British Geological Survey

MONTHLY MAGNETIC BULLETIN

Port Stanley Observatory

December 2021

MONTHLY MAGNETIC BULLETIN

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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Internet: geomag.bgs.ac.uk

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° 37'33.6"S 012° 24'14.4
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 2021.5. 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.

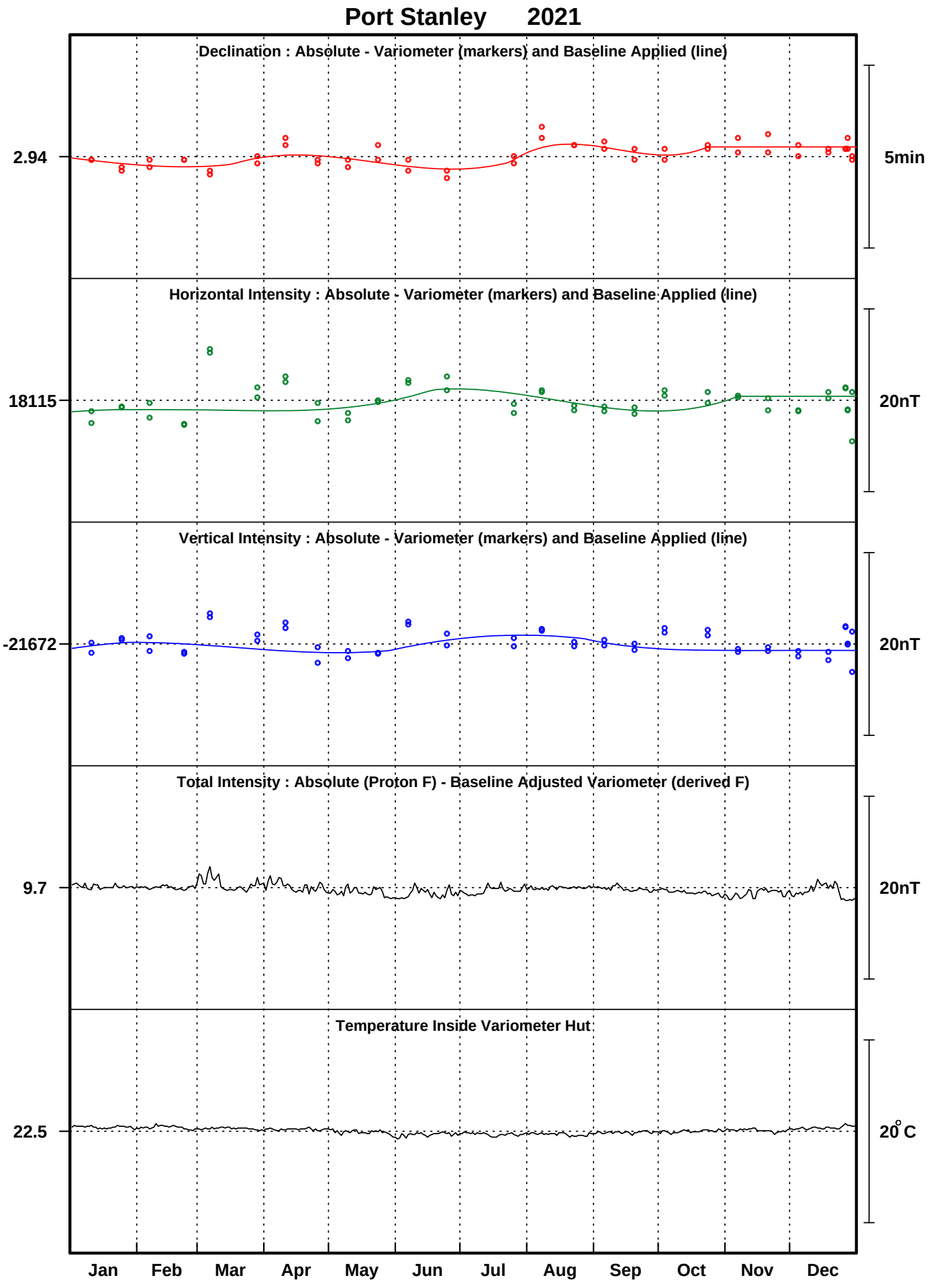
Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: ‘The results presented in this paper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

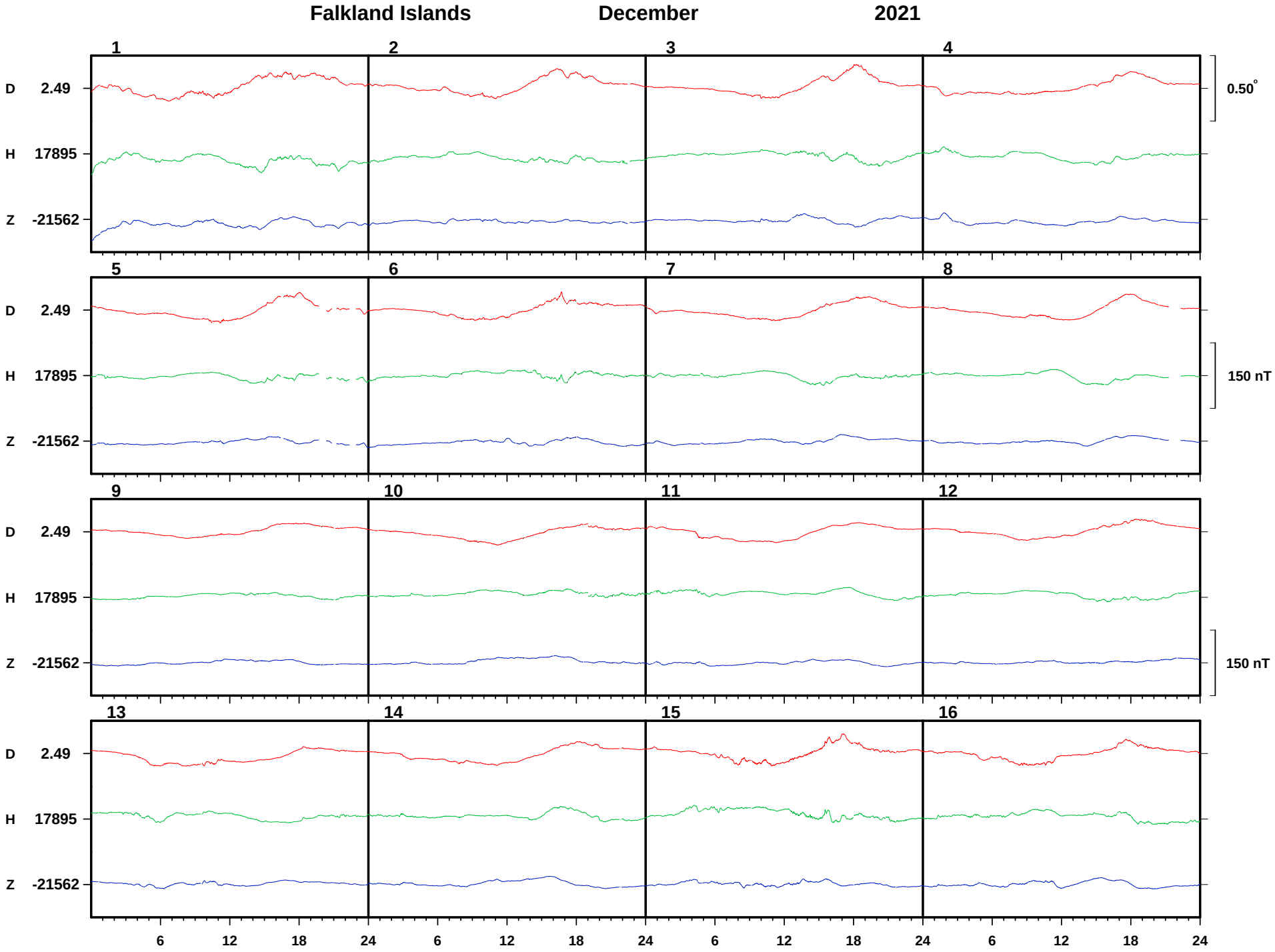
Commercial users can contact the geomagnetism team for information on the range of applications and services offered. Full contact details are available at geomag.bgs.ac.uk/contactus/staff

