

**BRITISH GEOLOGICAL SURVEY**

# Port Stanley Observatory Monthly Magnetic Bulletin

**December 2019**

**19/12/PS**



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

# 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: [www.geomag.bgs.ac.uk](http://www.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°33'00"S 012°46'12"E  
*Height above mean sea level:* 130 m

The geographical coordinates are measured by a handheld GPS device, which uses WGS84 as 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 12th generation International Geomagnetic Reference Field (IGRF) at epoch 2019.5. On-line access to models (including IGRF), charts and navigational data are available at

[http://www.geomag.bgs.ac.uk/data\\_service/models\\_compass/home](http://www.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 [www.geomag.bgs.ac.uk/data\\_service/home](http://www.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 ©NERC. 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 [www.geomag.bgs.ac.uk/contactus/staff](http://www.geomag.bgs.ac.uk/contactus/staff)



# Port Stanley 2019

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

2.95 5min

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

18112 20nT

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

-21674 20nT

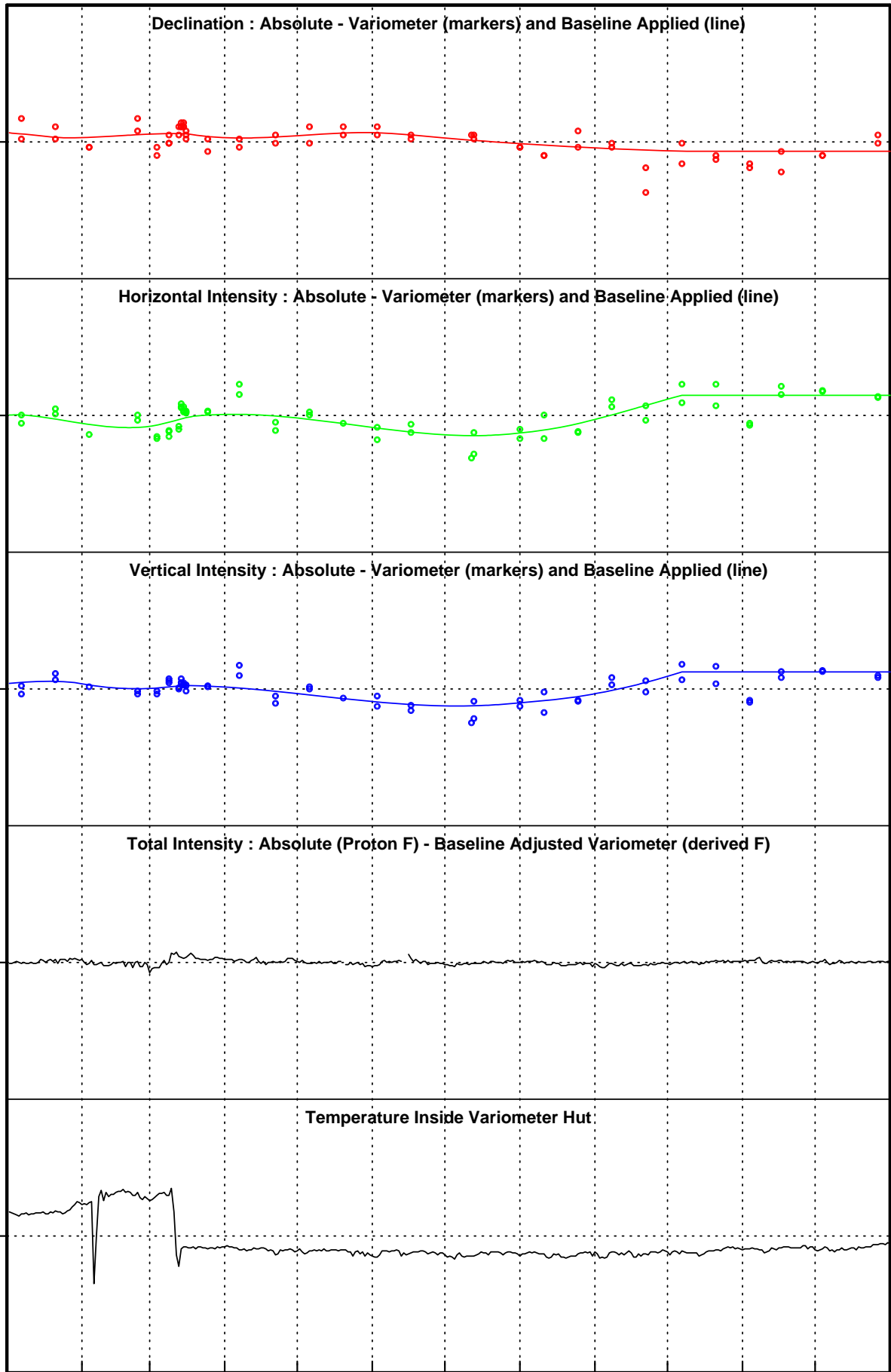
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)

