24.2′	17784 nT	-50° 28.5′	17768 nT	746 nT	-21554 nT	27944 nT

Note:

i. The values shown here are provisional.