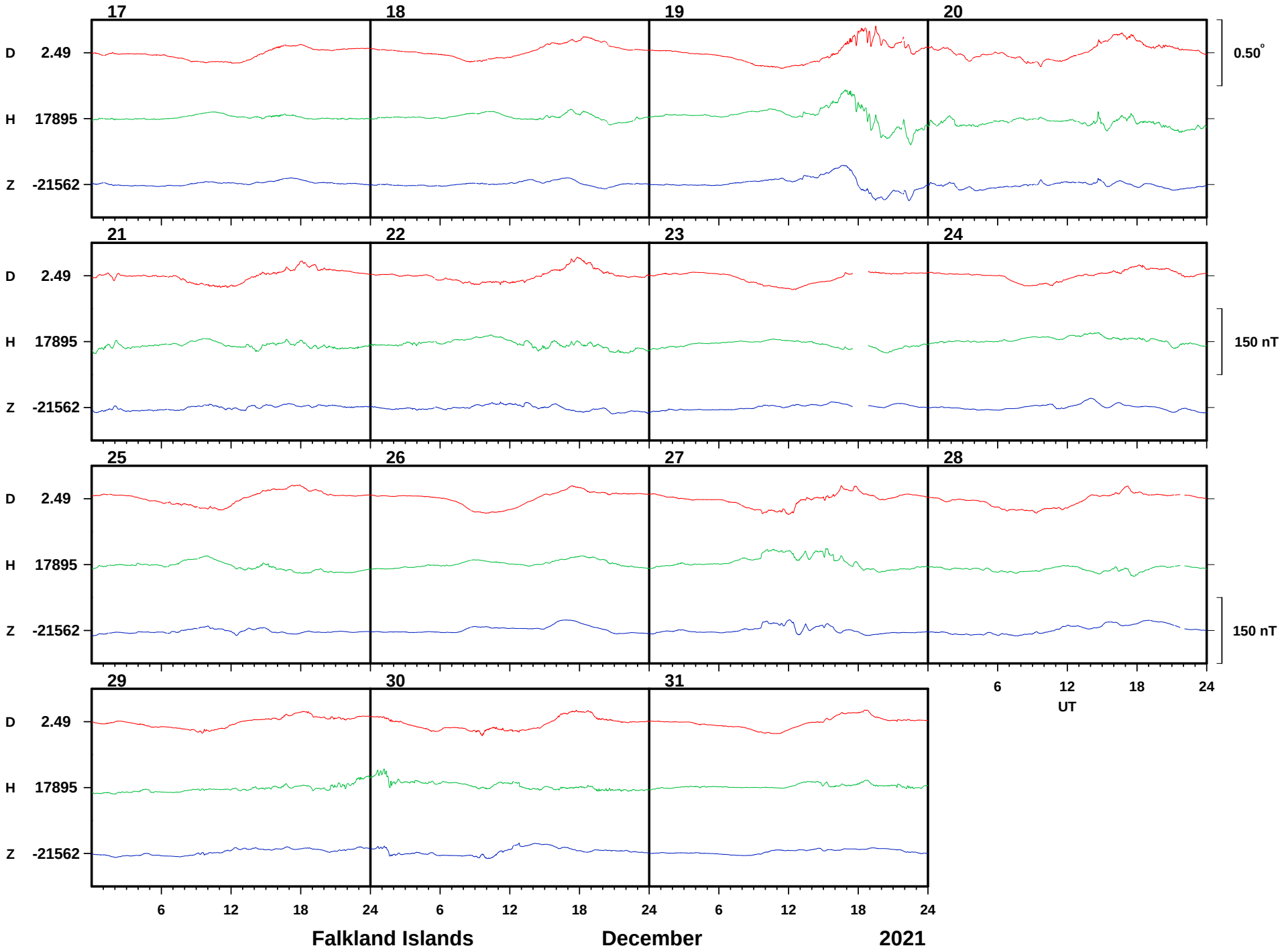
Port Stanley Observatory

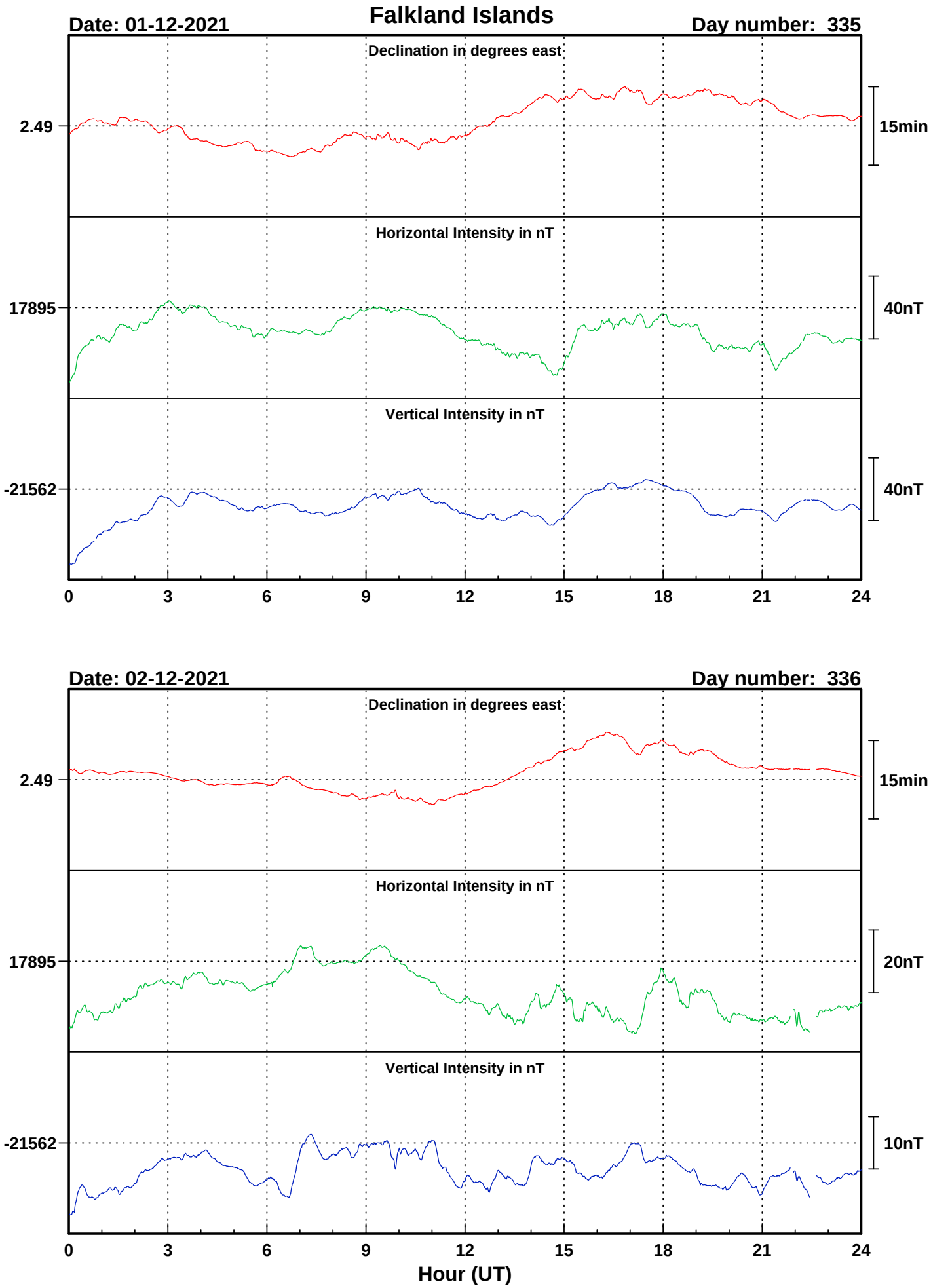
Absolute observations

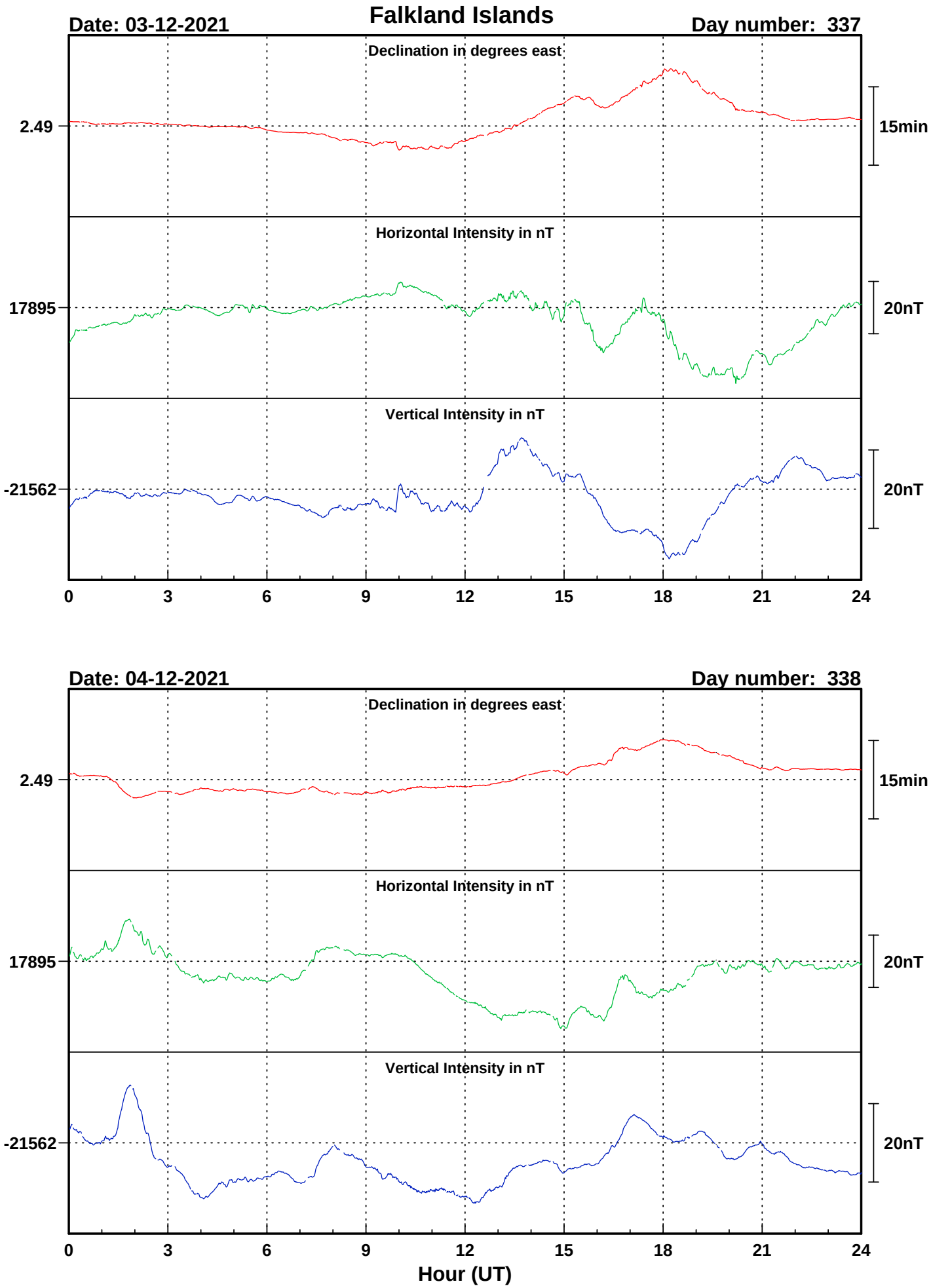
		Declination			Inclination		Total field		Horizontal intensity		Vertical intensity		
Date	**Day Number**	**Time (UT)**	**Absolute (º)**	**Baseline (º)**	**Time (UT)**	**Absolute (º)**	**Site difference (nT)**	**Absolute corrected (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Observer**
04-Dec-21	338	20:33	2.5384	2.9500	20:38	-50.3133	-9.7	28020.8	17893.7	18114.0	-21563.3	-21673.1	NB
04-Dec-21	338	20:44	2.5271	2.9450	20:50	-50.3154	-9.7	28020.0	17892.5	18113.9	-21563.4	-21673.7	NB
18-Dec-21	352	16:57	2.5680	2.9483	17:03	-50.2617	-9.7	28021.7	17913.8	18116.0	-21547.9	-21674.1	NB
18-Dec-21	352	17:08	2.5775	2.9467	17:14	-50.2596	-9.7	28023.5	17915.7	18115.3	-21548.7	-21673.2	NB
26-Dec-21	360	11:53	2.4044	2.9483	12:03	-50.2963	-9.7	28016.6	17897.5	18116.4	-21554.8	-21670.5	TM
26-Dec-21	360	12:15	2.4100	2.9483	12:27	-50.2974	-9.7	28016.4	17896.9	18116.5	-21555.0	-21670.4	TM
27-Dec-21	361	19:08	2.5122	2.9483	19:18	-50.3383	-9.7	28020.4	17884.1	18114.1	-21570.8	-21672.3	TM
27-Dec-21	361	19:24	2.5110	2.9533	19:32	-50.3454	-9.7	28016.9	17879.2	18114.0	-21570.4	-21672.4	TM
29-Dec-21	363	13:19	2.4913	2.9450	13:27	-50.3174	-9.7	28008.7	17884.5	18110.6	-21555.3	-21675.4	TM
29-Dec-21	363	13:35	2.4937	2.9433	13:43	-50.2992	-9.7	28009.5	17891.9	18116.0	-21550.3	-21671.0	TM

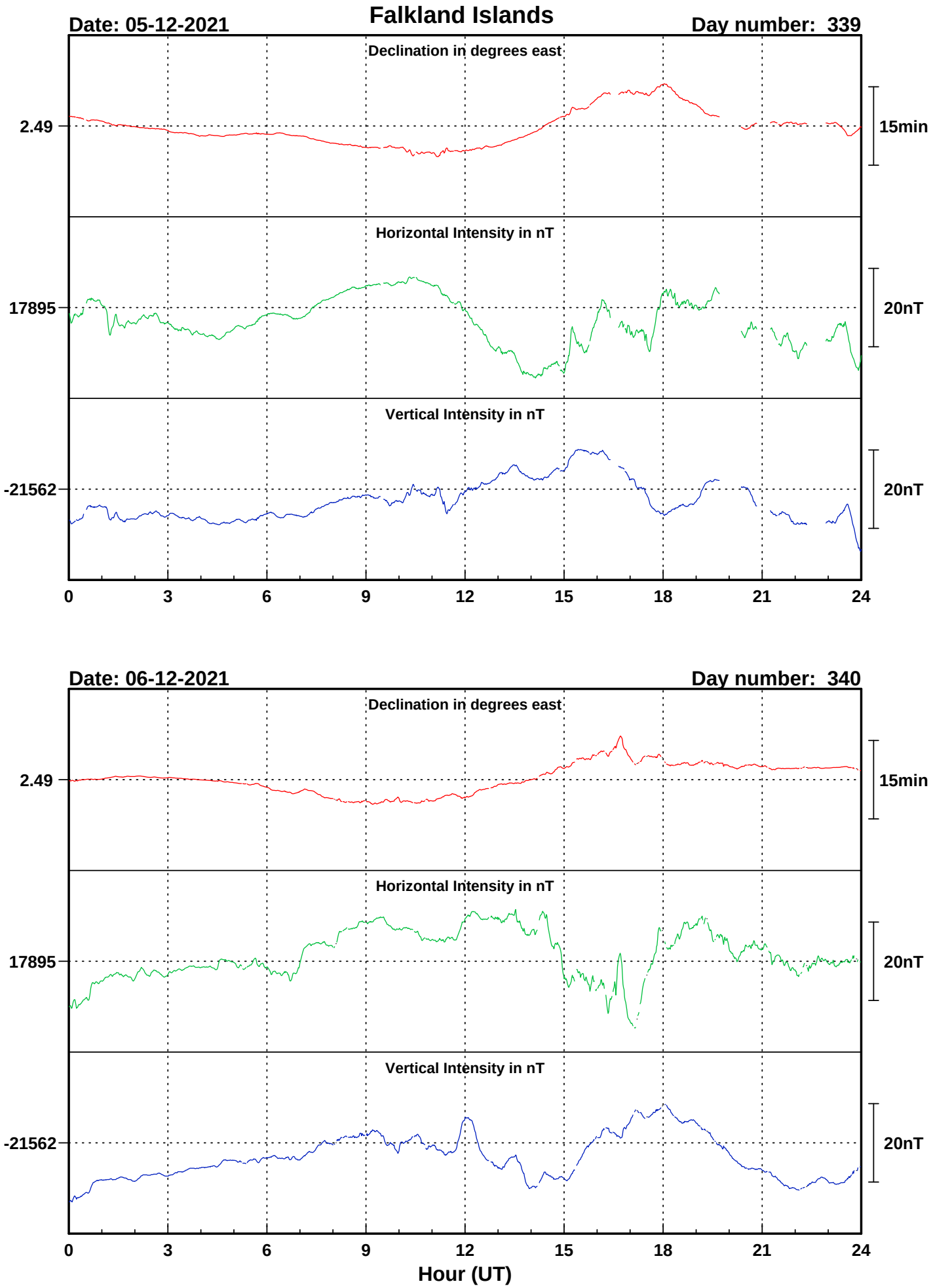

Port Stanley 2021
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
2.94
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
18115
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
-21672
20nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
9.7
20nT
Temperature Inside Variometer Hut
22.5
20°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

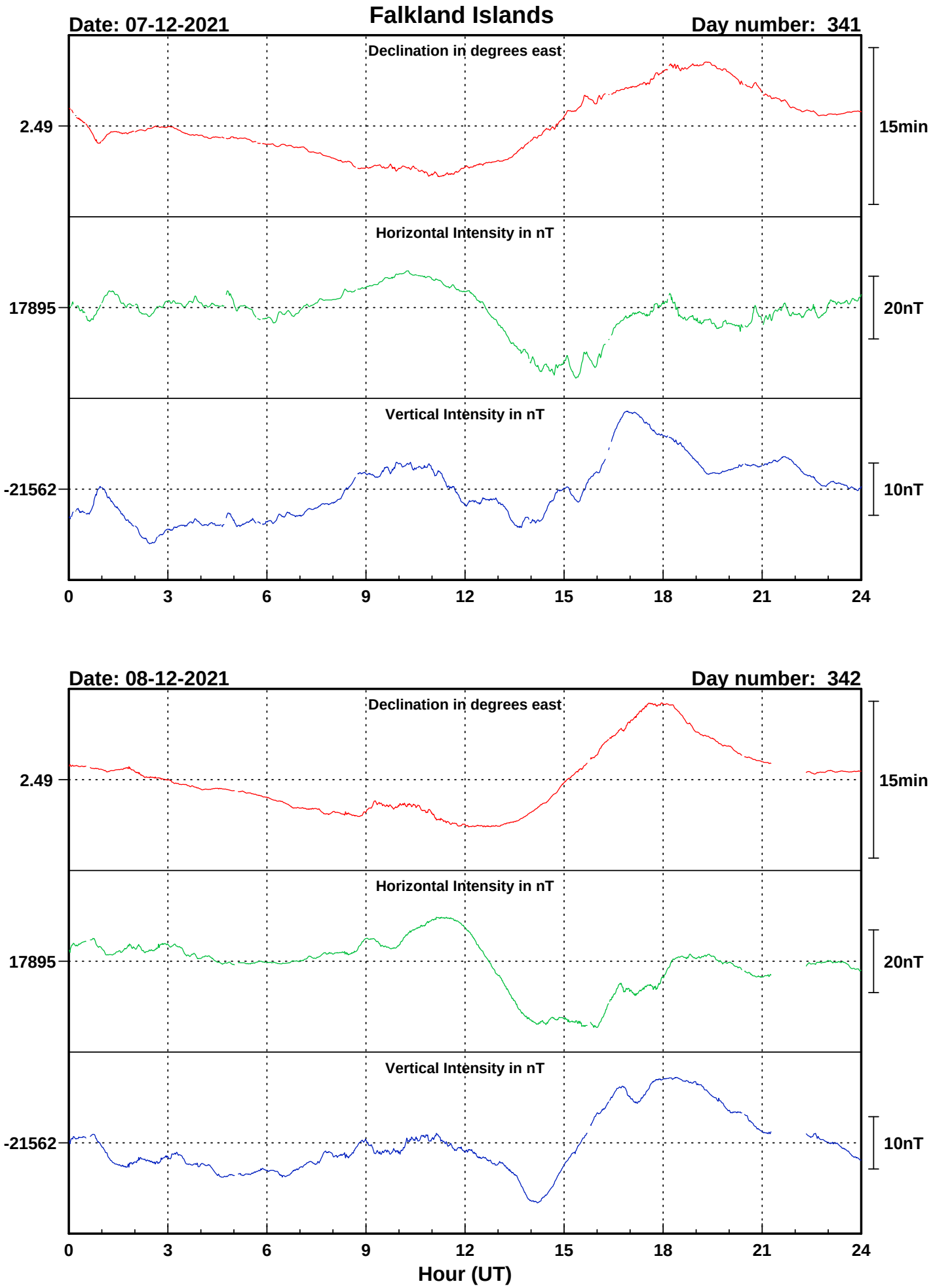

Falkland Islands
December
2021
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
D
2.49
H
17895
Z
-21562
0.50°
150 nT
150 nT
6
12
18
24