9.7 20nT

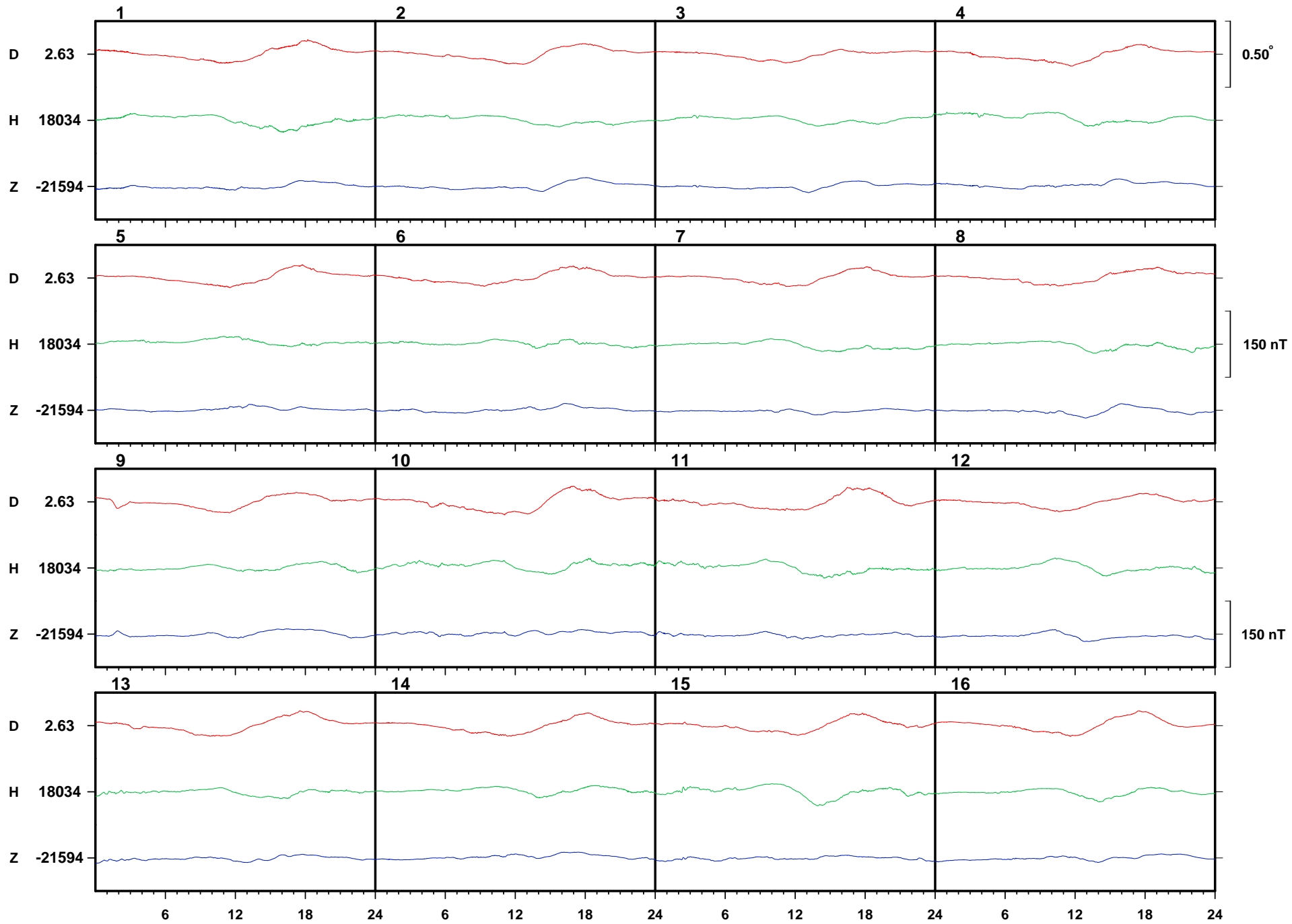
Temperature Inside Variometer Hut

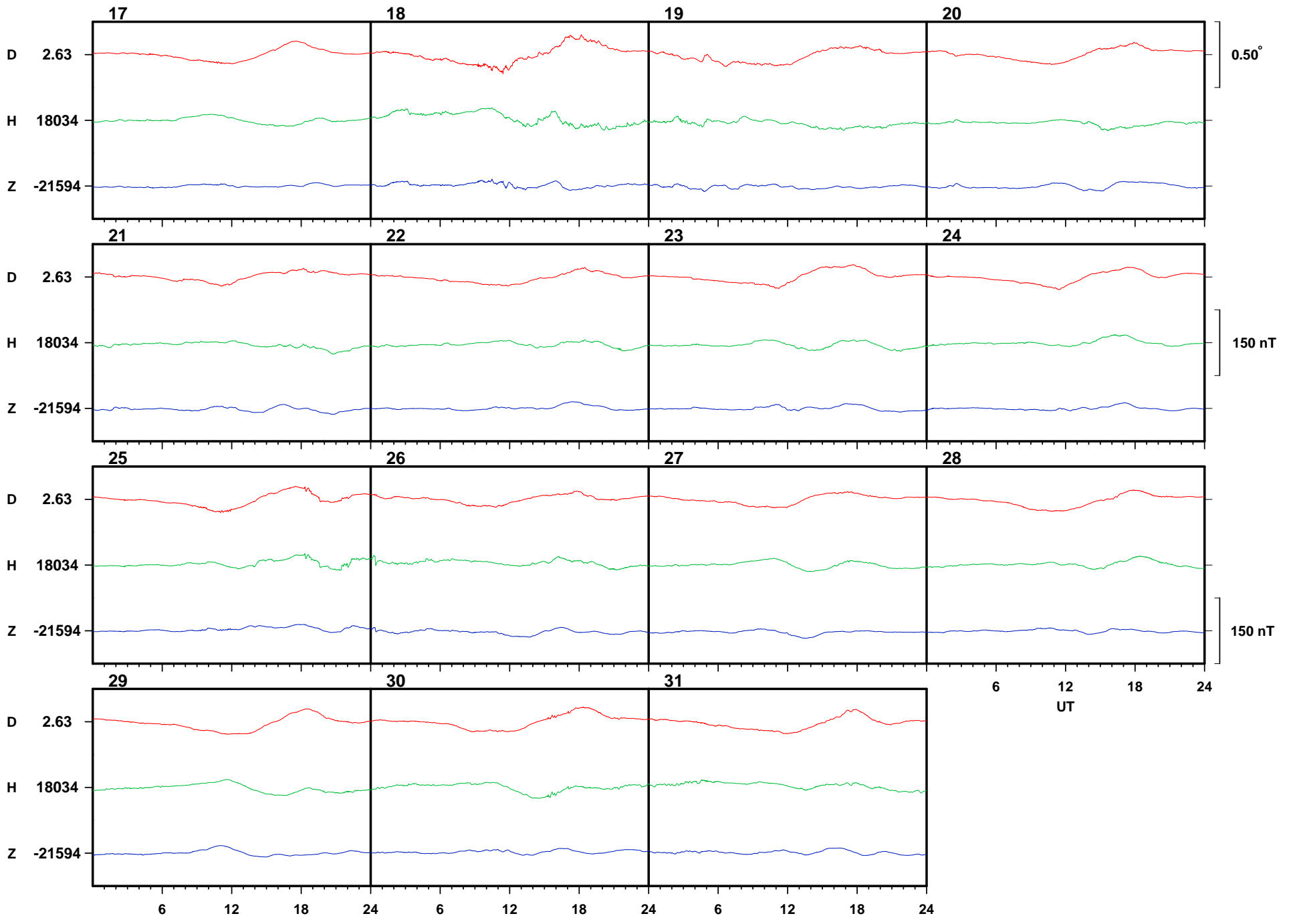
23.8 20°C

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



Falkland Islands December 2019



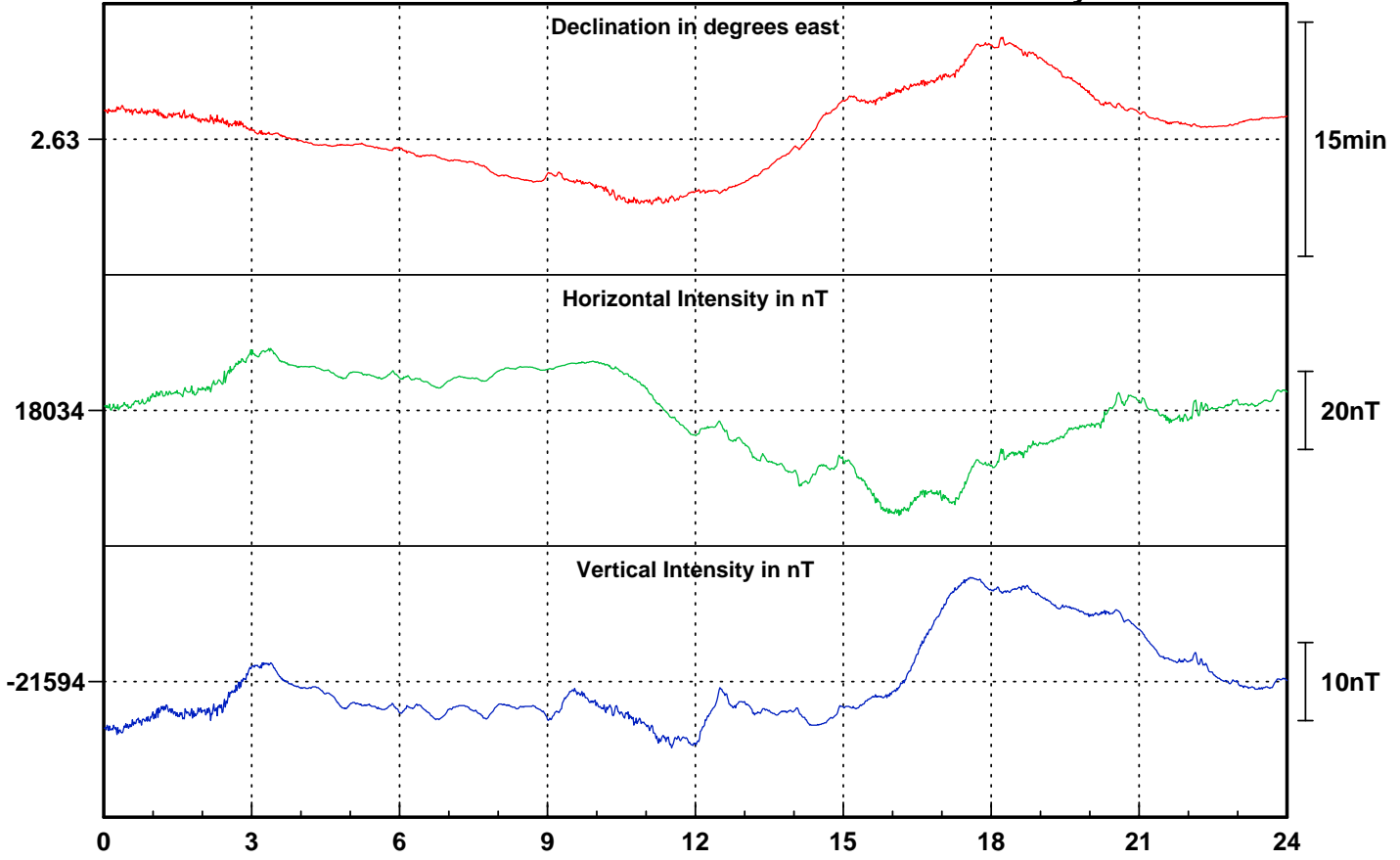


Falkland Islands December 2019

Date: 01-12-2019

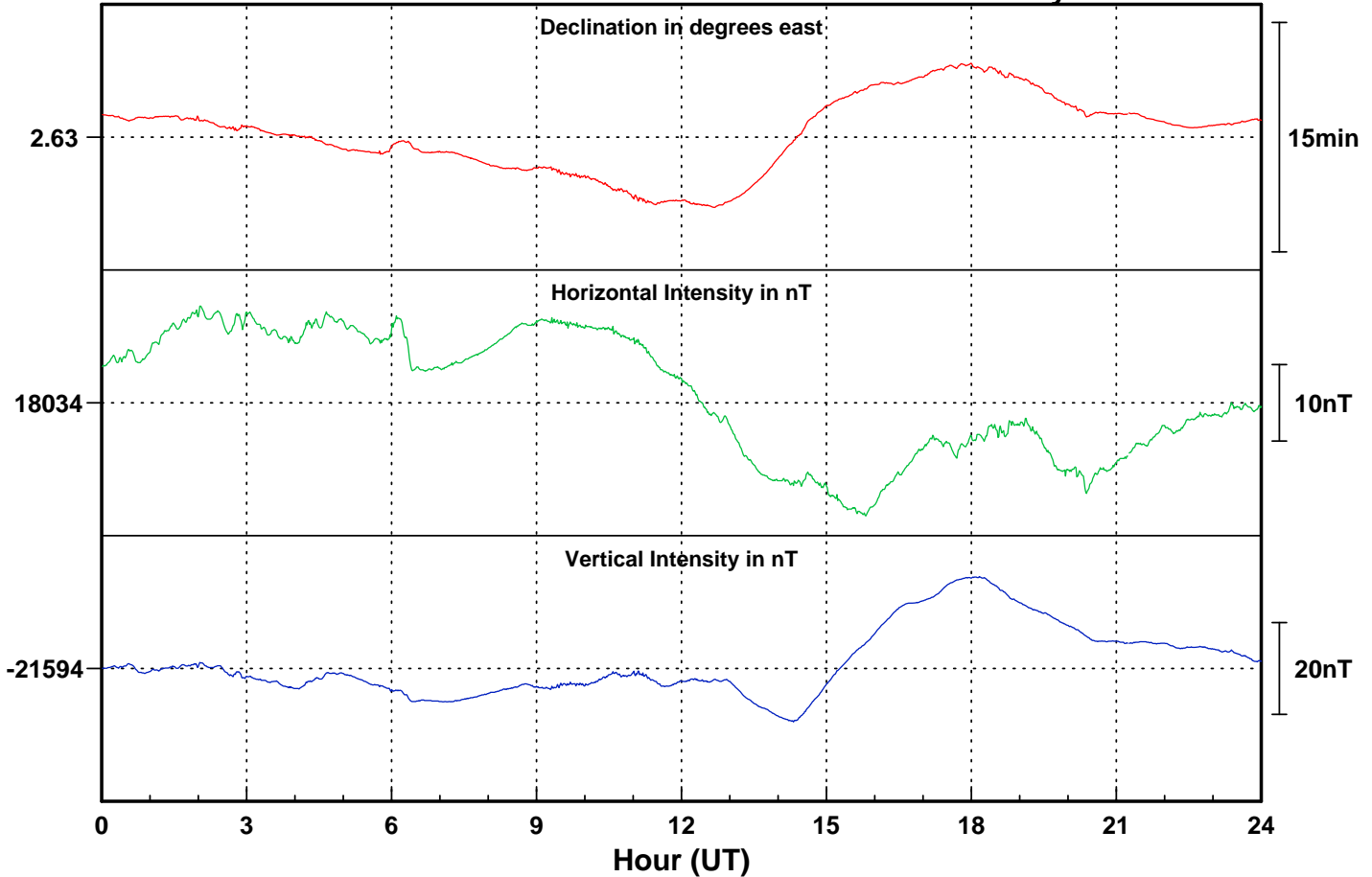
# Falkland Islands

Day number: 335