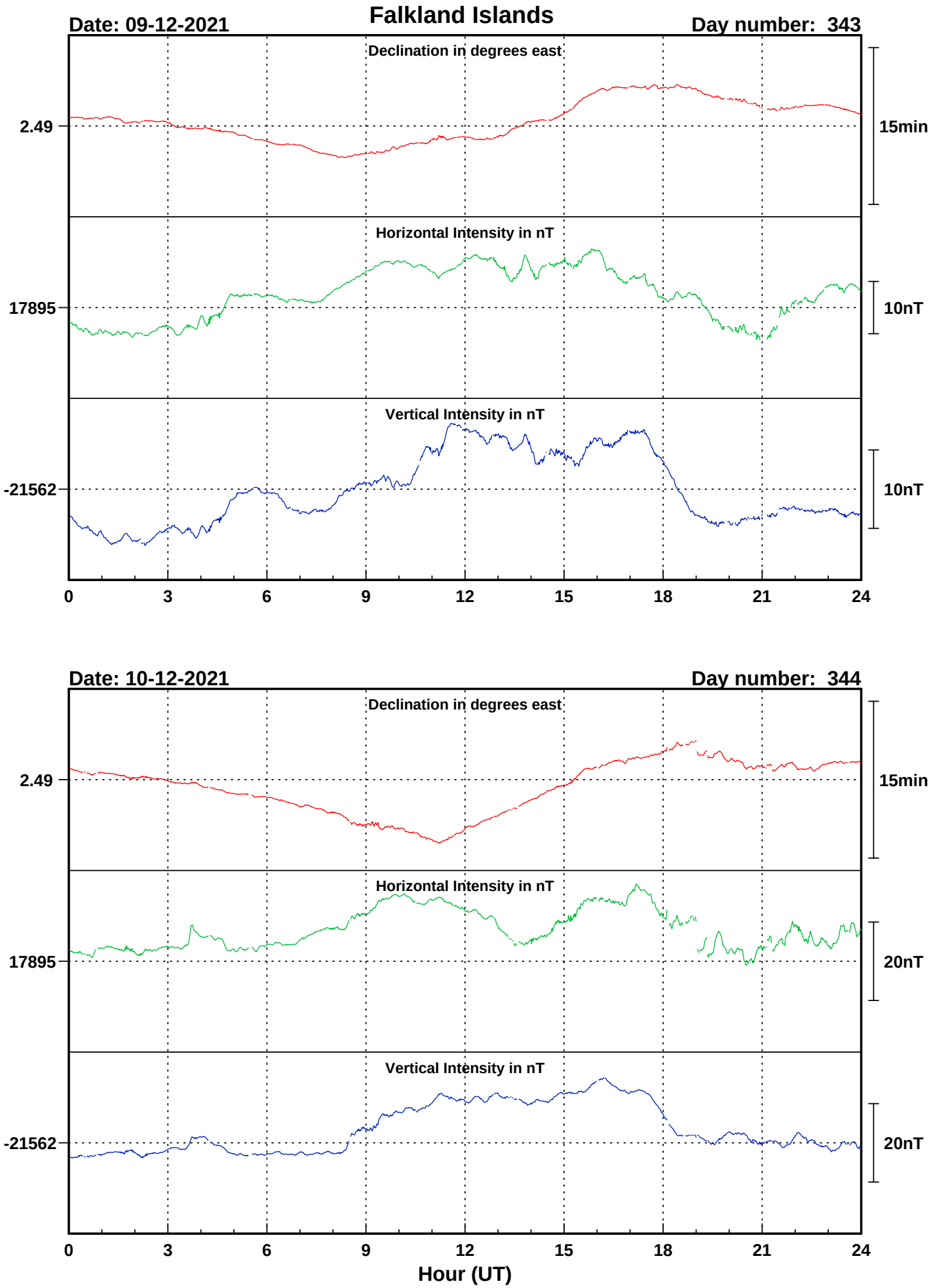

17
18
19
20
D 2.49
H 17895
Z -21562
0.50°
21
22
23
24
D 2.49
H 17895
Z -21562
150 nT
25
26
27
28
D 2.49
H 17895
Z -21562
150 nT
29
30
31
D 2.49
H 17895
Z -21562
6
12
18
24
UT
6
12
18
24
6
12
18
24
6
12
18
24
Falkland Islands
December
2021

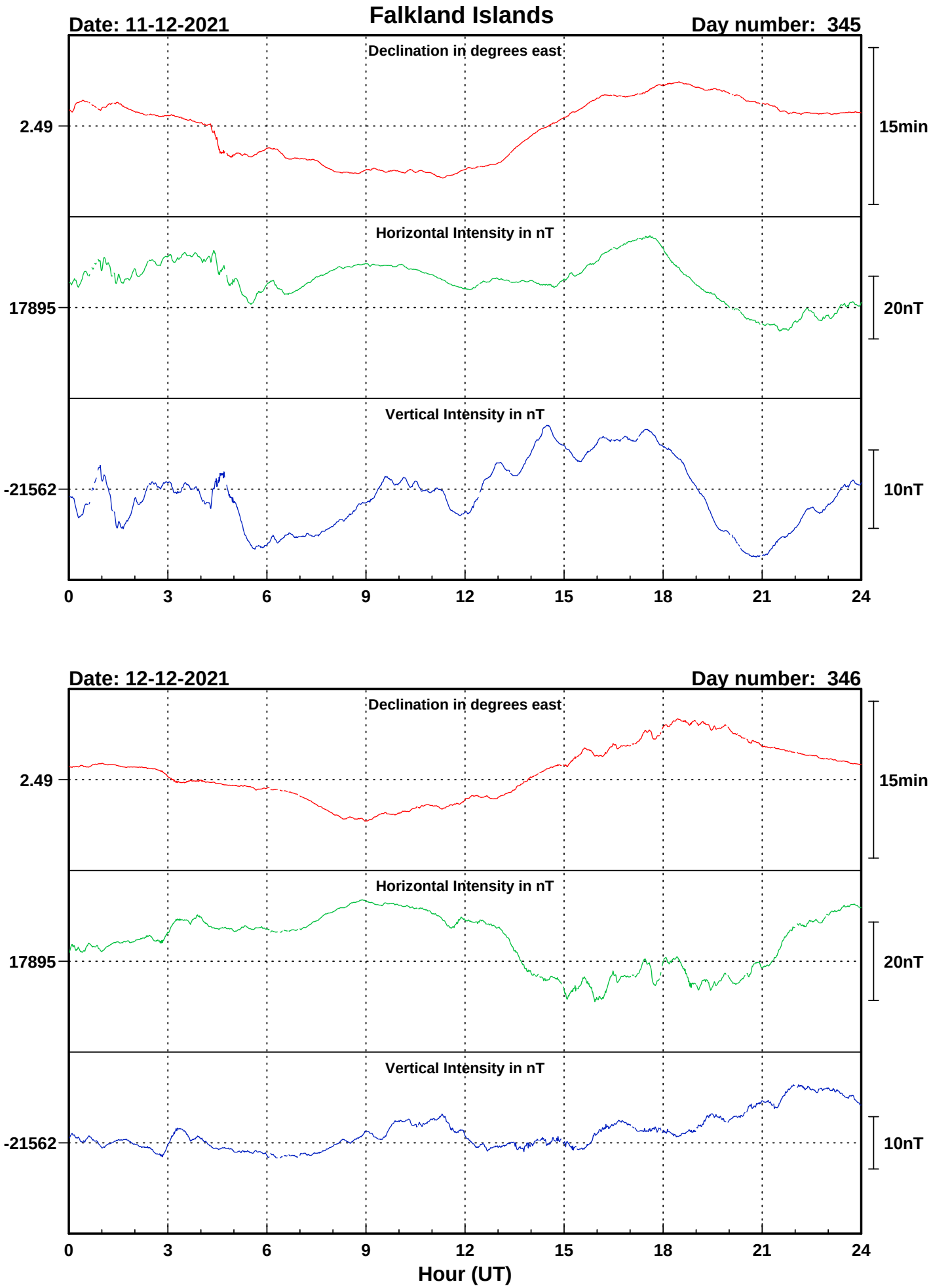

Falkland Islands
Date: 01-12-2021
Day number: 335
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
40nT
Vertical Intensity in nT
-21562
40nT
0
3
6
9
12
15
18
21
24
Date: 02-12-2021
Day number: 336
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

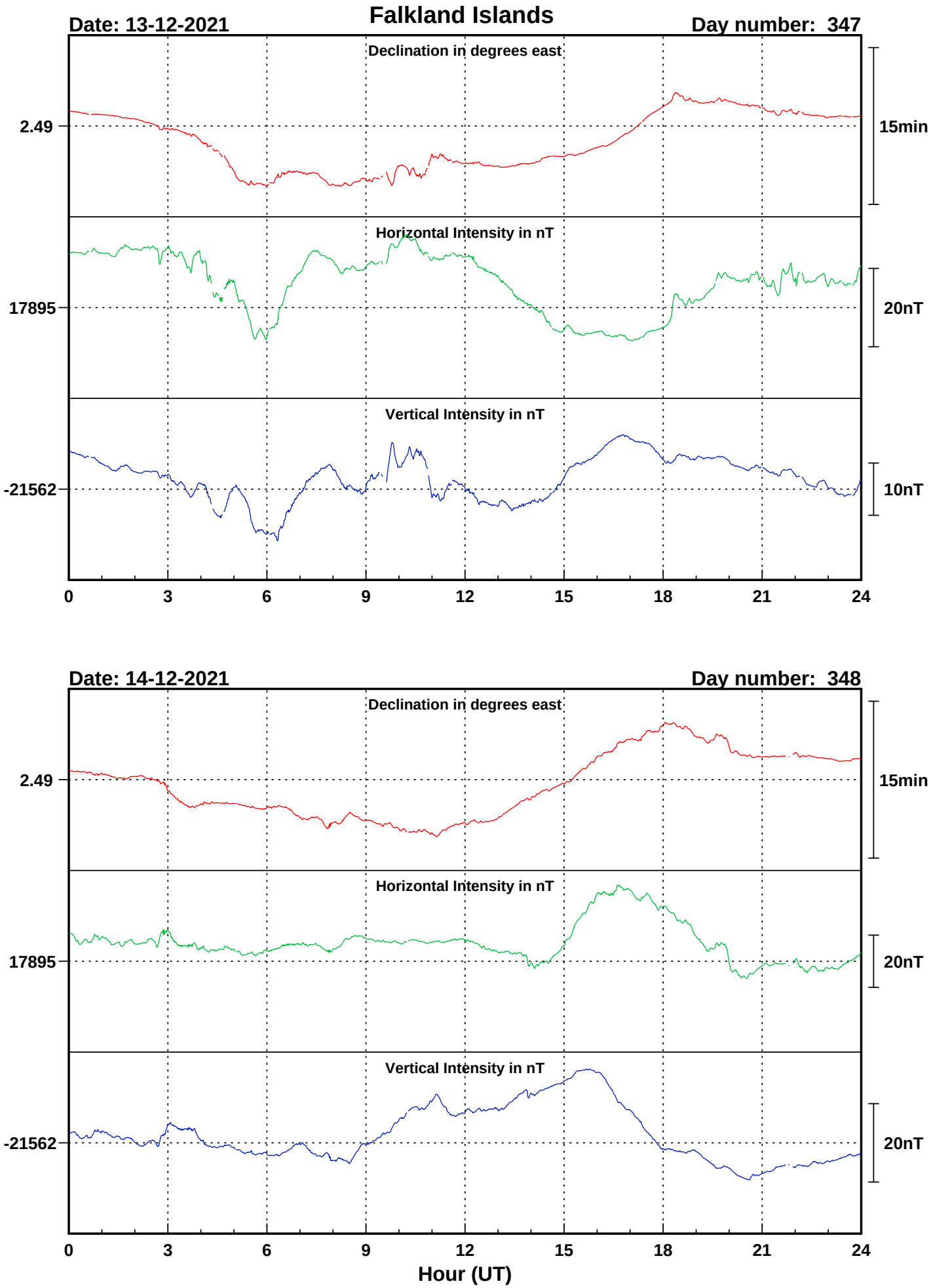

Falkland Islands
Date: 03-12-2021
Day number: 337
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Date: 04-12-2021
Day number: 338
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

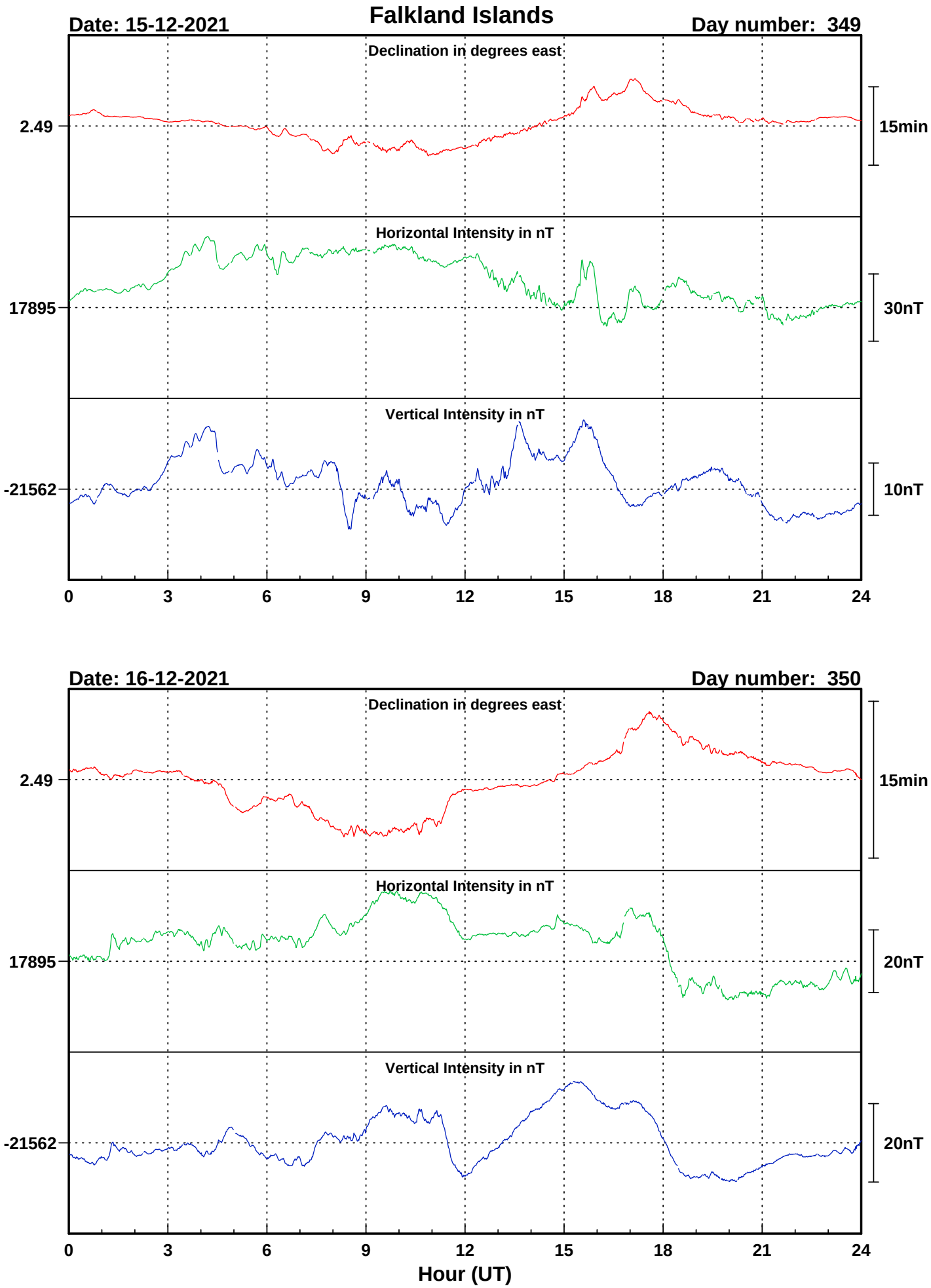

Falkland Islands
Date: 05-12-2021
Day number: 339
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Date: 06-12-2021
Day number: 340
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

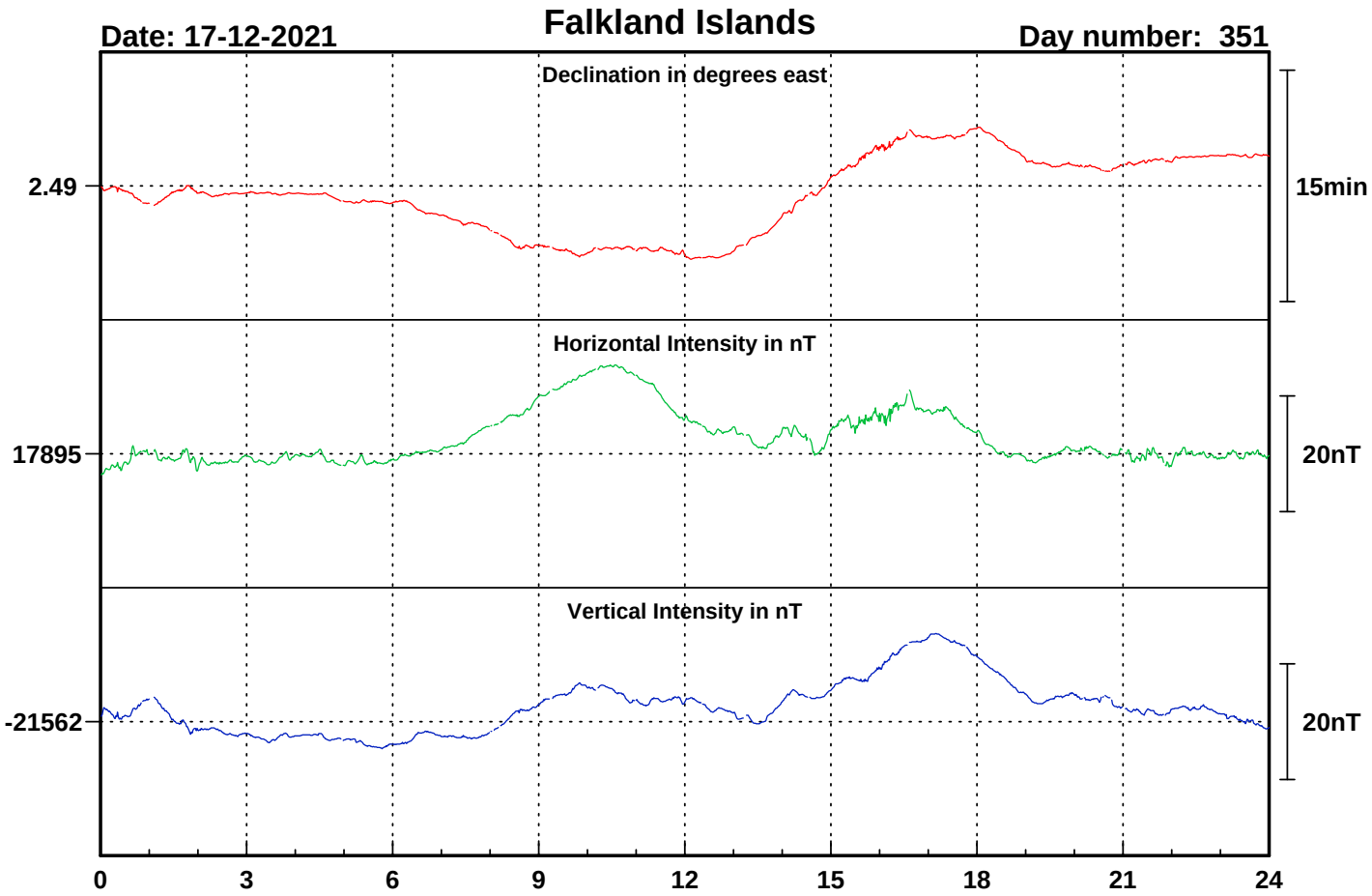

Falkland Islands
Date: 07-12-2021
Day number: 341
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Date: 08-12-2021
Day number: 342
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

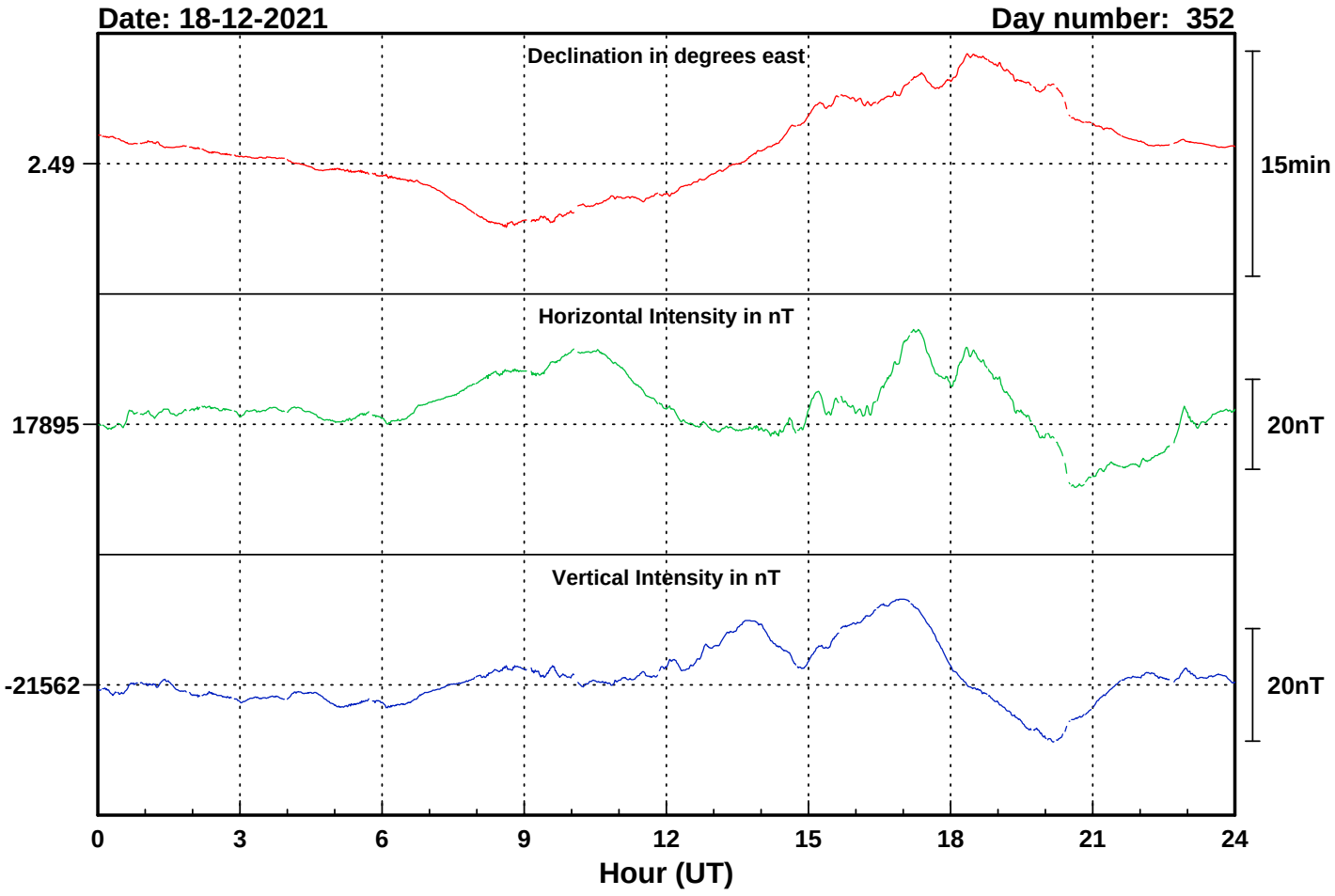

Falkland Islands
Date: 09-12-2021
Day number: 343
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
10nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Date: 10-12-2021
Day number: 344
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

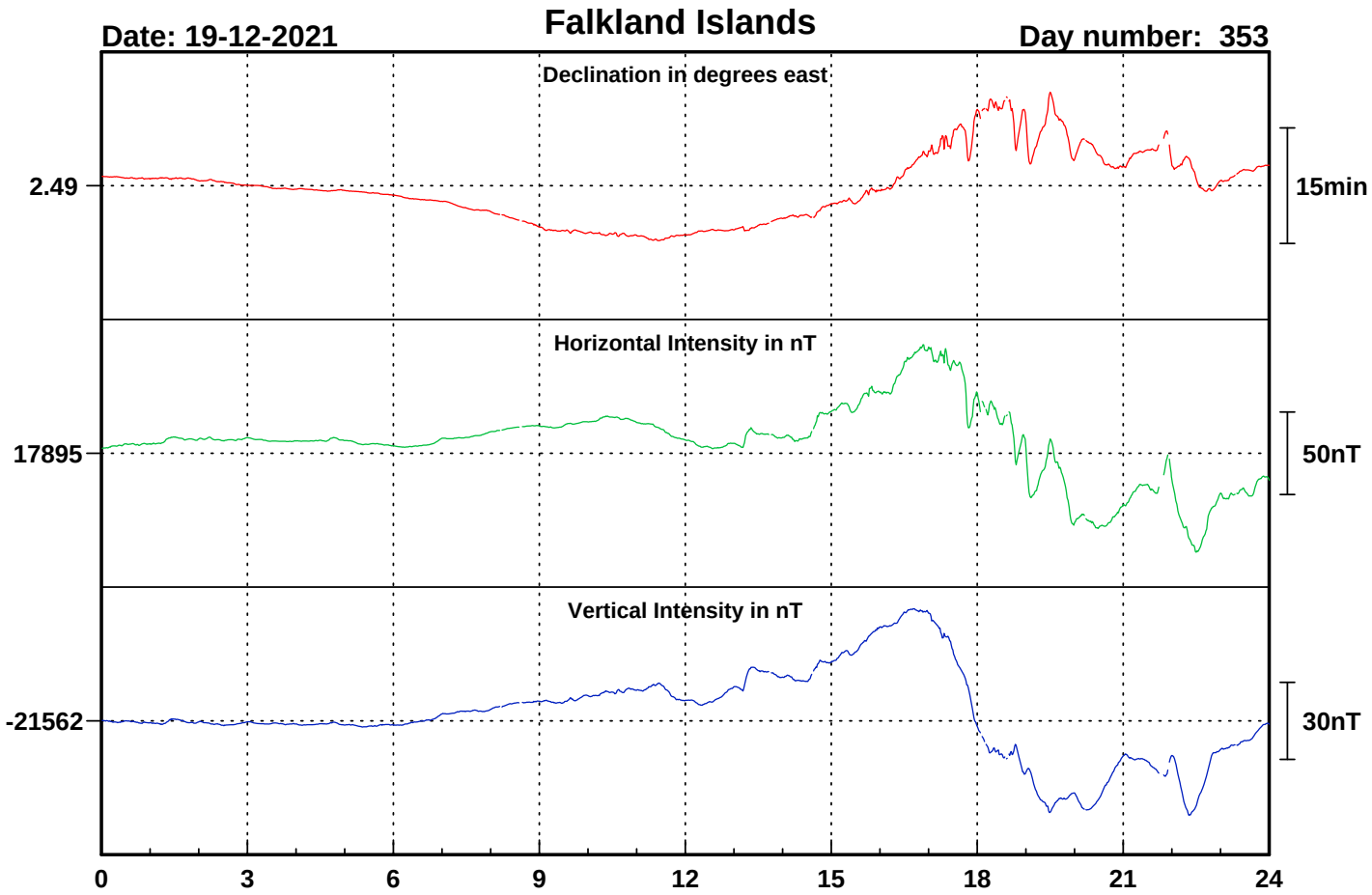

Falkland Islands
Date: 11-12-2021
Day number: 345
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Date: 12-12-2021
Day number: 346
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