Date: 02-12-2019

Day number: 336

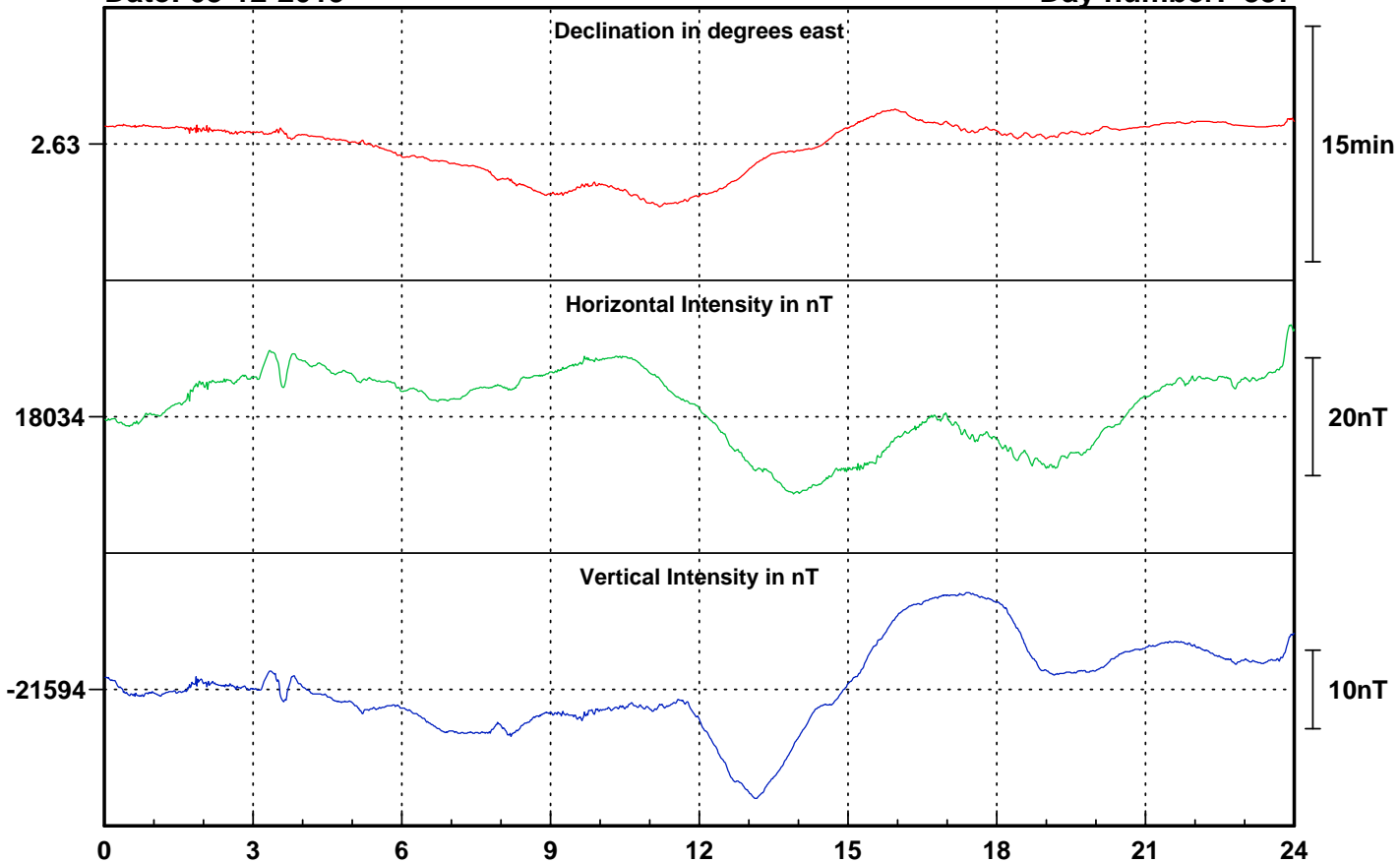




Date: 03-12-2019

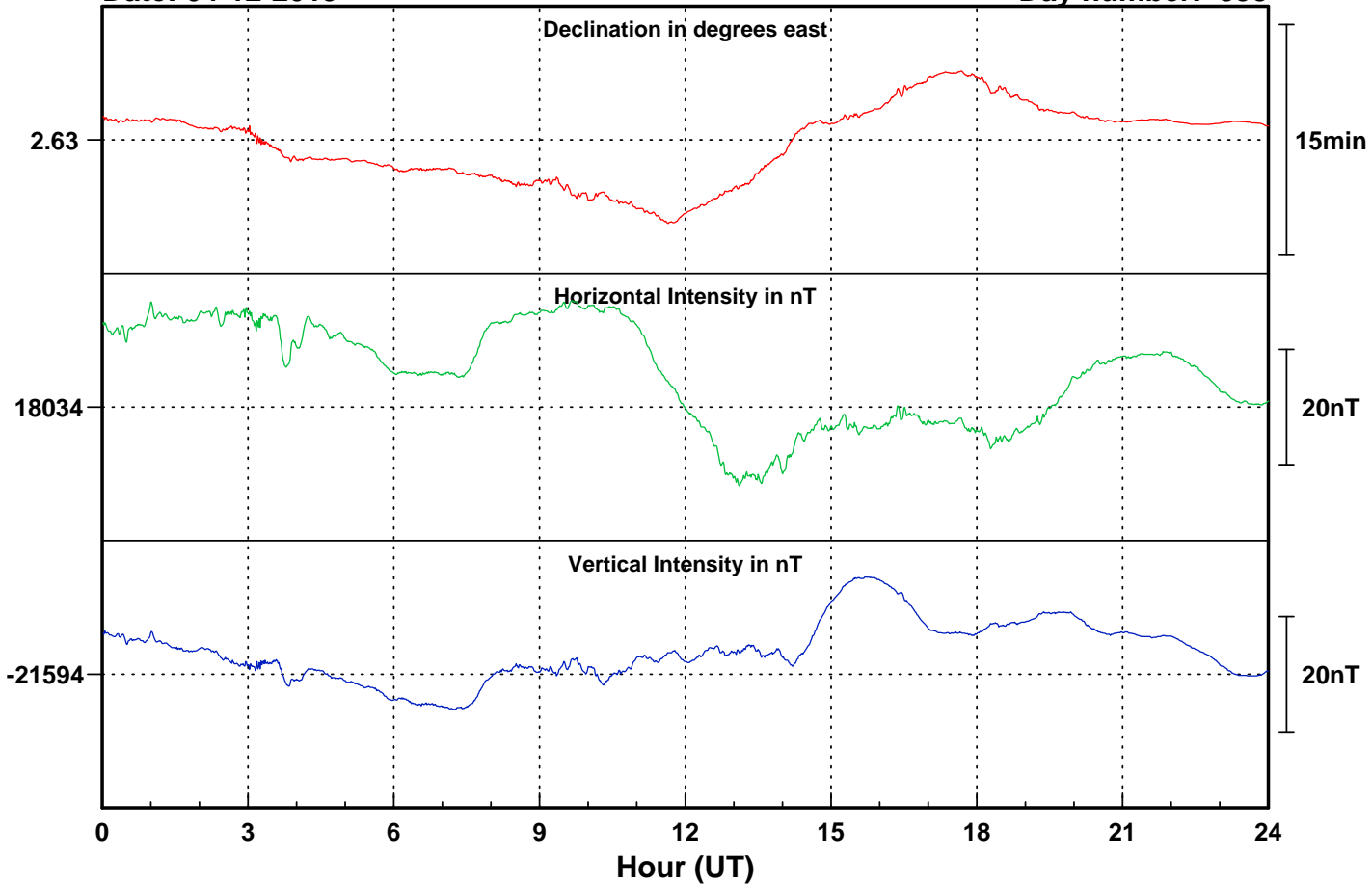
# Falkland Islands

Day number: 337



Date: 04-12-2019

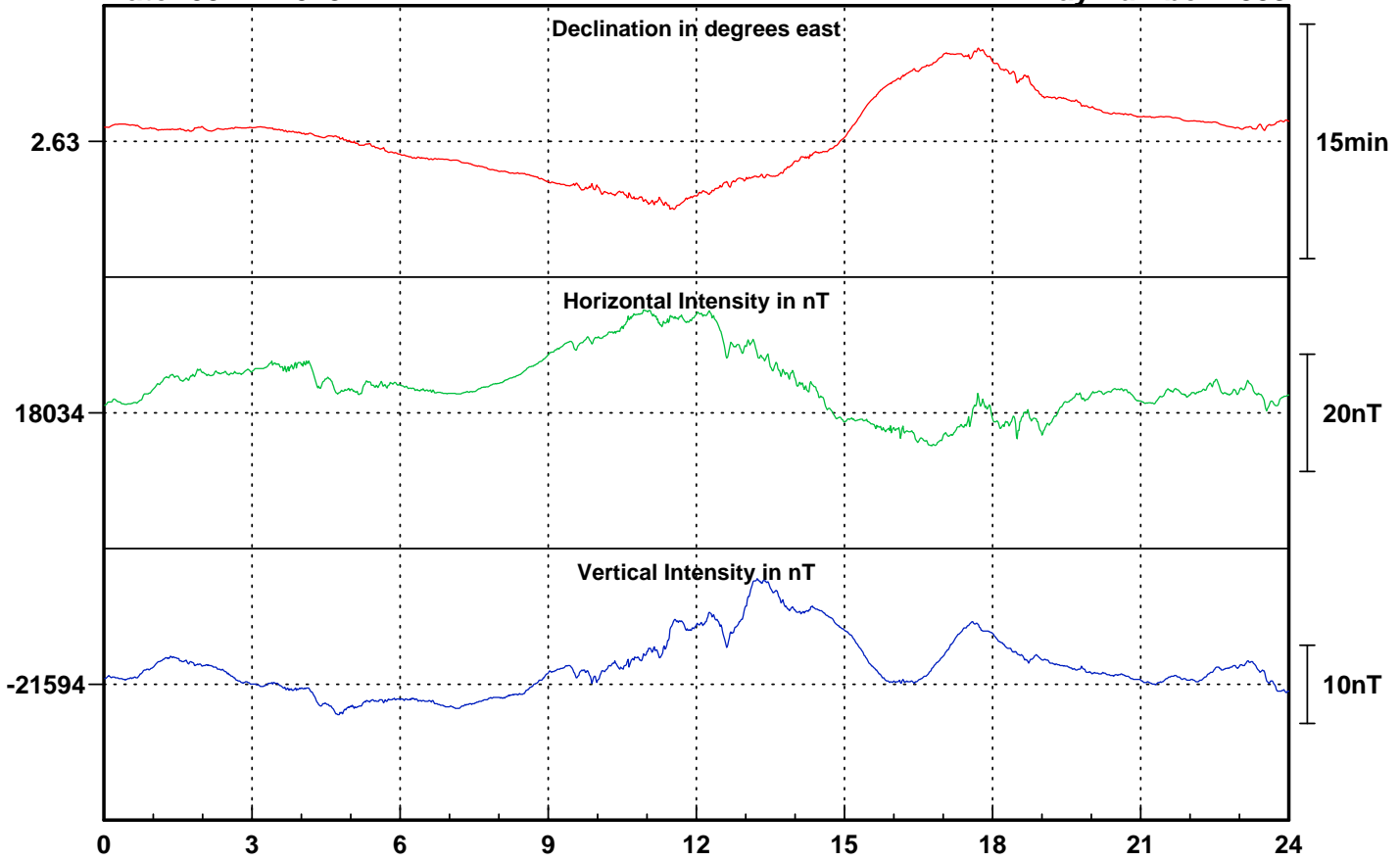
Day number: 338



Date: 05-12-2019

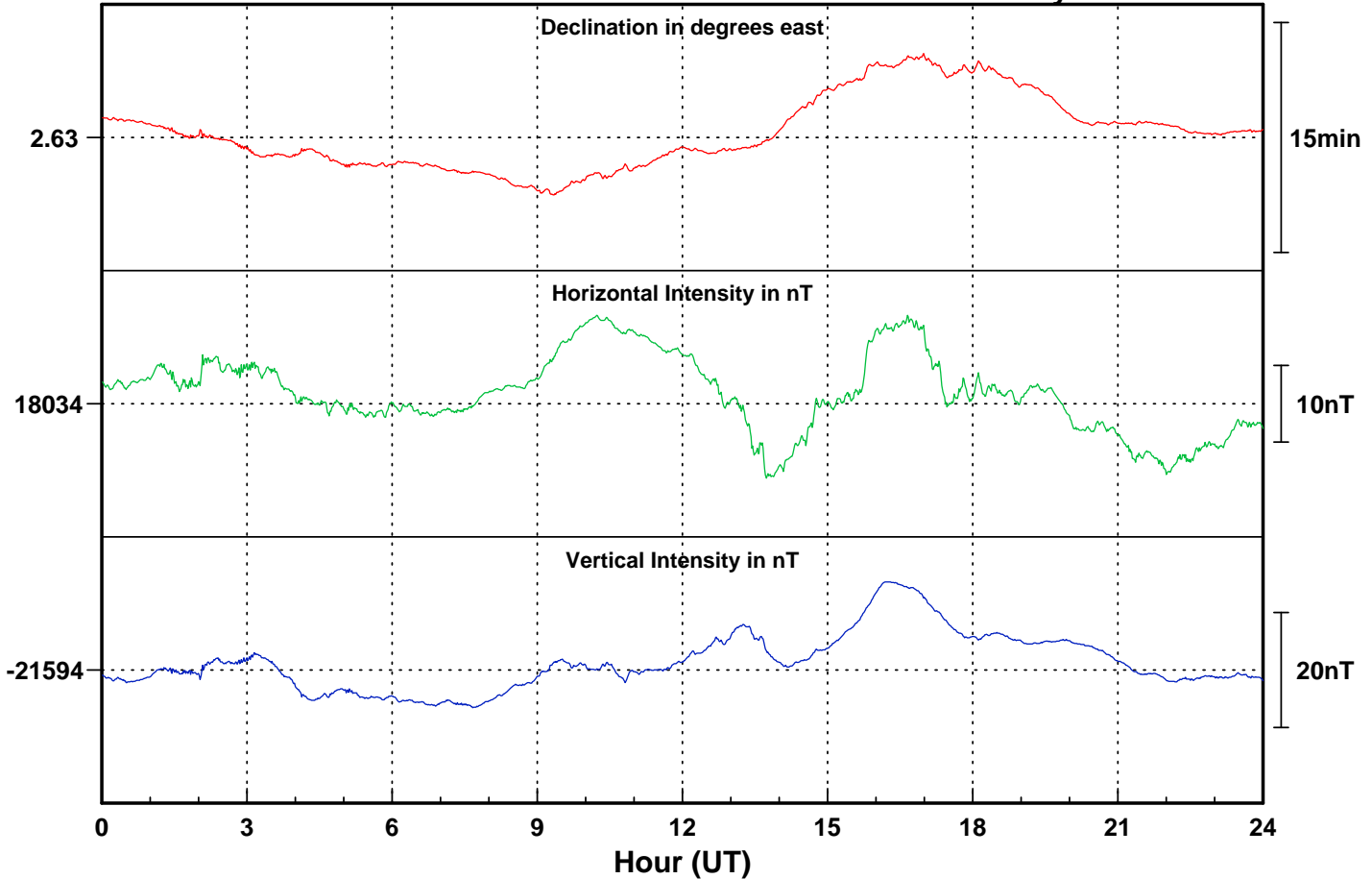
# Falkland Islands

Day number: 339



Date: 06-12-2019

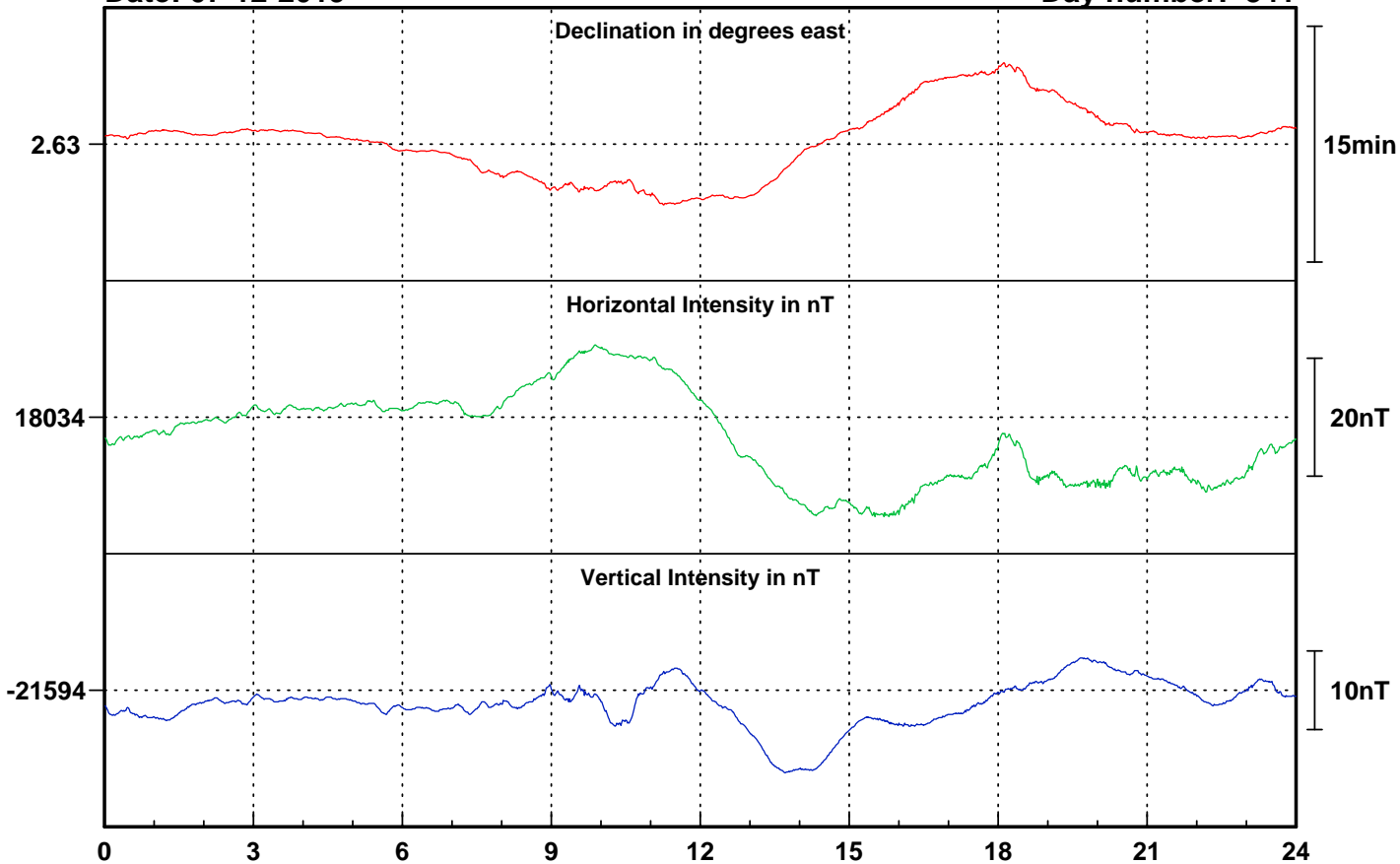
Day number: 340



Date: 07-12-2019

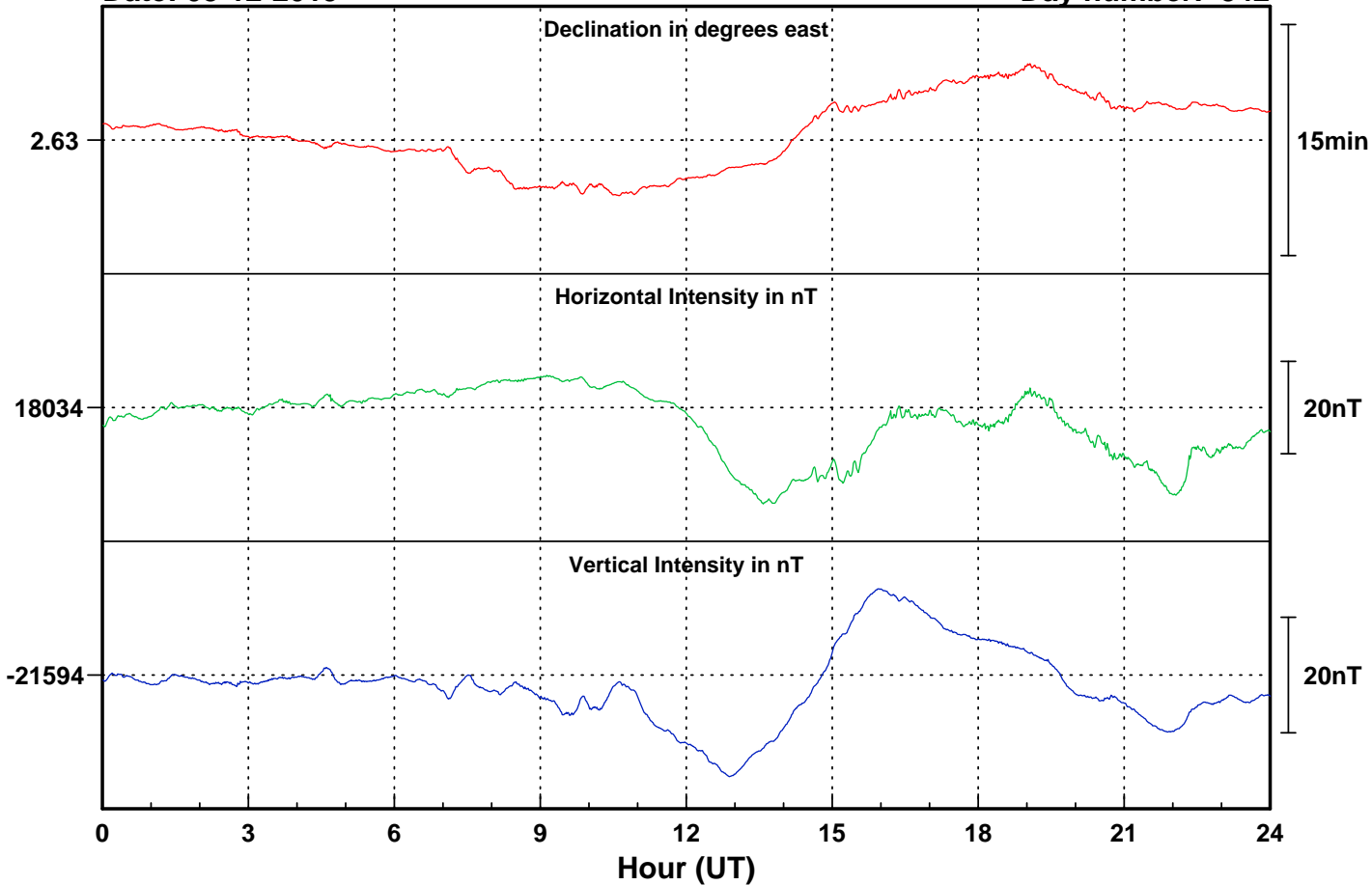
# Falkland Islands

Day number: 341



Date: 08-12-2019

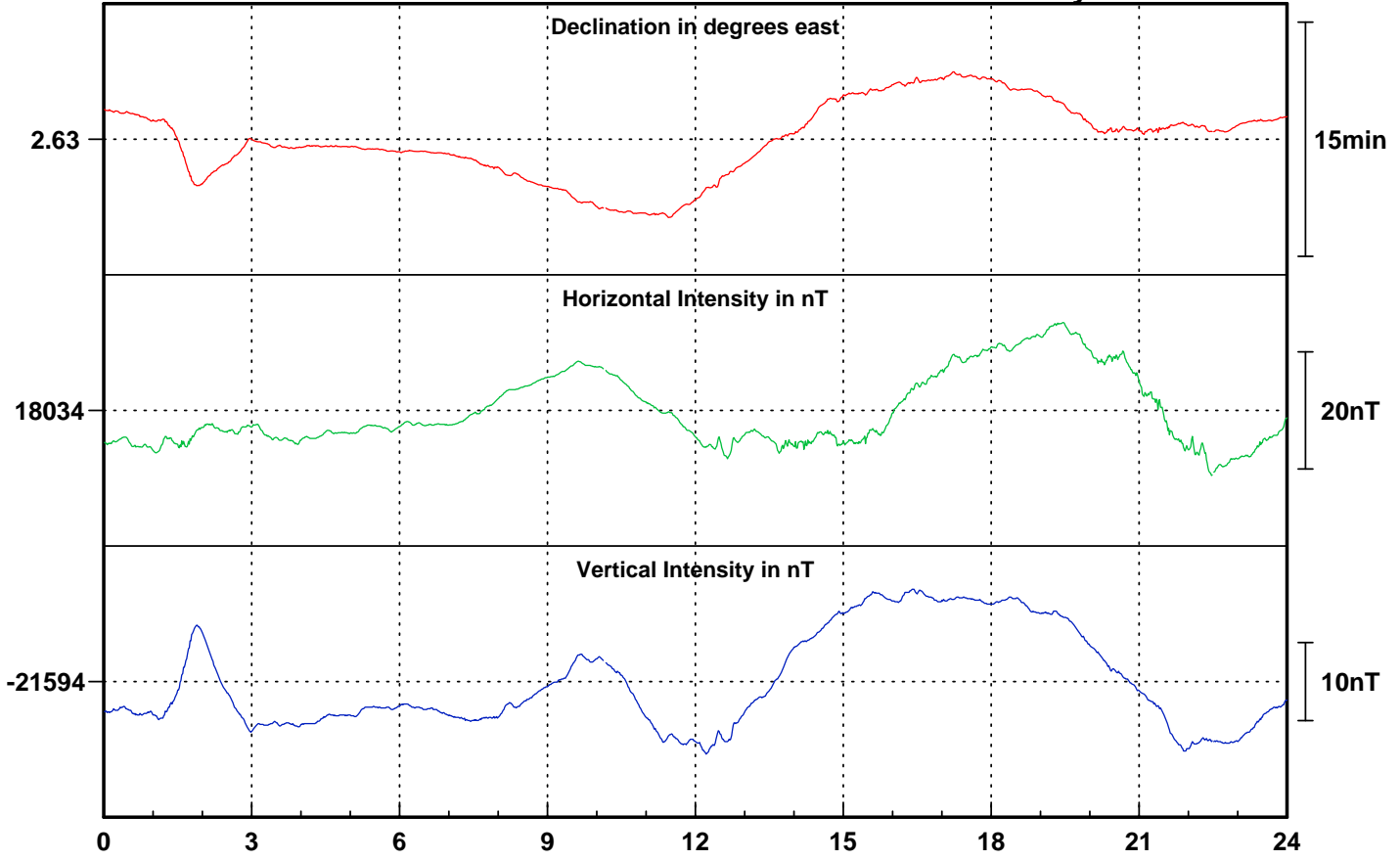
Day number: 342



Date: 09-12-2019

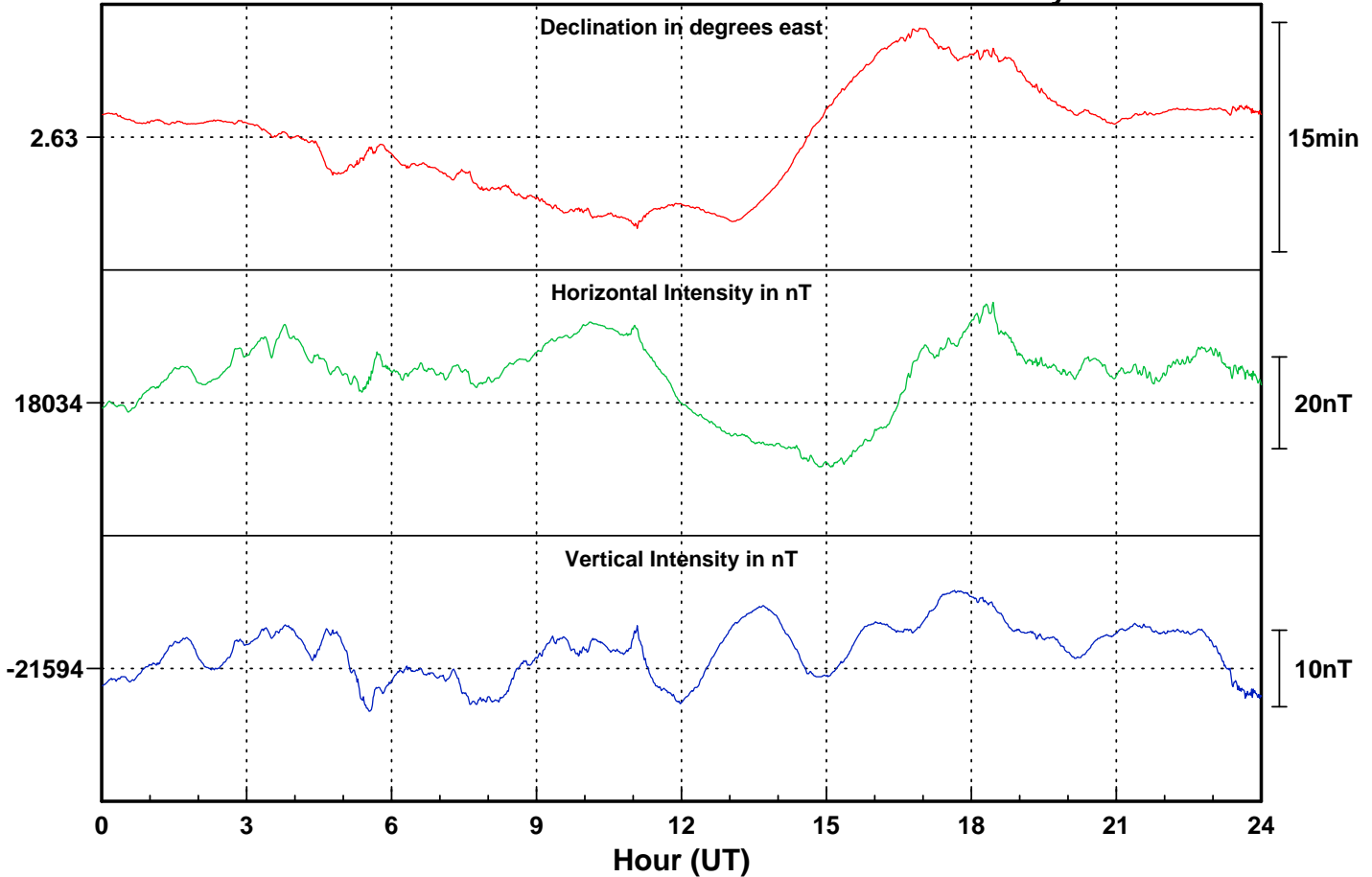
# Falkland Islands

Day number: 343



Date: 10-12-2019

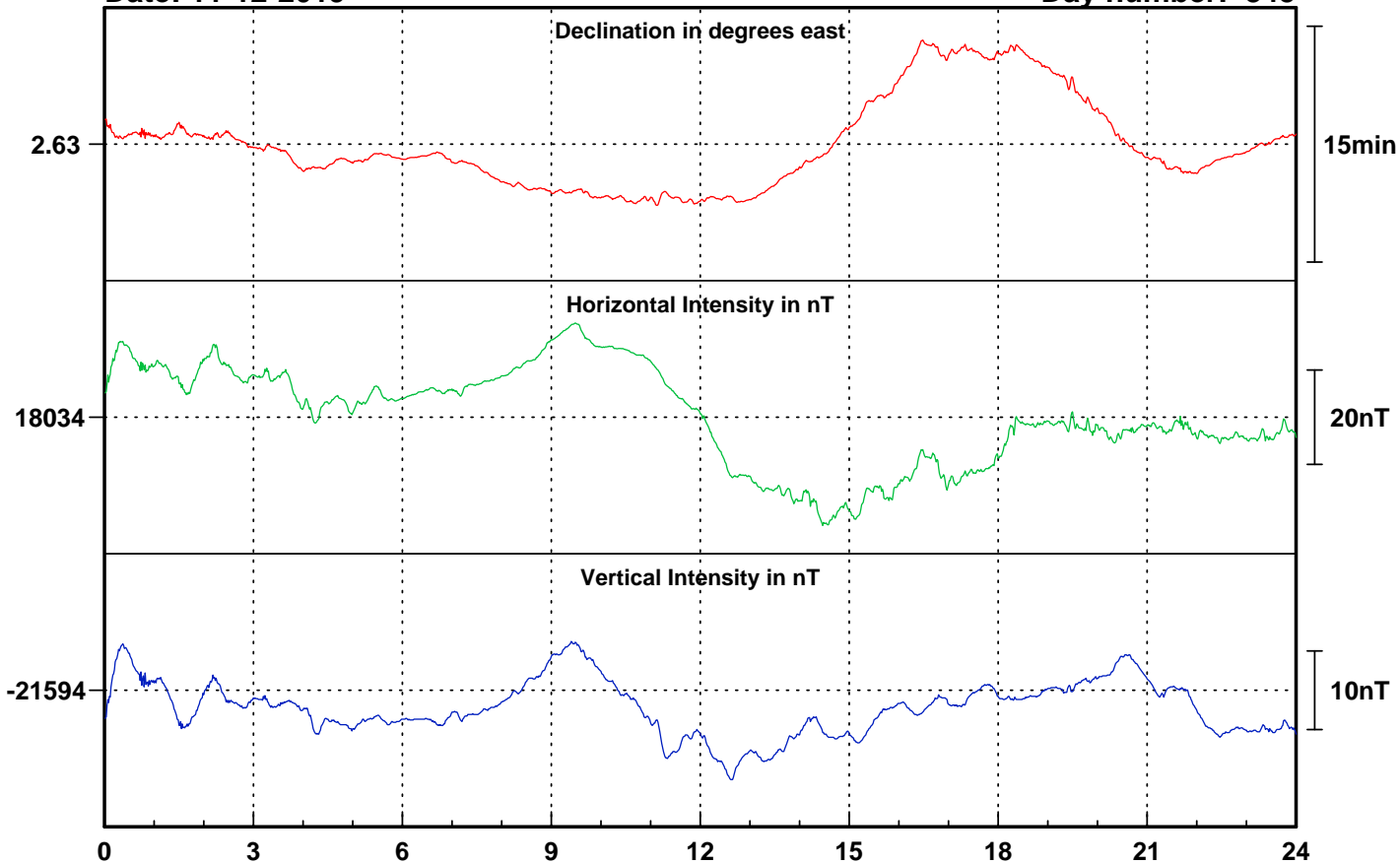
Day number: 344



Date: 11-12-2019