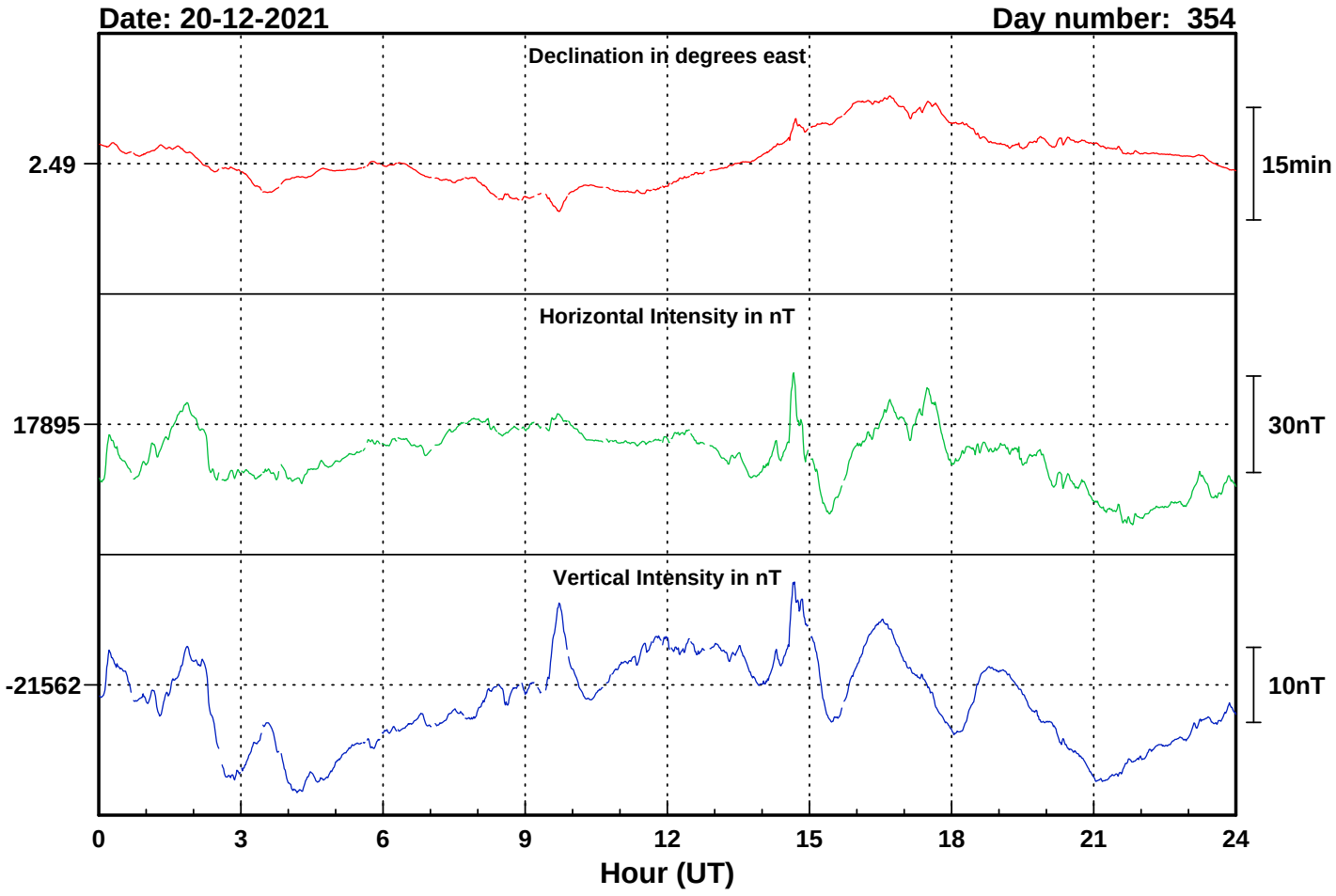

Falkland Islands
Date: 13-12-2021
Day number: 347
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Date: 14-12-2021
Day number: 348
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

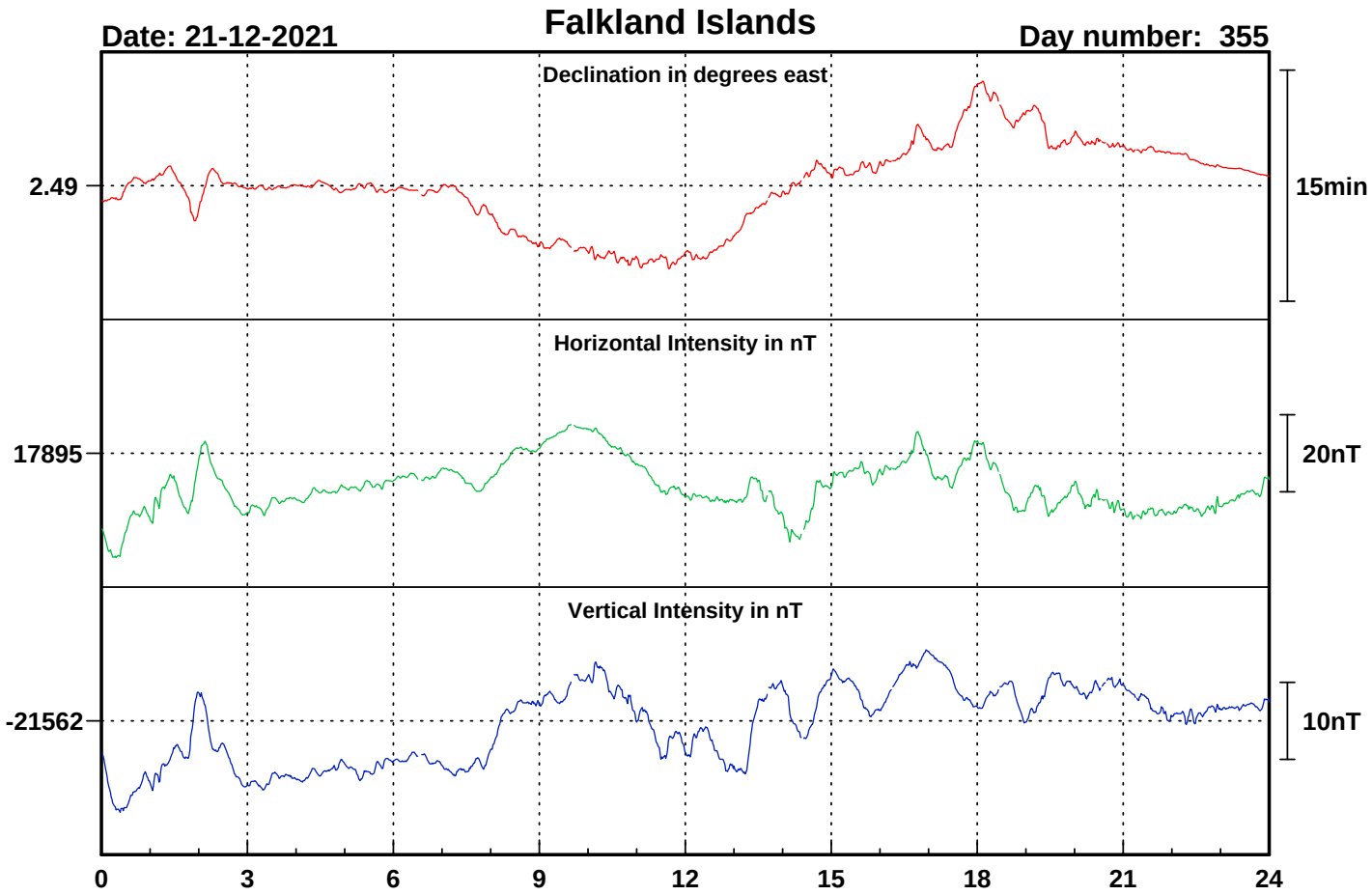

Falkland Islands
Date: 15-12-2021
Day number: 349
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
30nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Date: 16-12-2021
Day number: 350
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

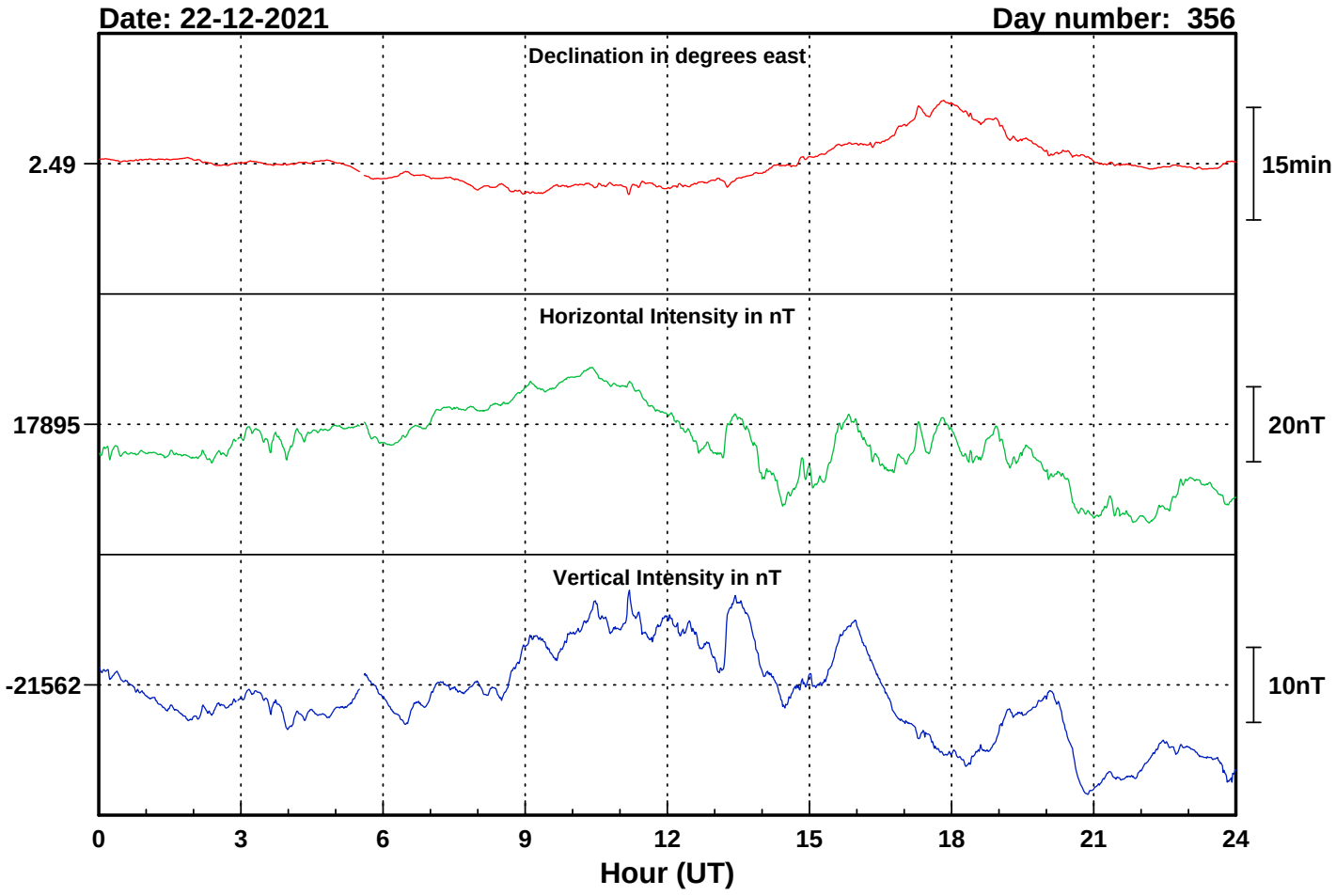

Falkland Islands
Date: 17-12-2021
Day number: 351
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24

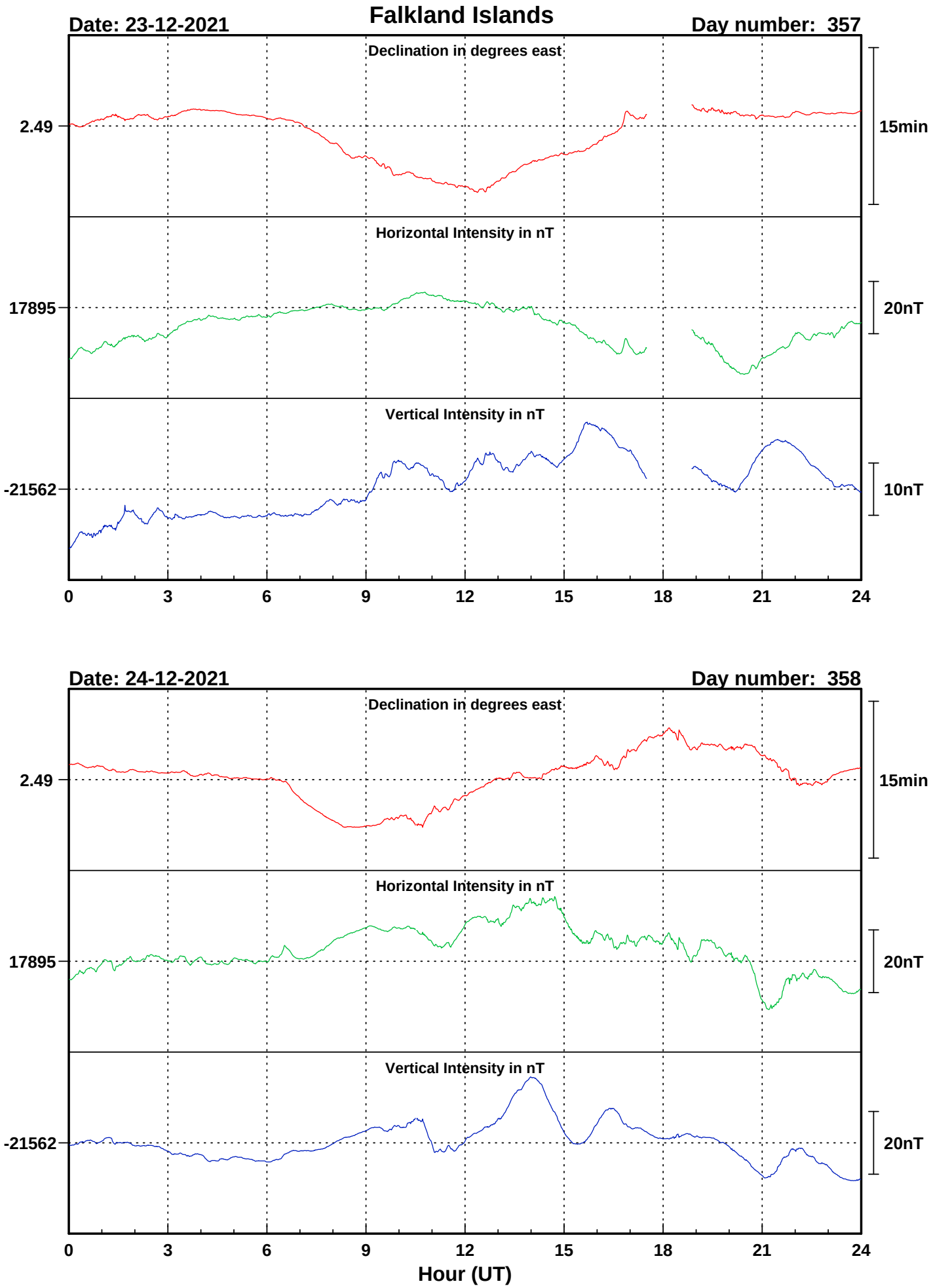

Date: 18-12-2021
Day number: 352
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

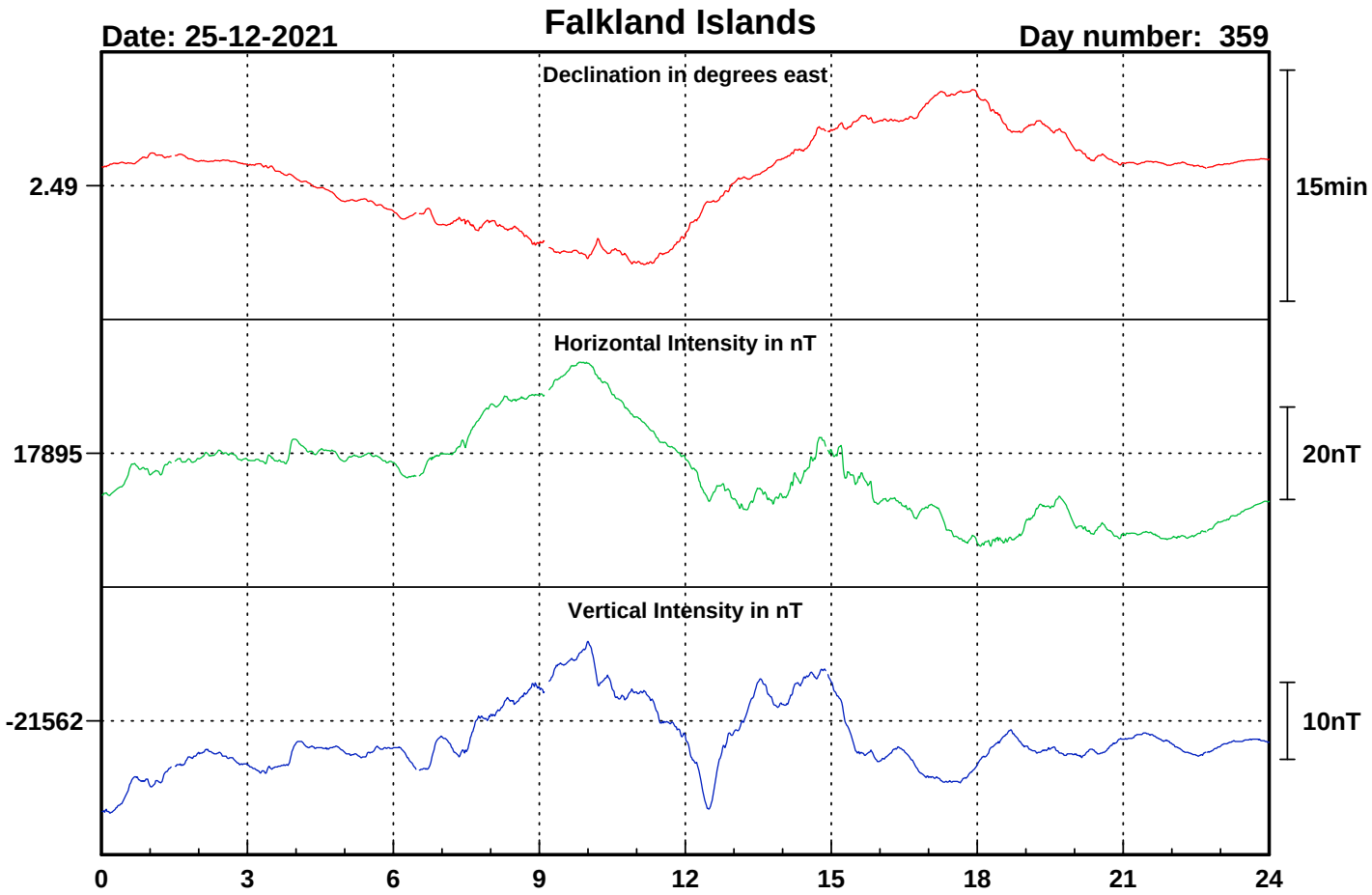

Falkland Islands
Date: 19-12-2021
Day number: 353
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
50nT
Vertical Intensity in nT
-21562
30nT
0
3
6
9
12
15
18
21
24

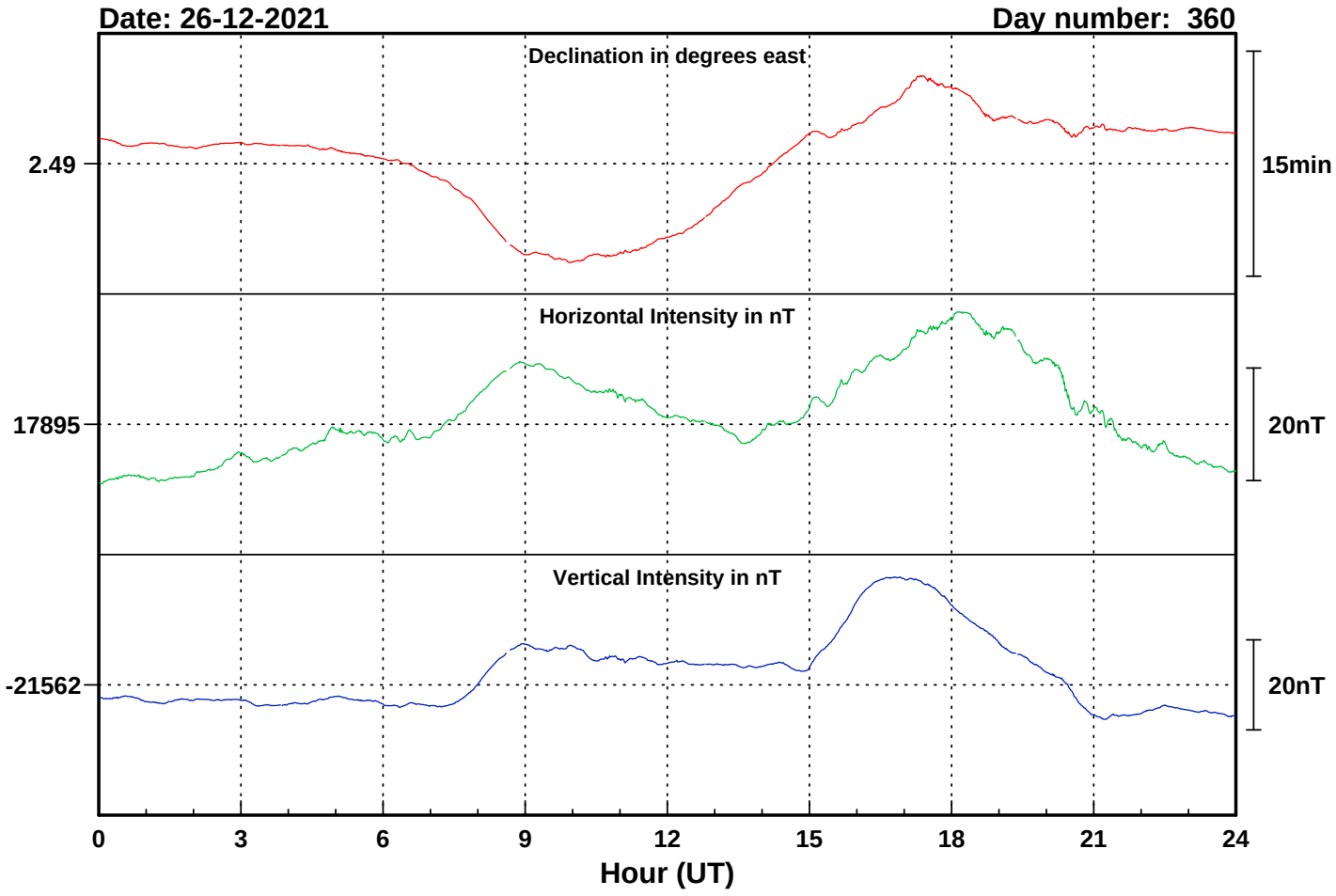

Date: 20-12-2021
Day number: 354
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
30nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

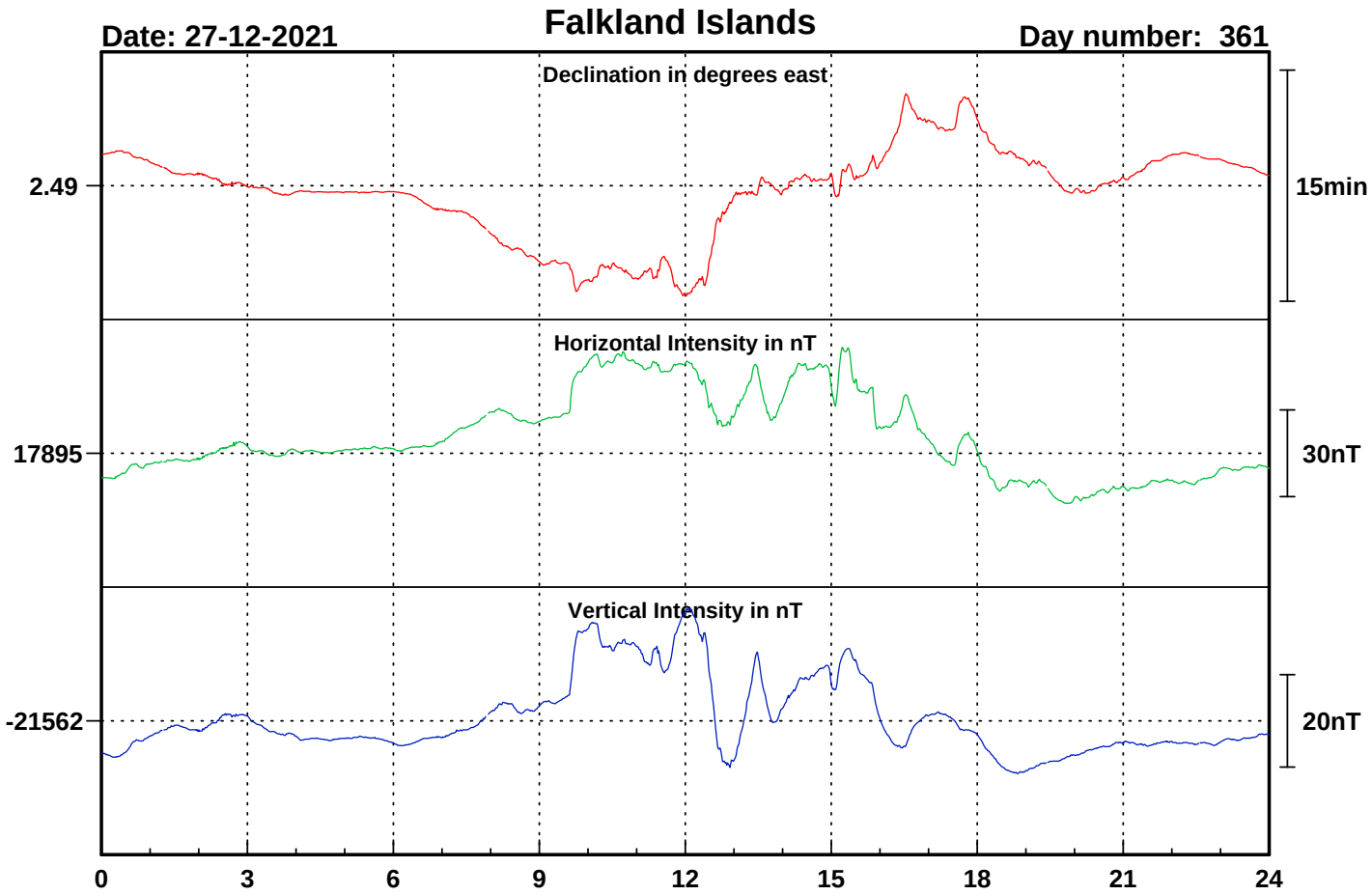

Falkland Islands
Date: 21-12-2021
Day number: 355
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24