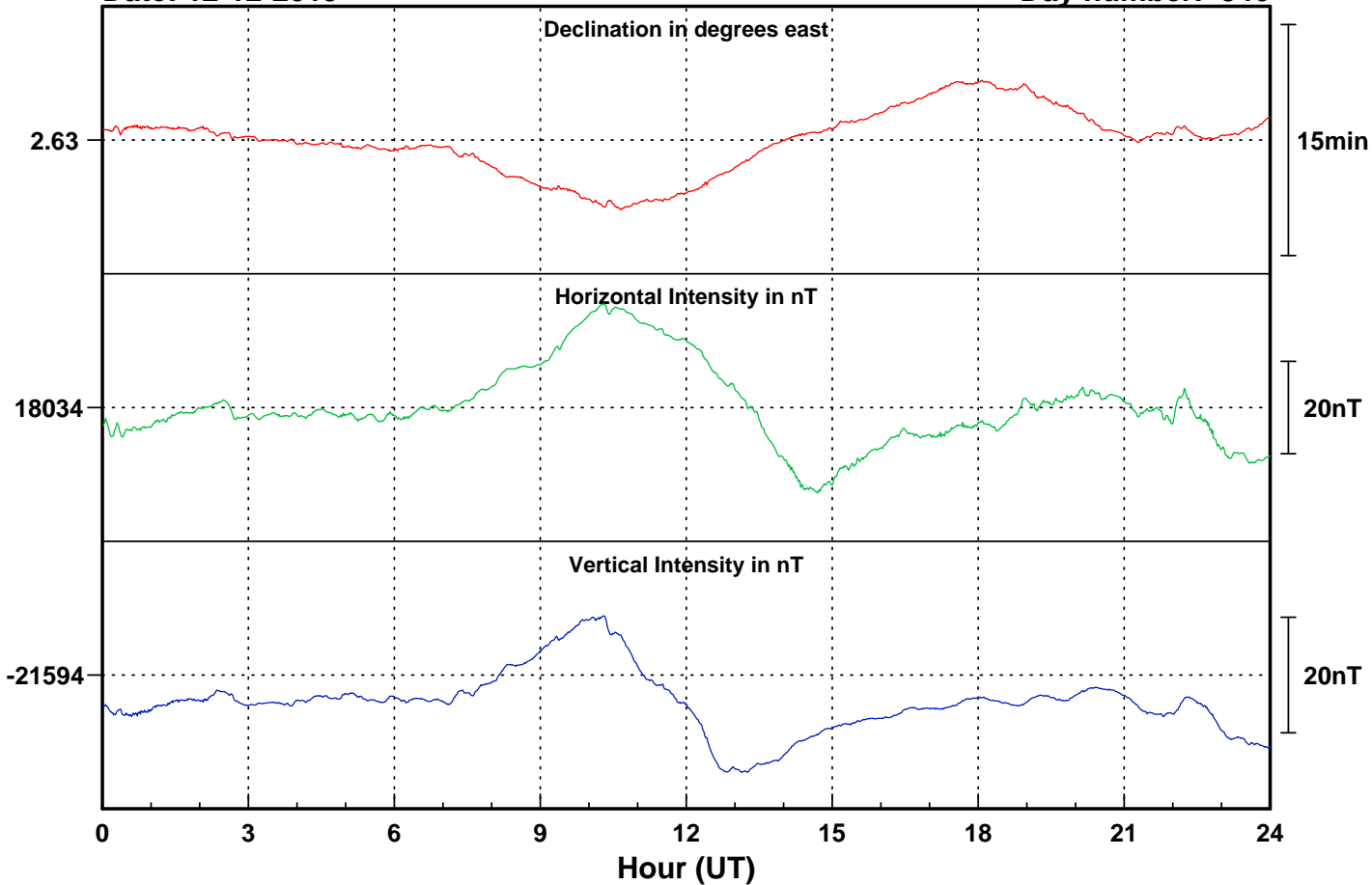
# Falkland Islands

Day number: 345



Date: 12-12-2019

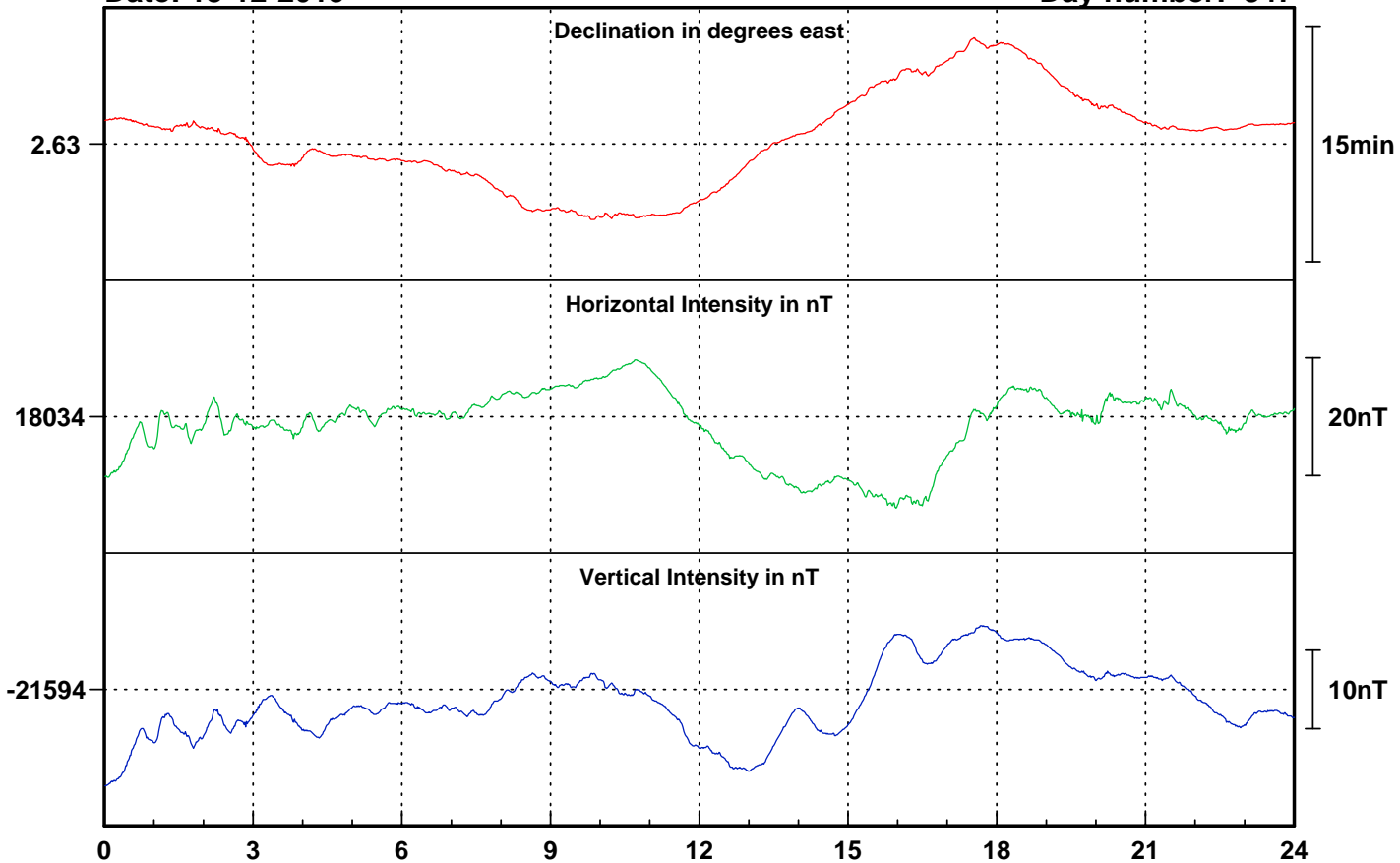
Day number: 346



Date: 13-12-2019

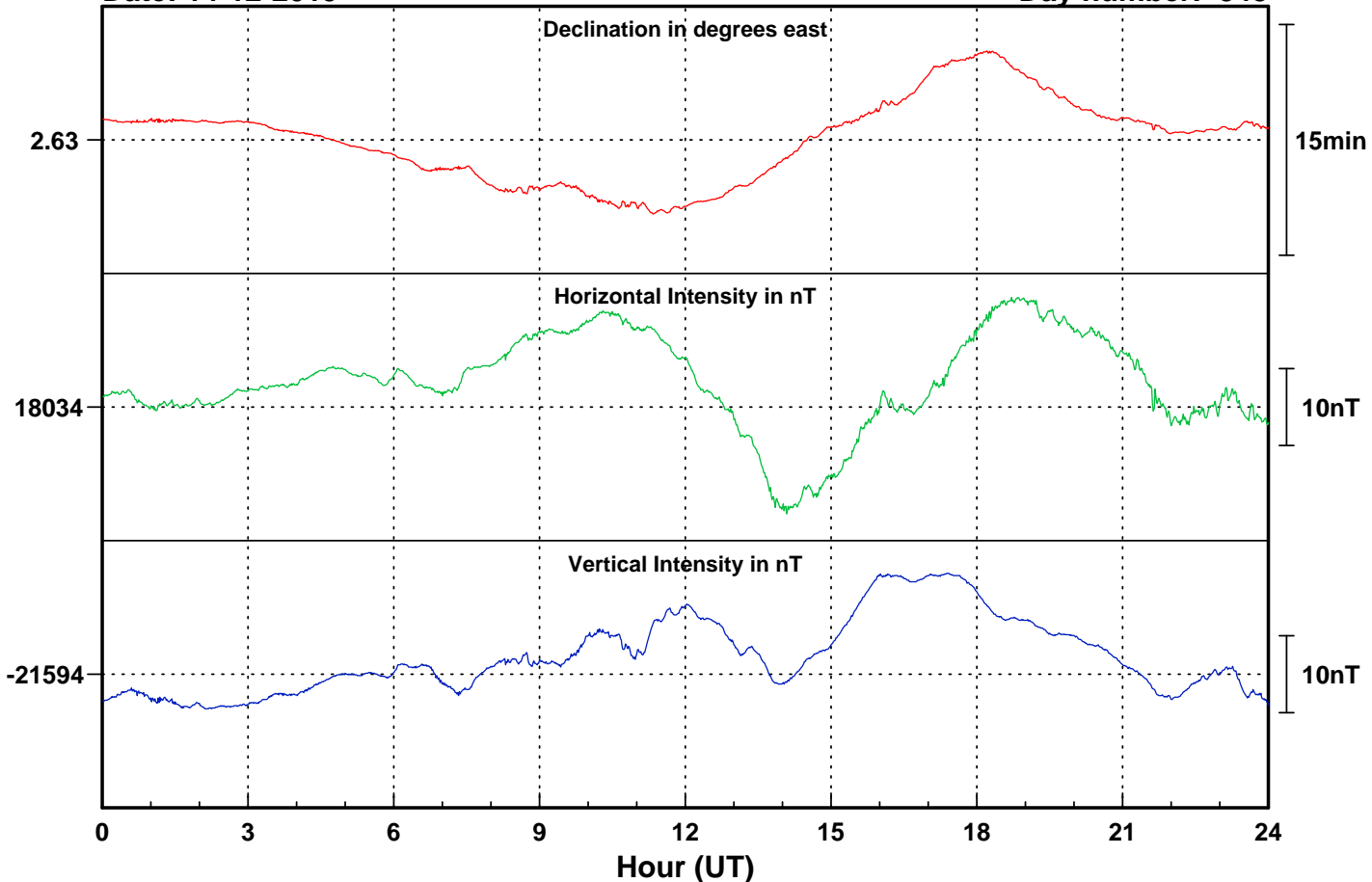
# Falkland Islands

Day number: 347



Date: 14-12-2019

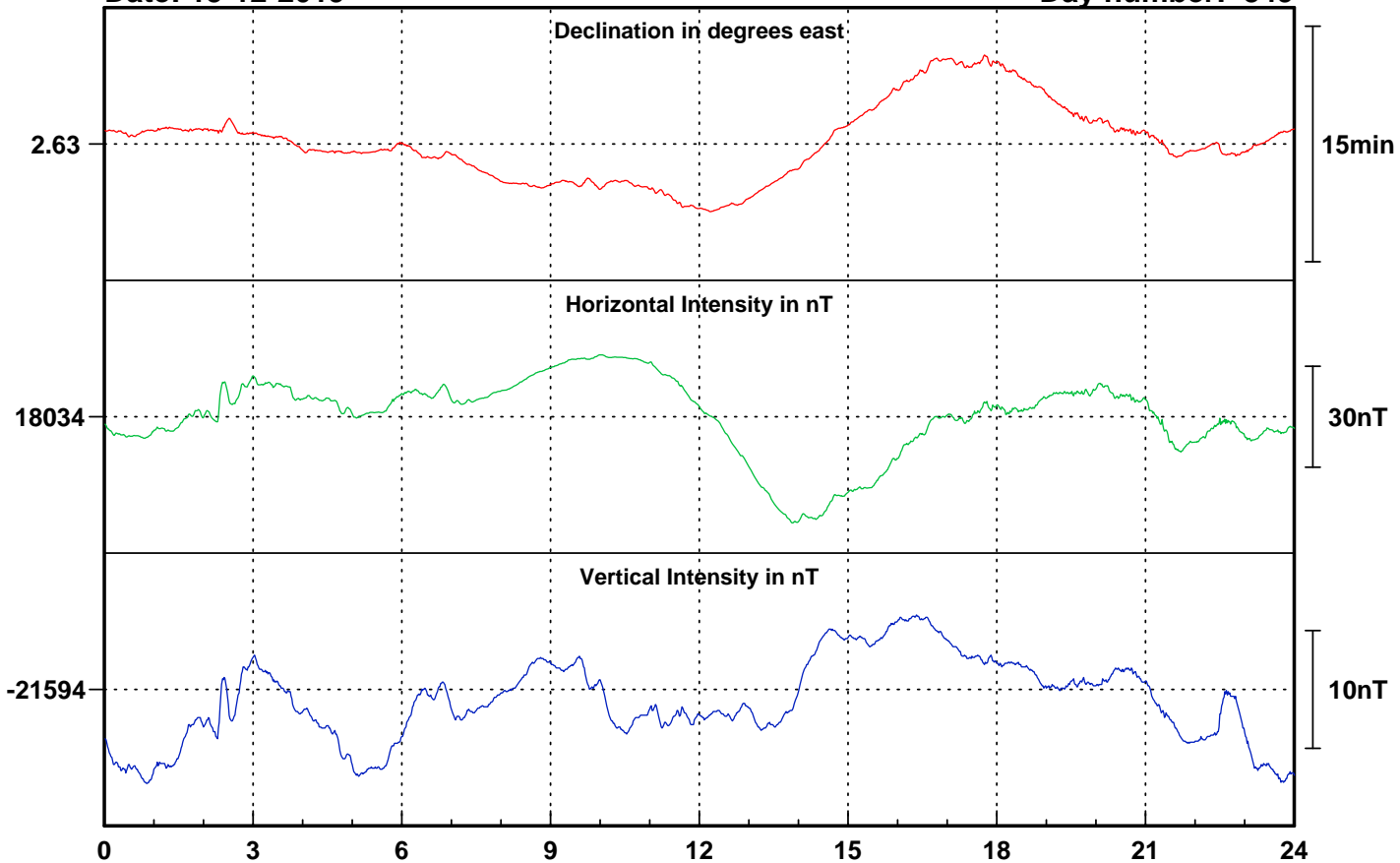
Day number: 348



Date: 15-12-2019

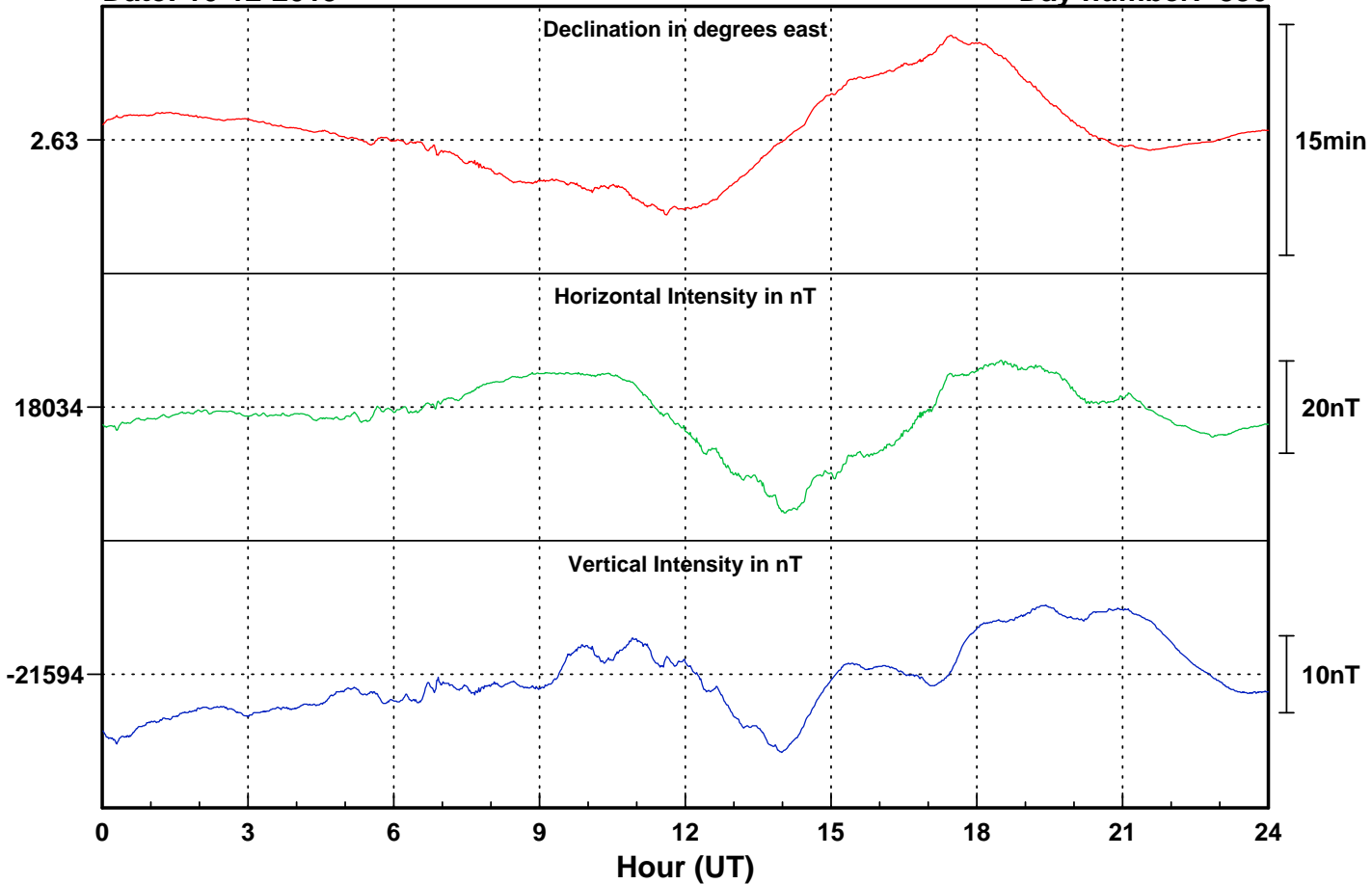
# Falkland Islands

Day number: 349



Date: 16-12-2019

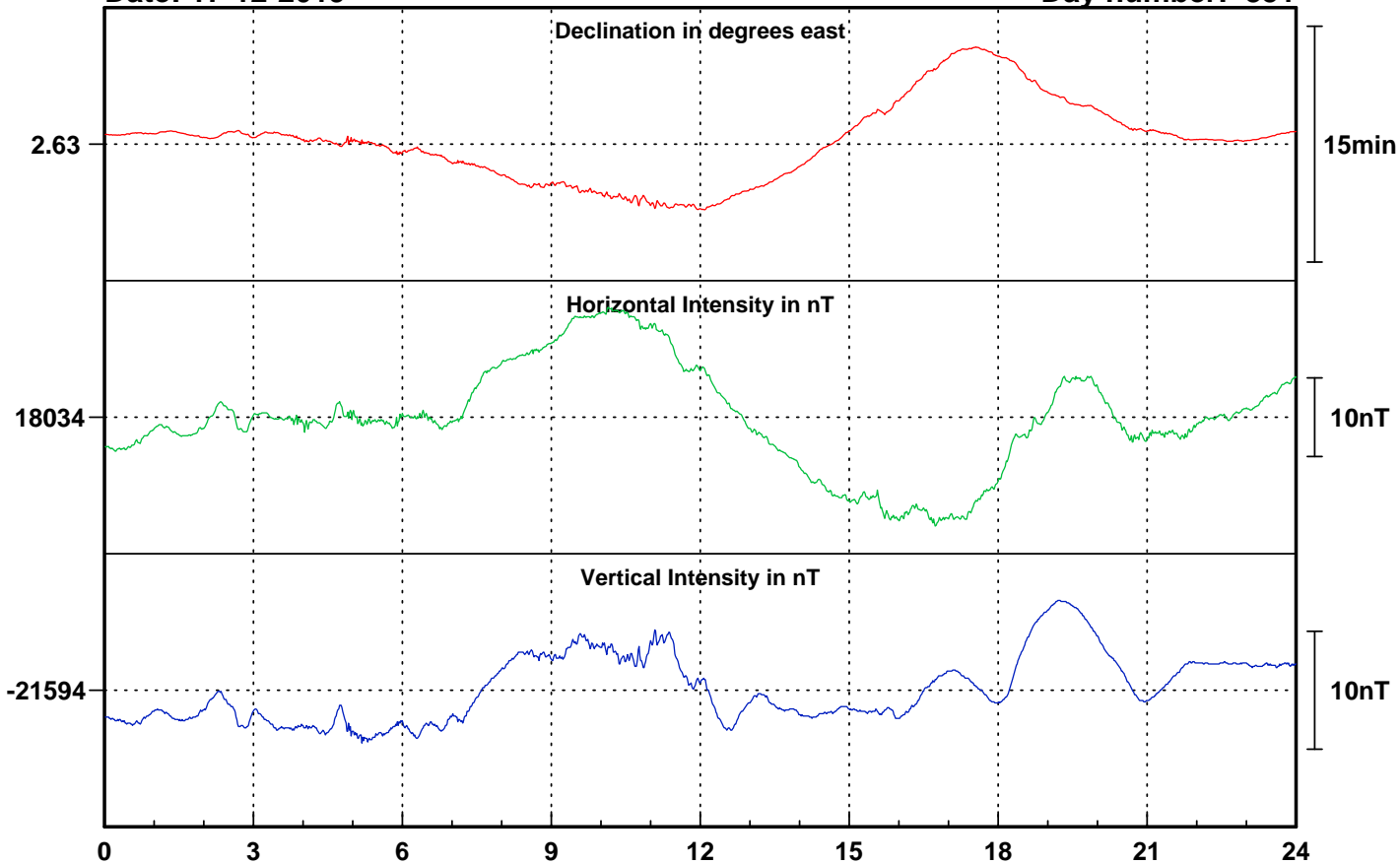
Day number: 350



Date: 17-12-2019

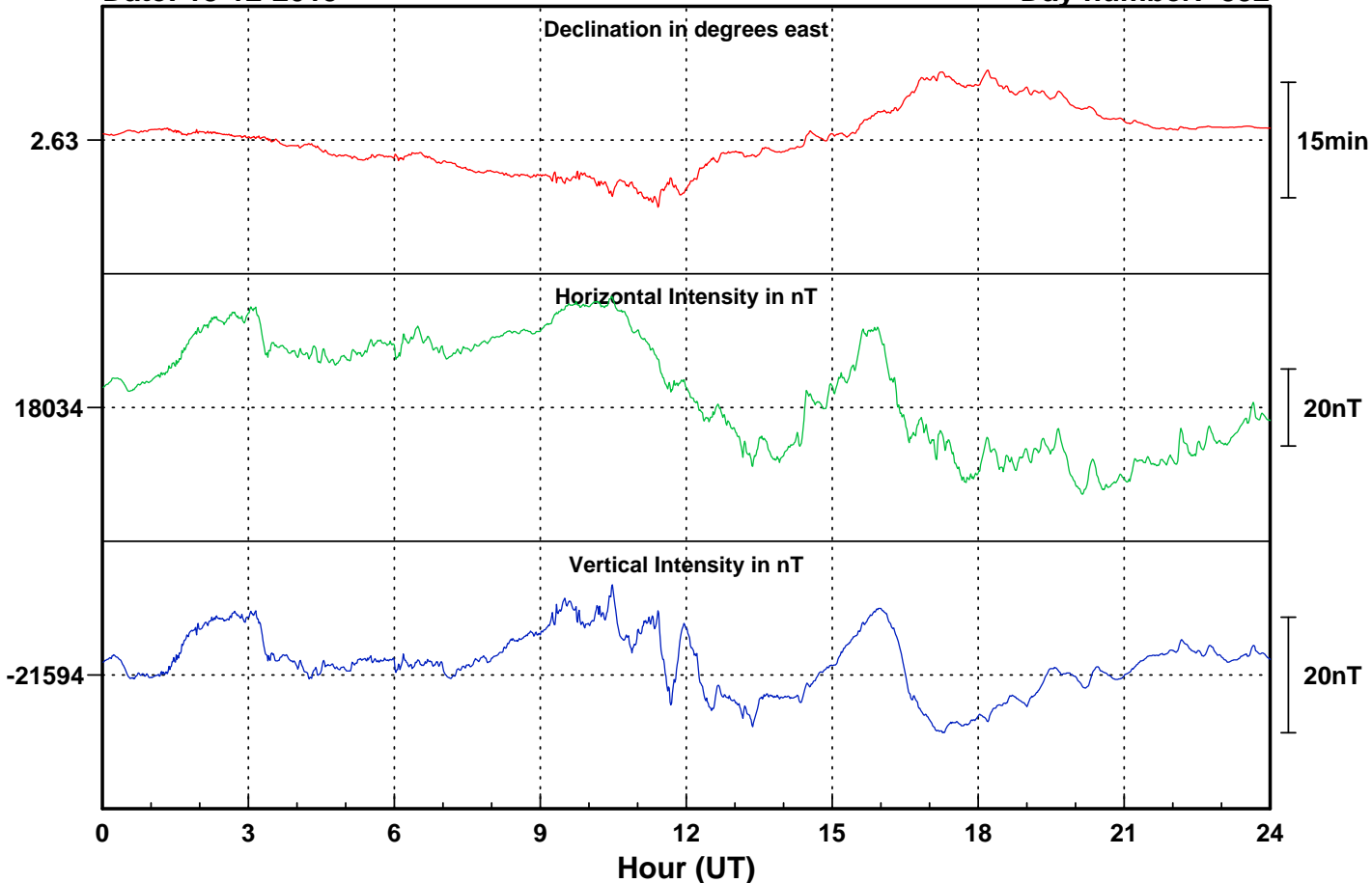
# Falkland Islands

Day number: 351



Date: 18-12-2019

Day number: 352

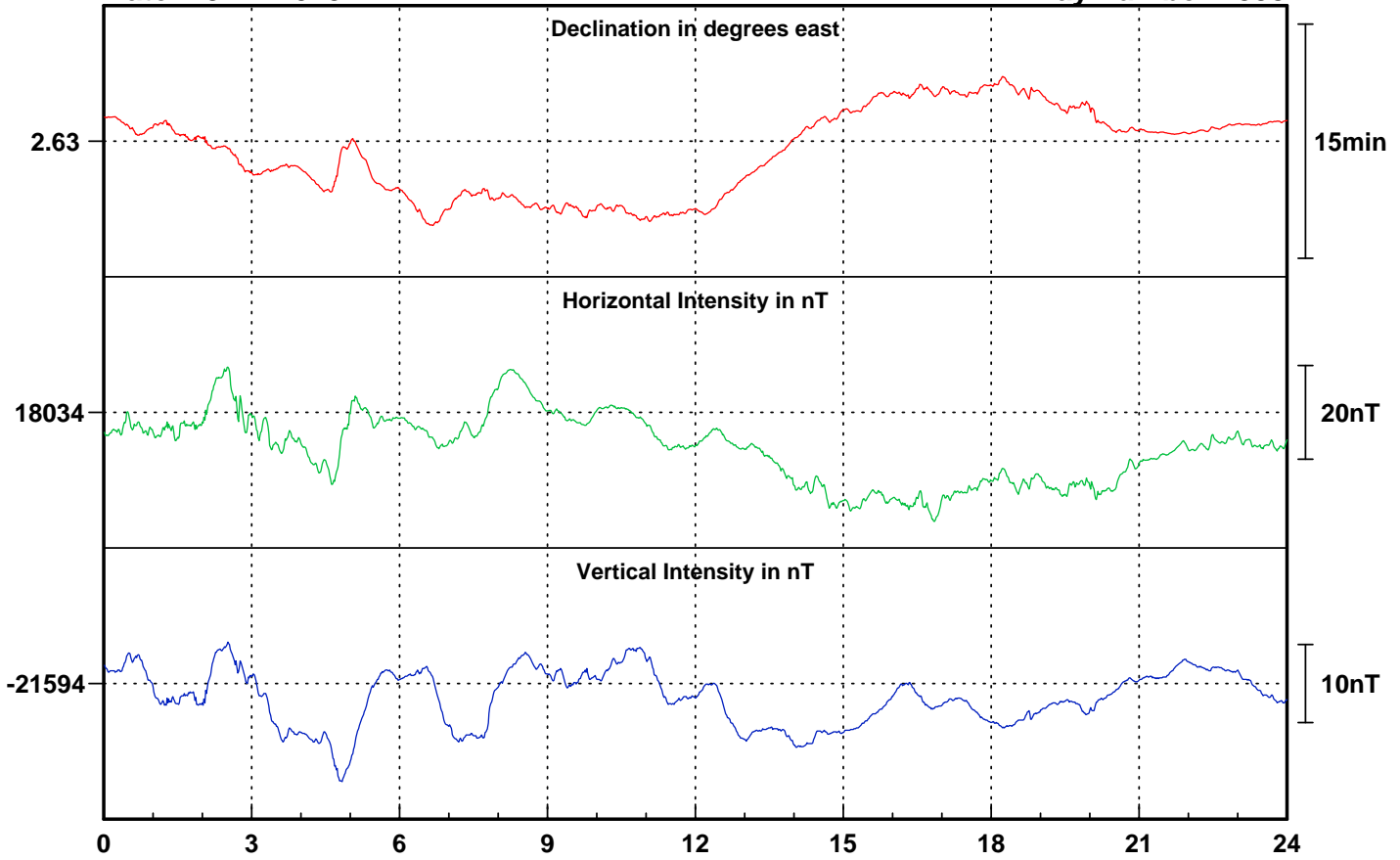




Date: 19-12-2019

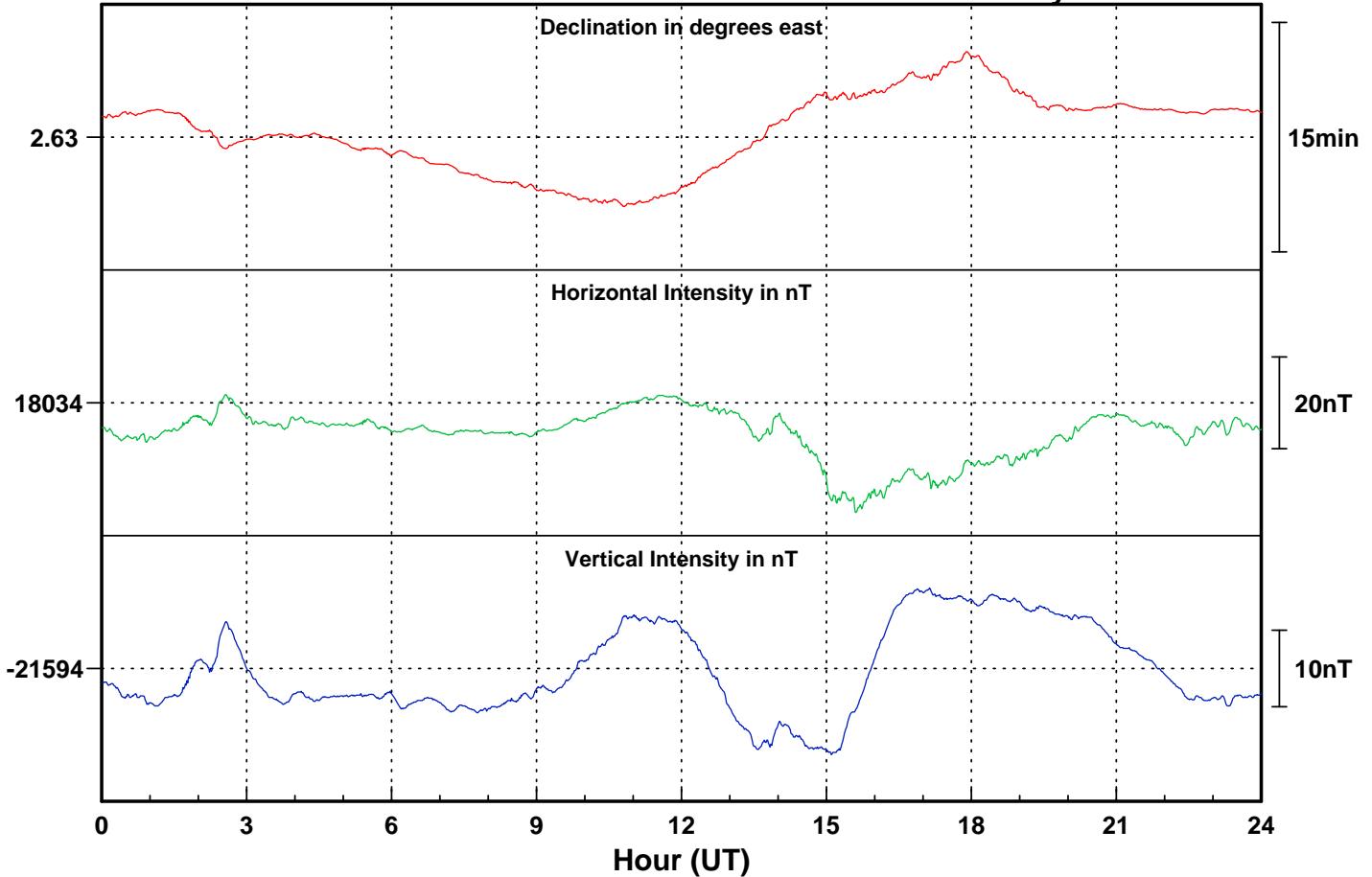
# Falkland Islands

Day number: 353