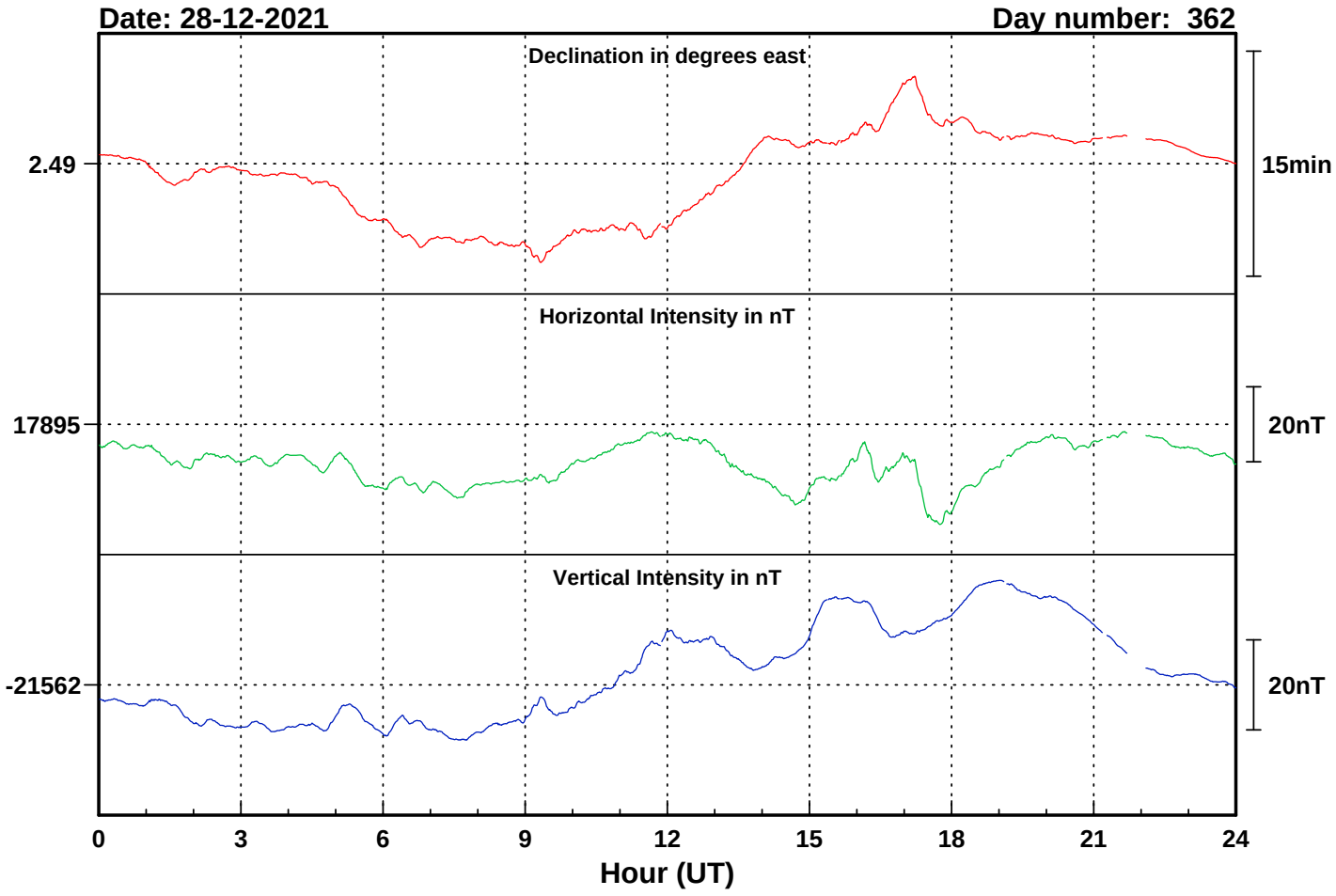

Date: 22-12-2021
Day number: 356
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

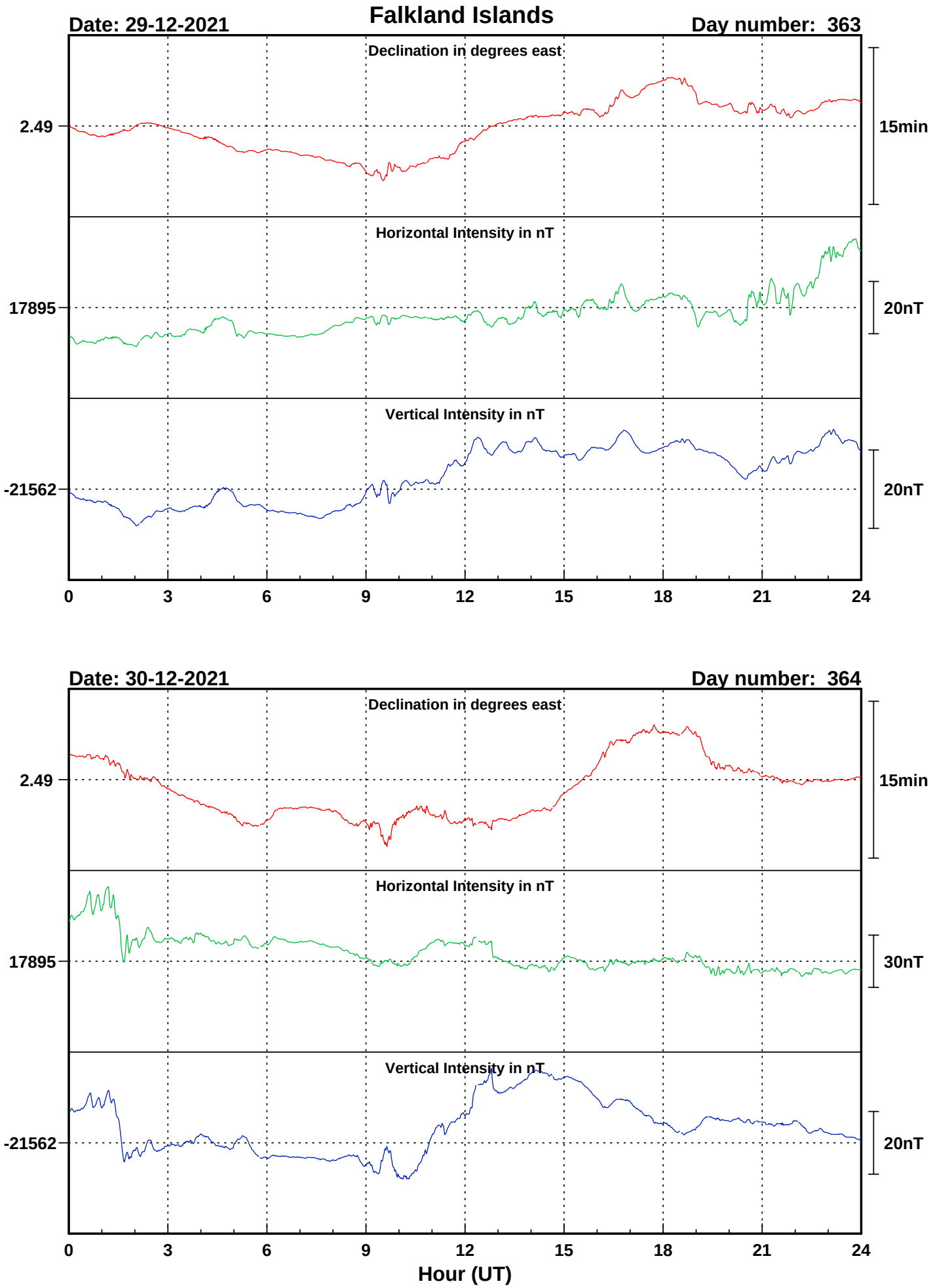

Falkland Islands
Date: 23-12-2021
Day number: 357
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24
Date: 24-12-2021
Day number: 358
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

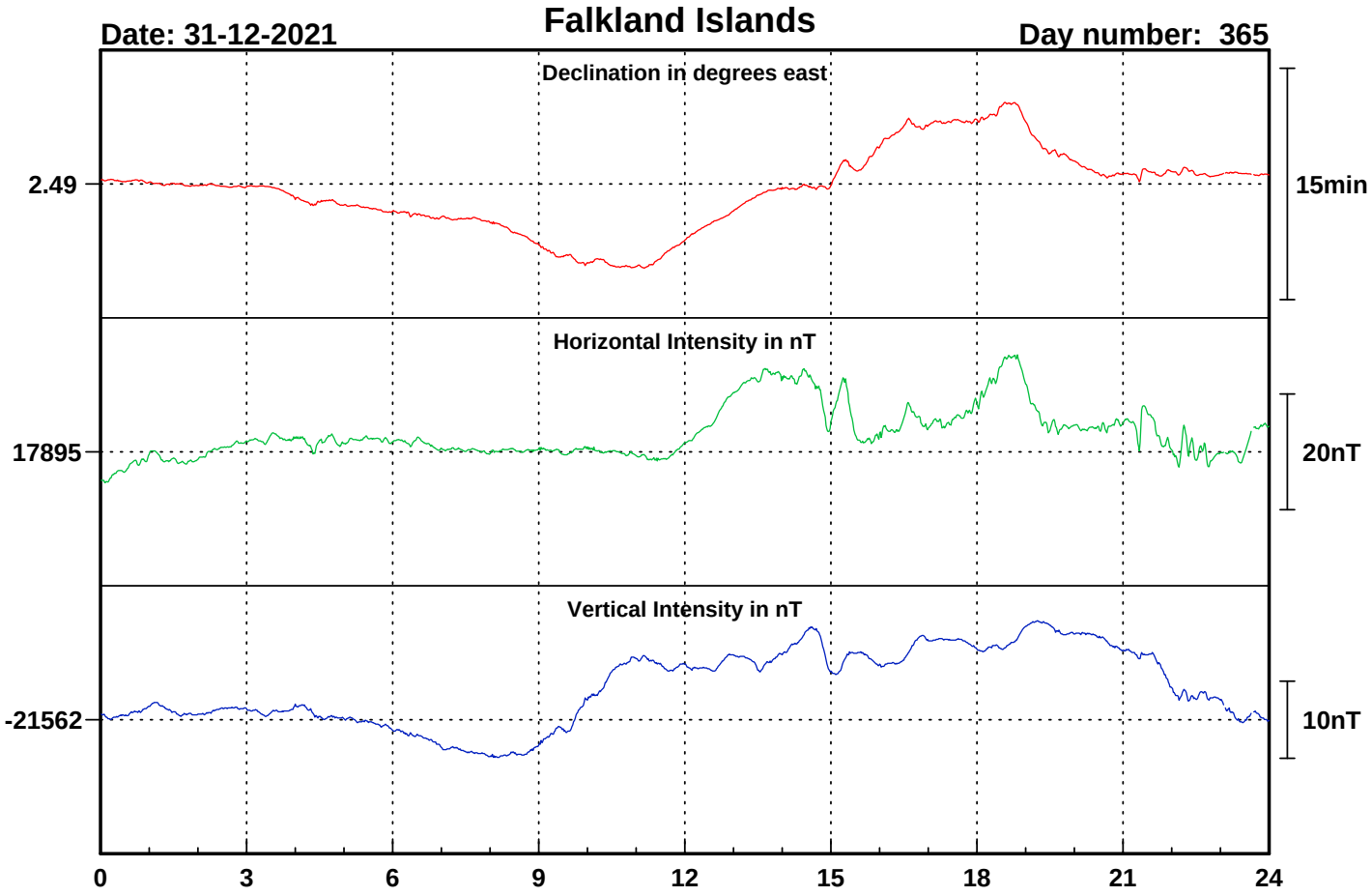

Falkland Islands
Date: 25-12-2021
Day number: 359
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24


Date: 26-12-2021
Day number: 360
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

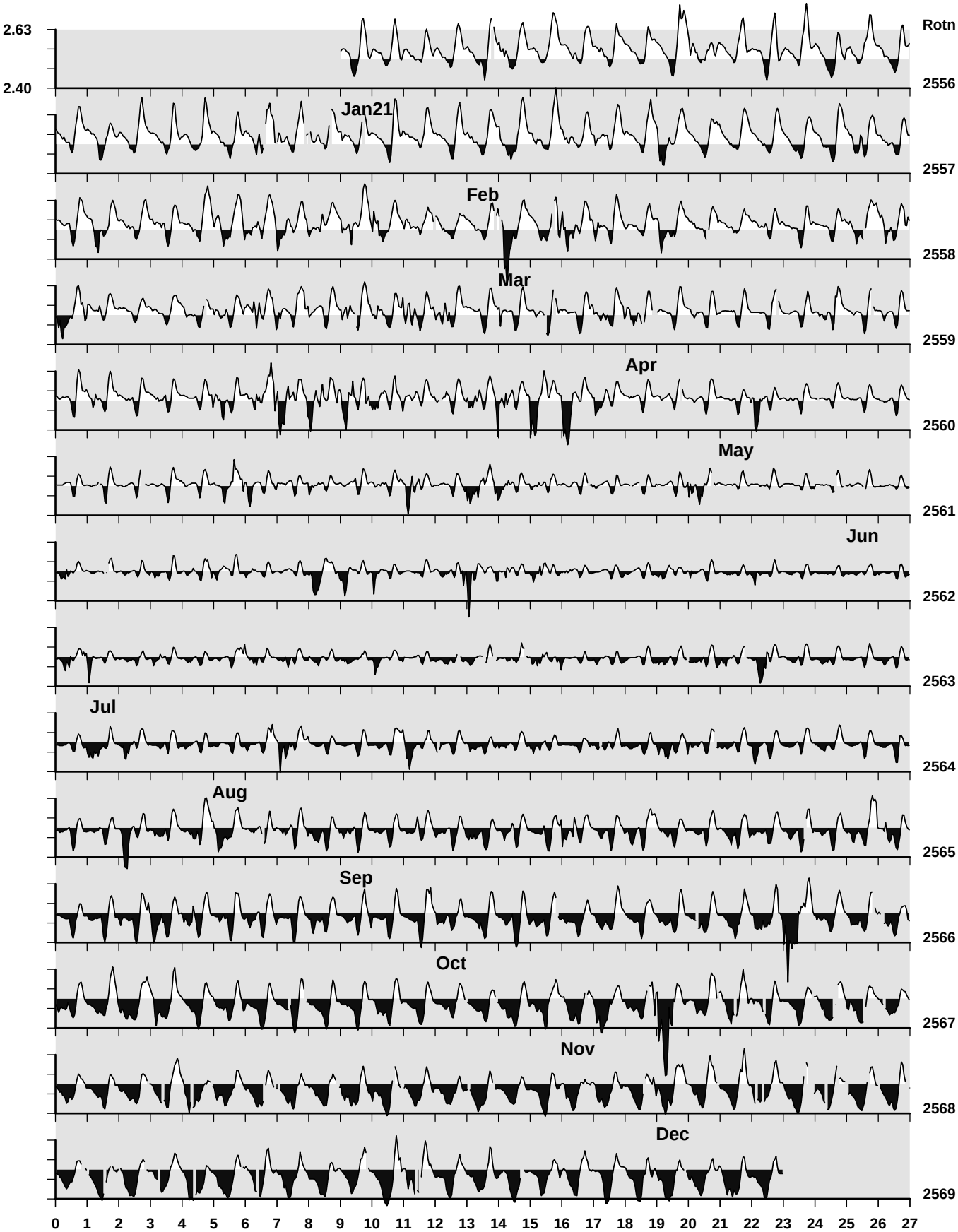

Falkland Islands
Date: 27-12-2021
Day number: 361
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
30nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24