Date: 20-12-2019

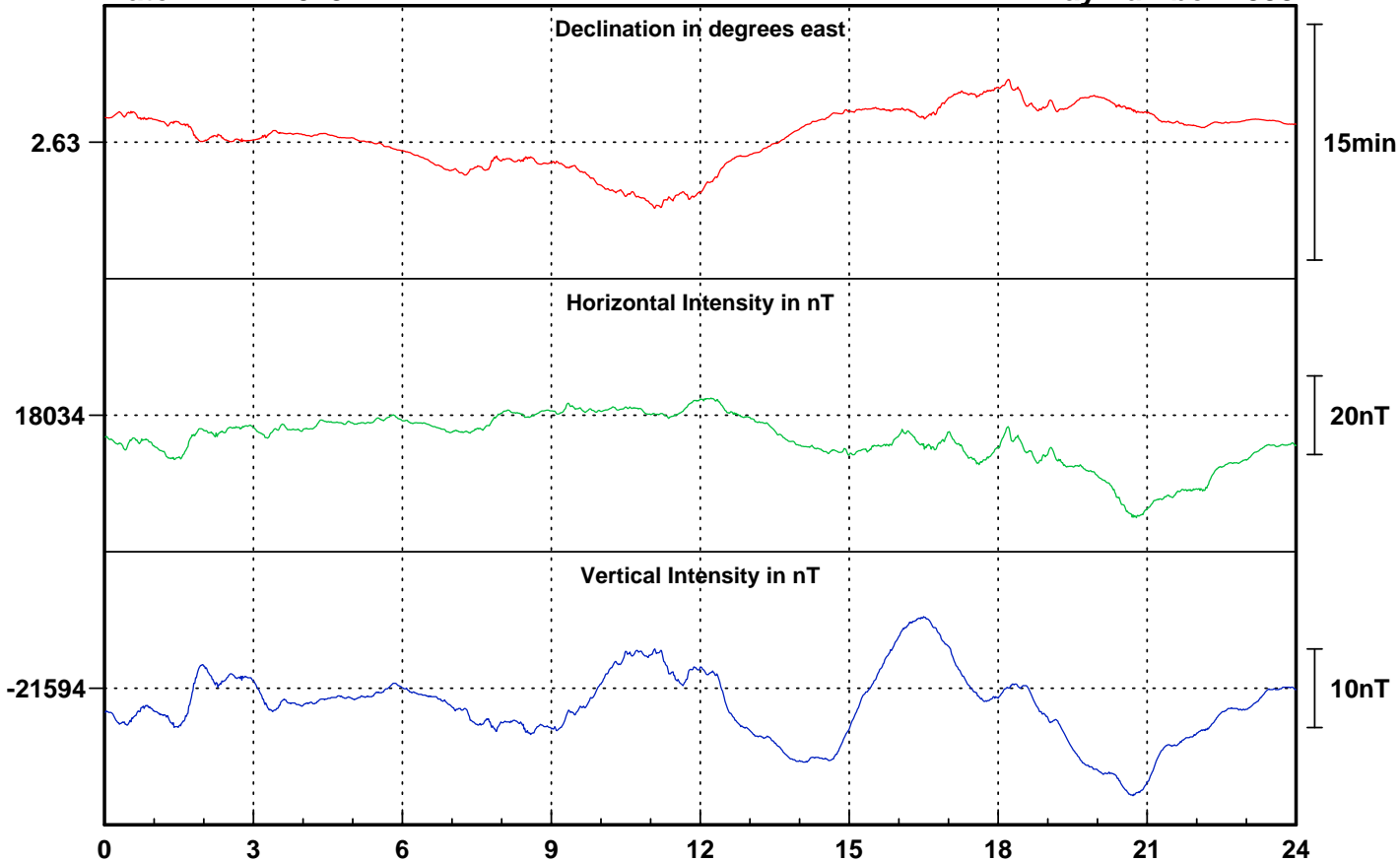
Day number: 354



Date: 21-12-2019

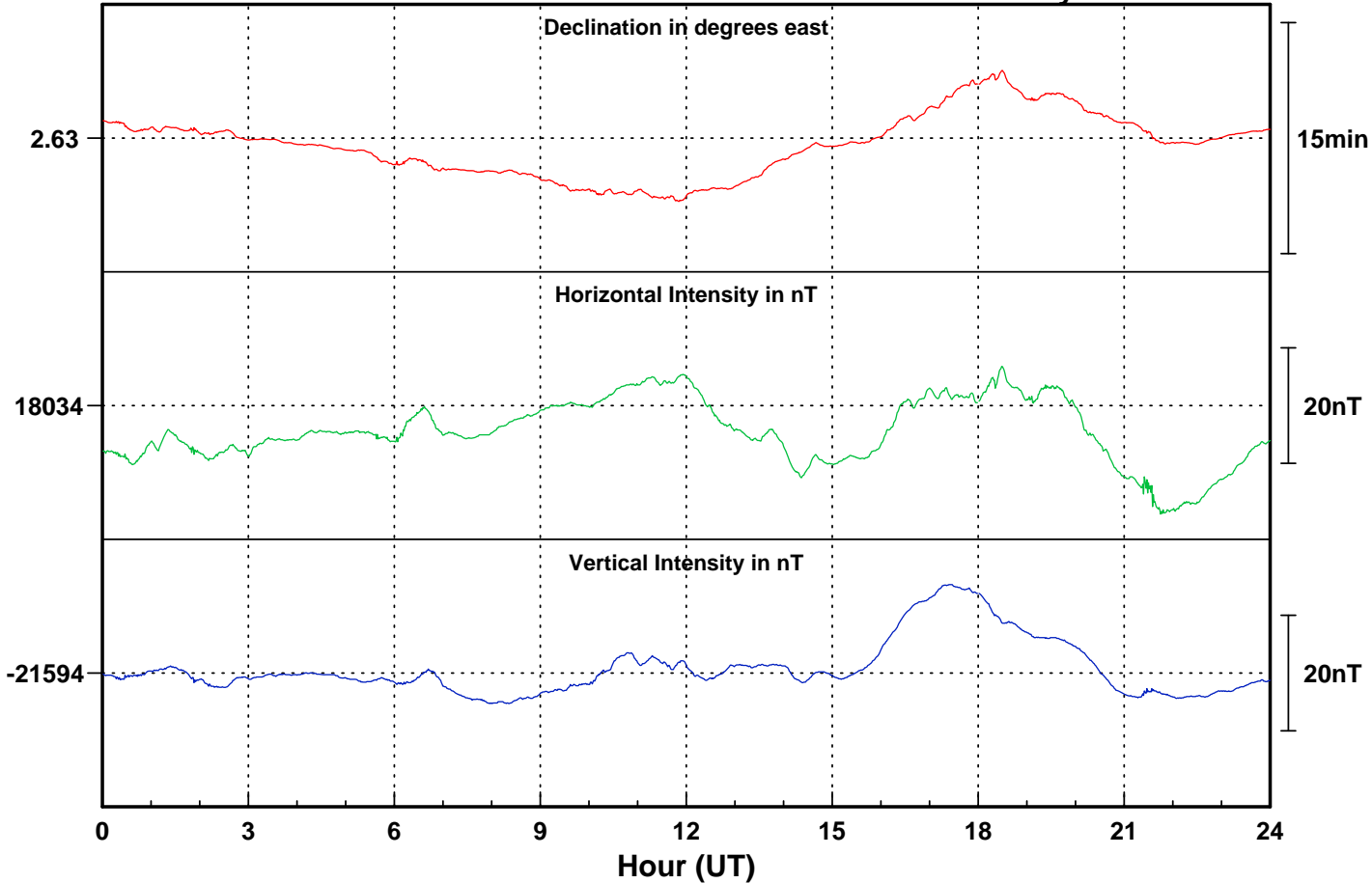
# Falkland Islands

Day number: 355



Date: 22-12-2019

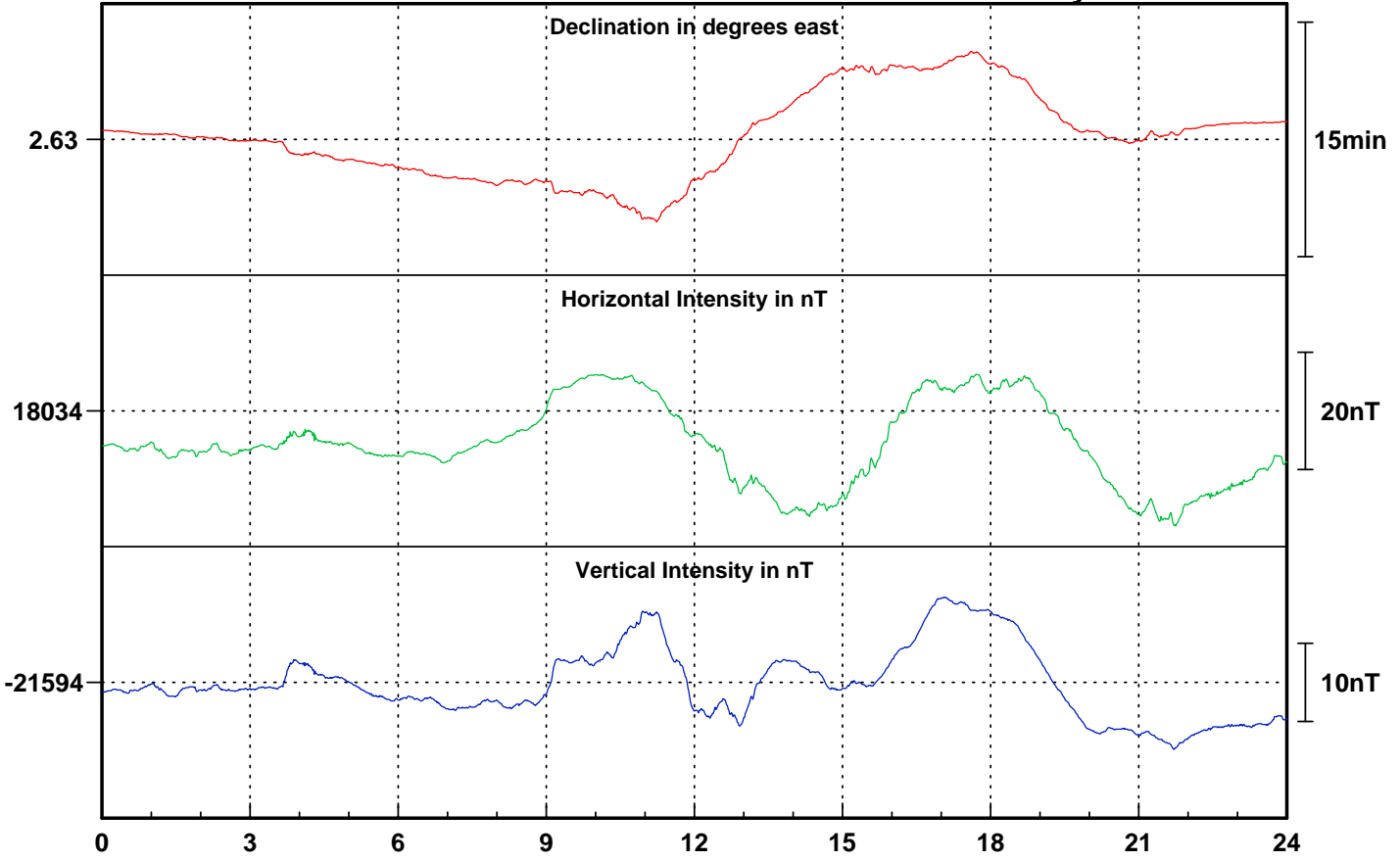
Day number: 356



Date: 23-12-2019

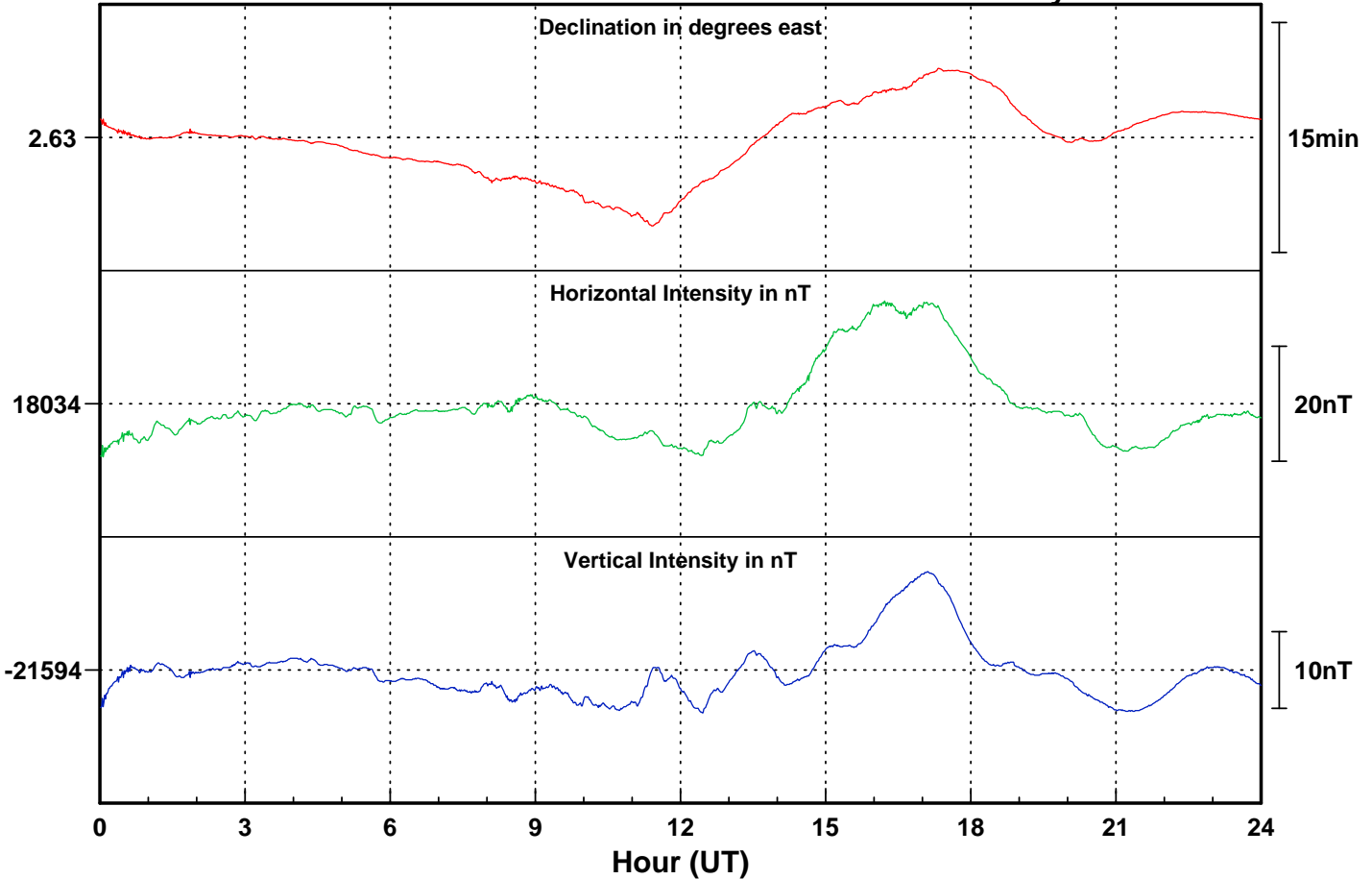
# Falkland Islands

Day number: 357



Date: 24-12-2019

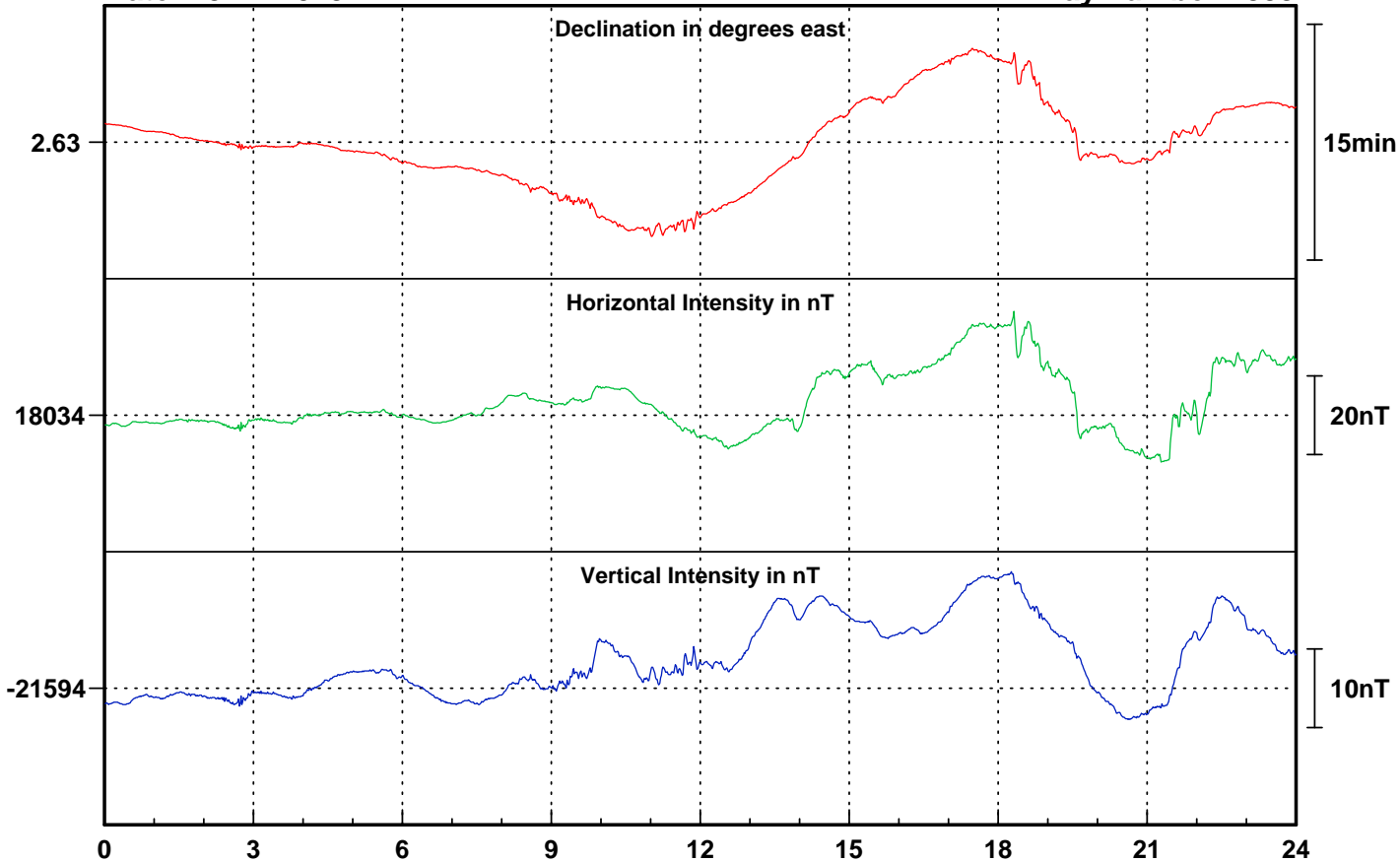