Date: 28-12-2021
Day number: 362
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)


Falkland Islands
Date: 29-12-2021
Day number: 363
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Date: 30-12-2021
Day number: 364
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
30nT
Vertical Intensity in nT
-21562
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

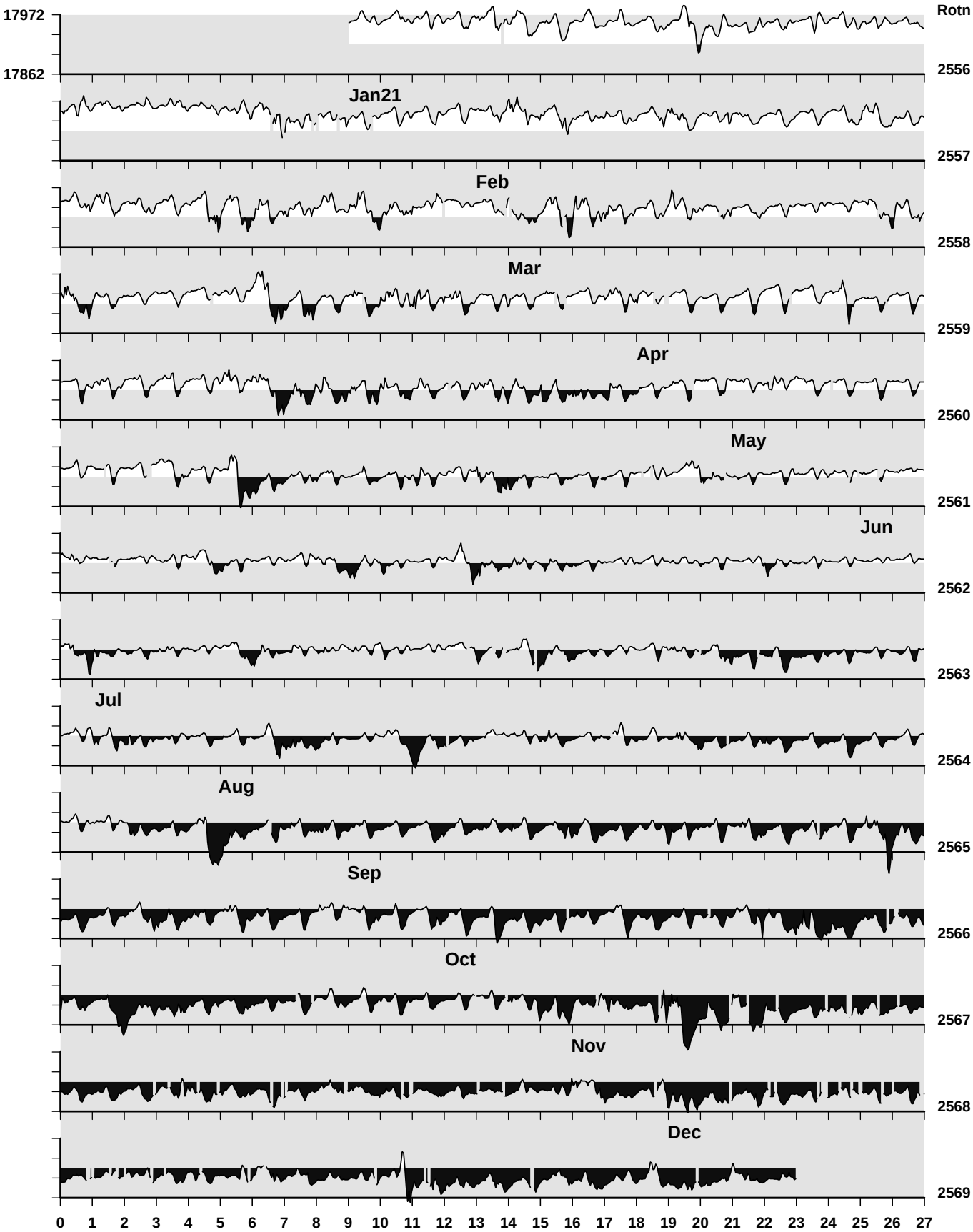

Falkland Islands
Date: 31-12-2021
Day number: 365
Declination in degrees east
2.49
15min
Horizontal Intensity in nT
17895
20nT
Vertical Intensity in nT
-21562
10nT
0
3
6
9
12
15
18
21
24

Falkland Islands Observatory: Declination (degrees)



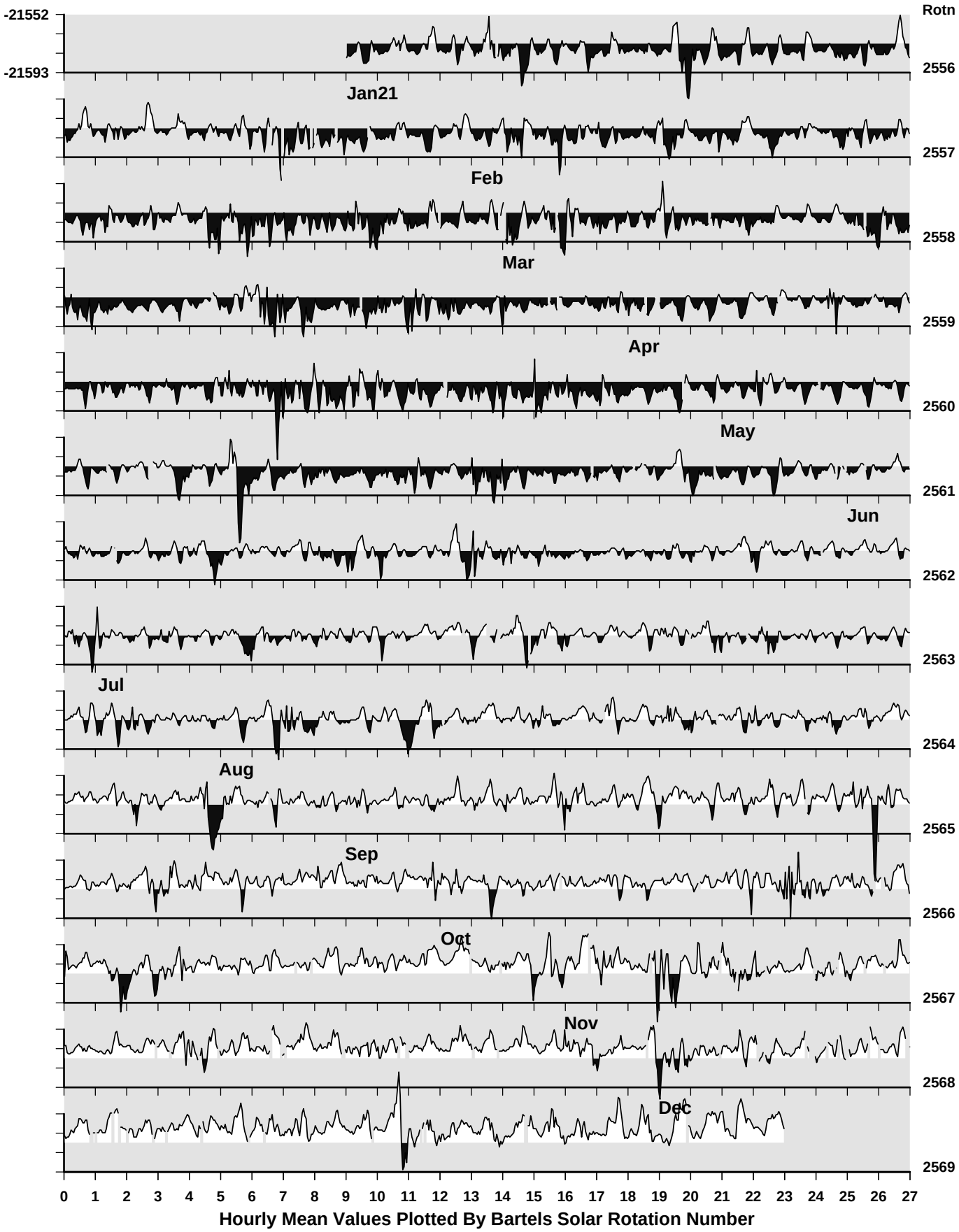
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Falkland Islands Observatory: Horizontal Intensity (nT)



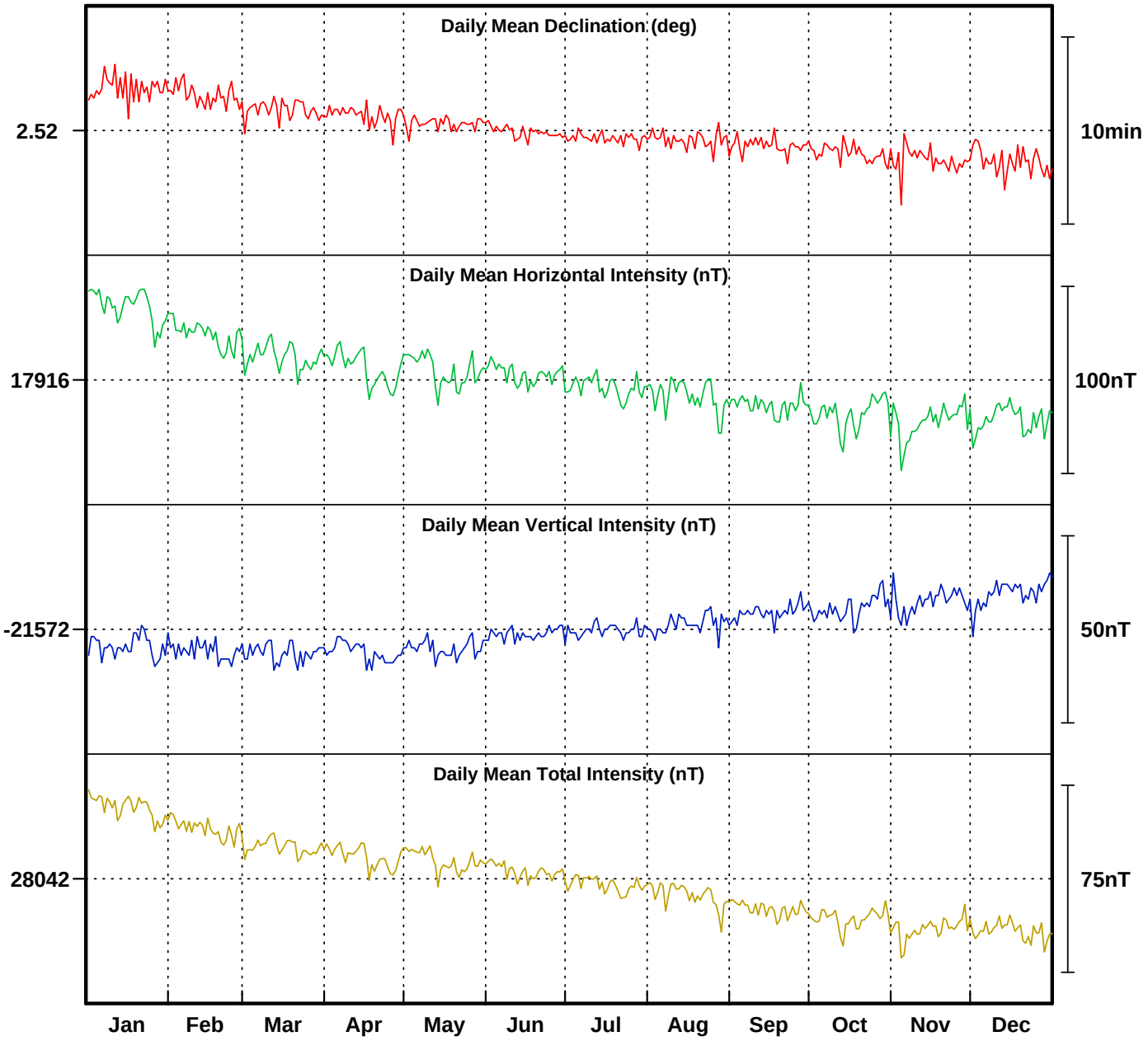
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Falkland Islands Observatory: Vertical Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

Falklands Is Observatory 2021



Monthly mean values for Port Stanley Observatory 2021

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	2° 33.2′	17956 nT	-50° 14.0′	17938 nT	800 nT	-21577 nT	28071 nT
February	2° 32.9′	17941 nT	-50° 15.5′	17923 nT	797 nT	-21578 nT	28062 nT
March	2° 32.1′	17929 nT	-50° 16.7′	17911 nT	793 nT	-21578 nT	28055 nT
April	2° 31.8′	17923 nT	-50° 17.2′	17905 nT	791 nT	-21578 nT	28051 nT
May	2° 31.3′	17921 nT	-50° 17.3′	17904 nT	789 nT	-21577 nT	28049 nT
June	2° 30.9′	17919 nT	-50° 17.2′	17902 nT	786 nT	-21573 nT	28045 nT
July	2° 30.5′	17912 nT	-50° 17.7′	17895 nT	784 nT	-21572 nT	28040 nT
August	2° 30.5′	17908 nT	-50° 18.1′	17891 nT	783 nT	-21571 nT	28035 nT
September	2° 30.2′	17903 nT	-50° 18.3′	17886 nT	782 nT	-21567 nT	28030 nT
October	2° 29.8′	17898 nT	-50° 18.6′	17881 nT	779 nT	-21566 nT	28026 nT
November	2° 29.4′	17894 nT	-50° 18.8’	17878 nT	777 nT	-21565 nT	28022 nT
December	2° 29.3′	17895 nT	-50° 18.6′	17878 nT	777 nT	-21562 nT	28021 nT

Note:

i. The values shown here are provisional.