Day number: 358



Date: 25-12-2019

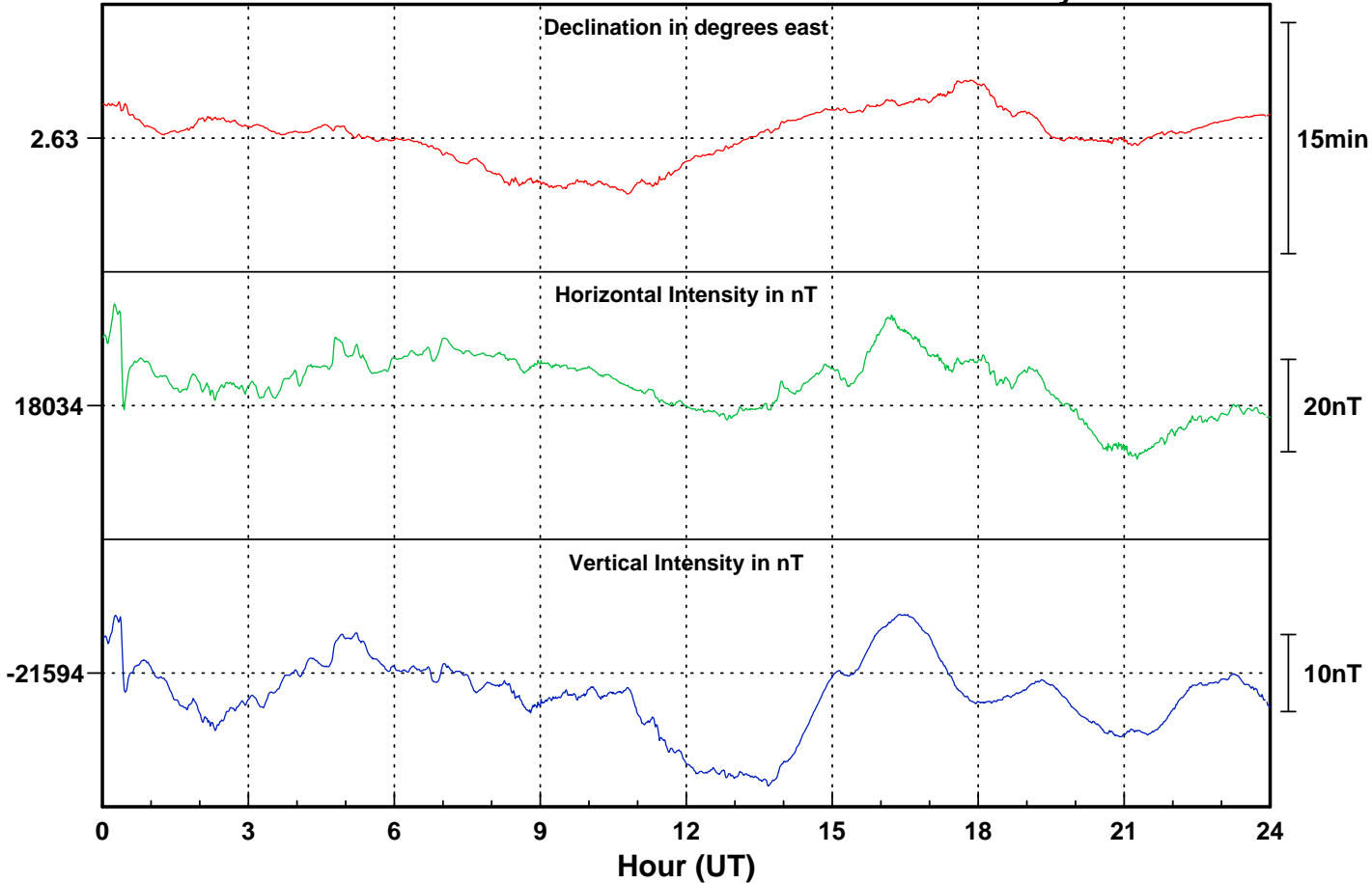
# Falkland Islands

Day number: 359



Date: 26-12-2019

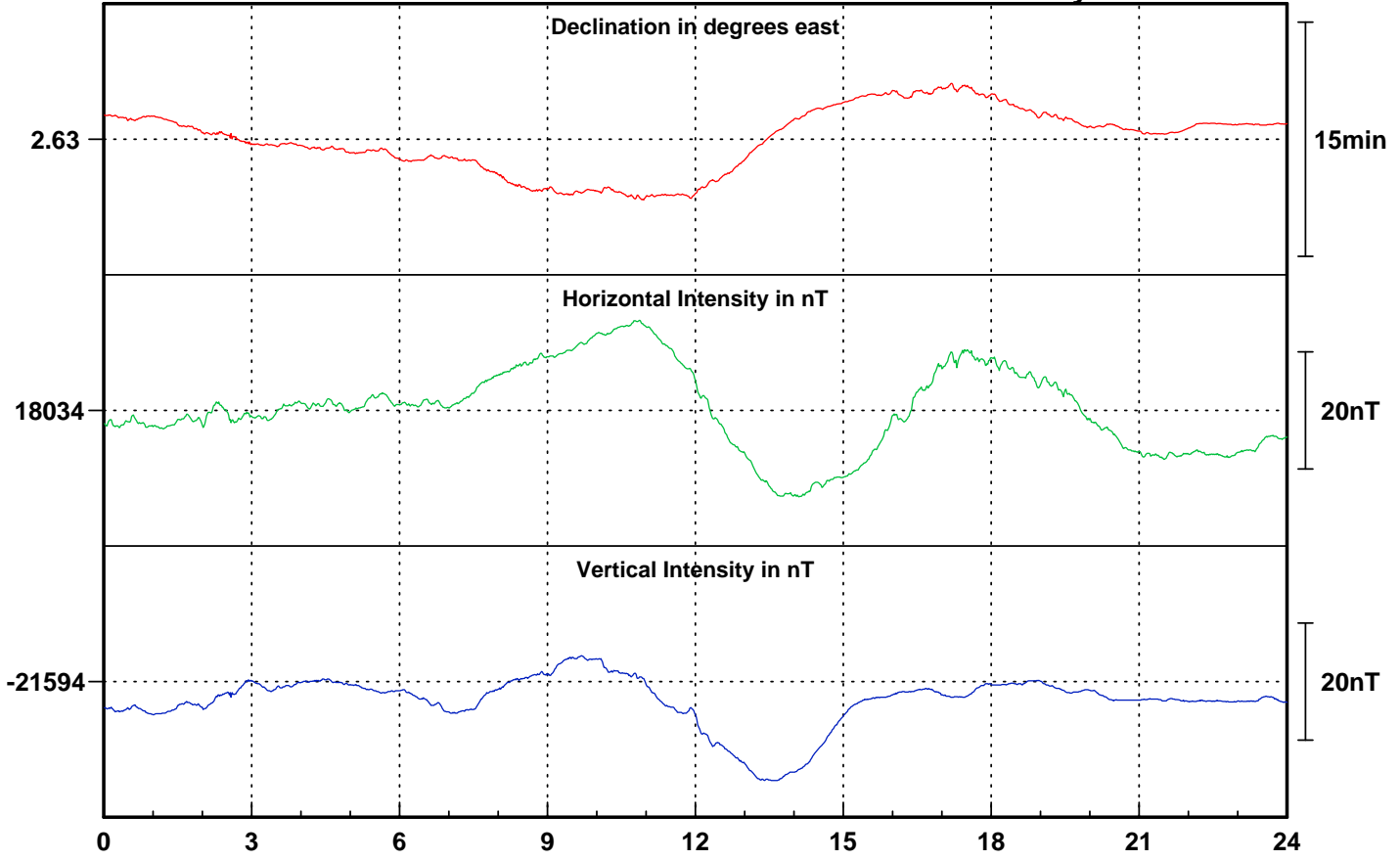
Day number: 360



Date: 27-12-2019

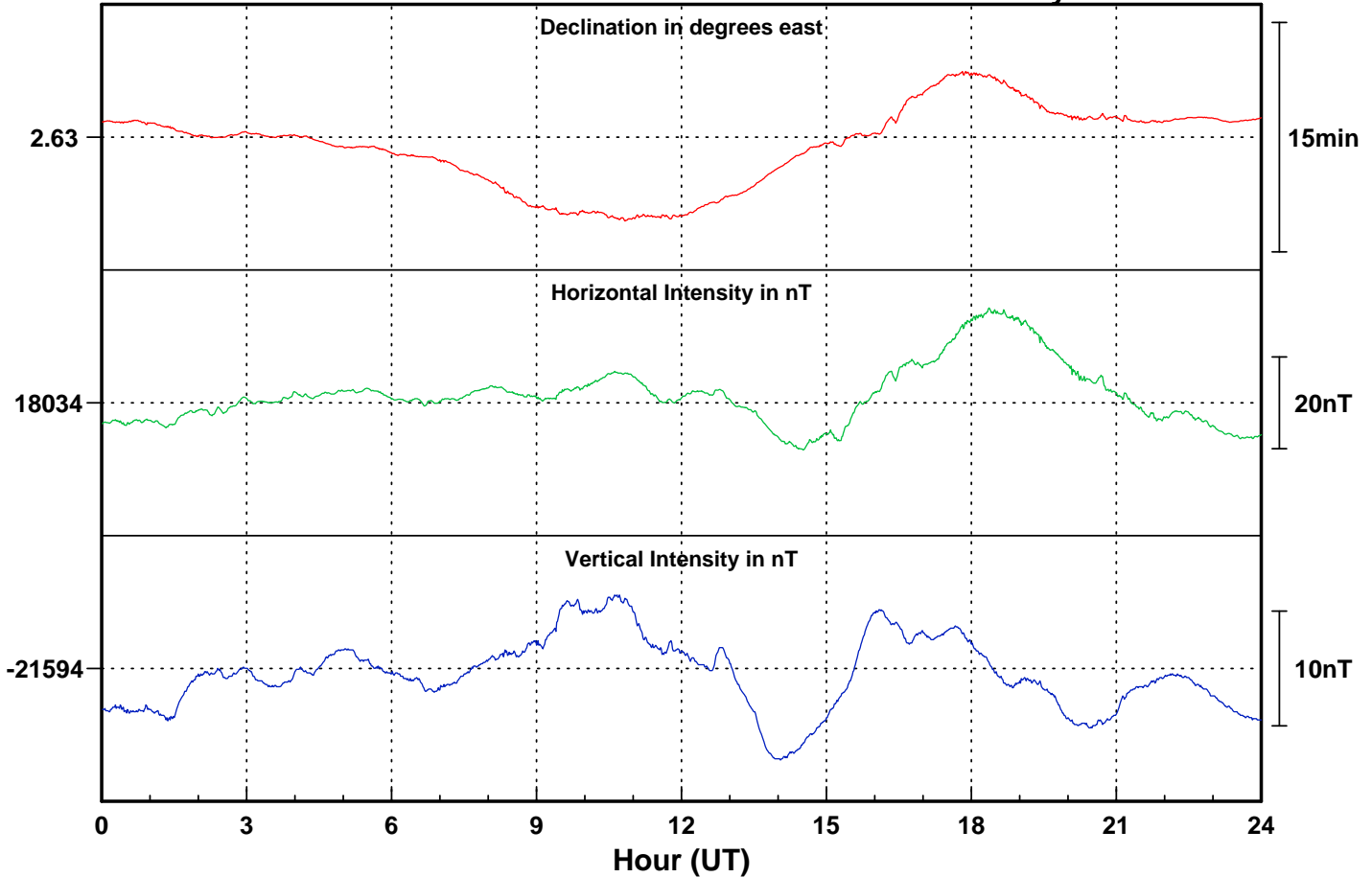
# Falkland Islands

Day number: 361



Date: 28-12-2019

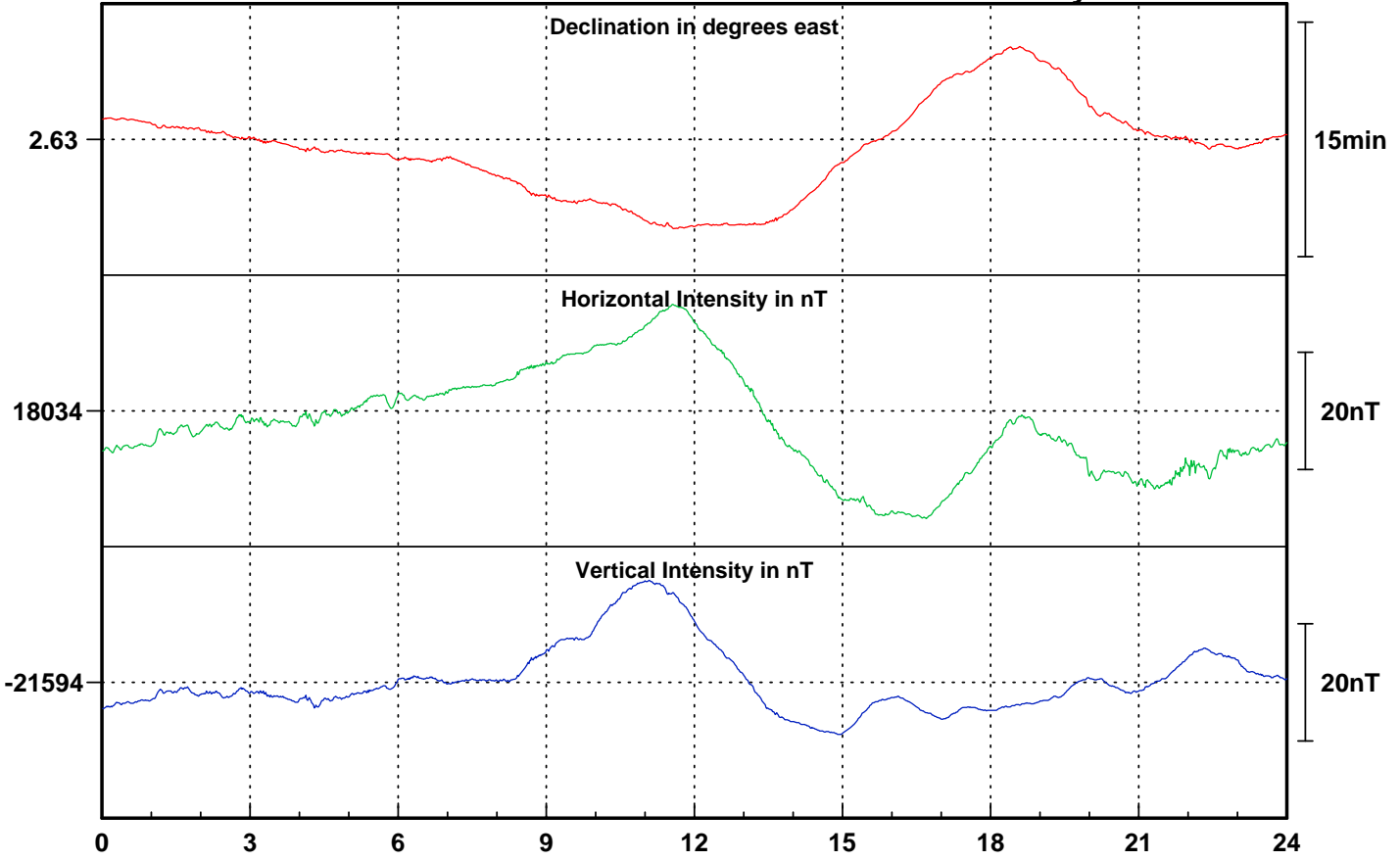
Day number: 362



Date: 29-12-2019

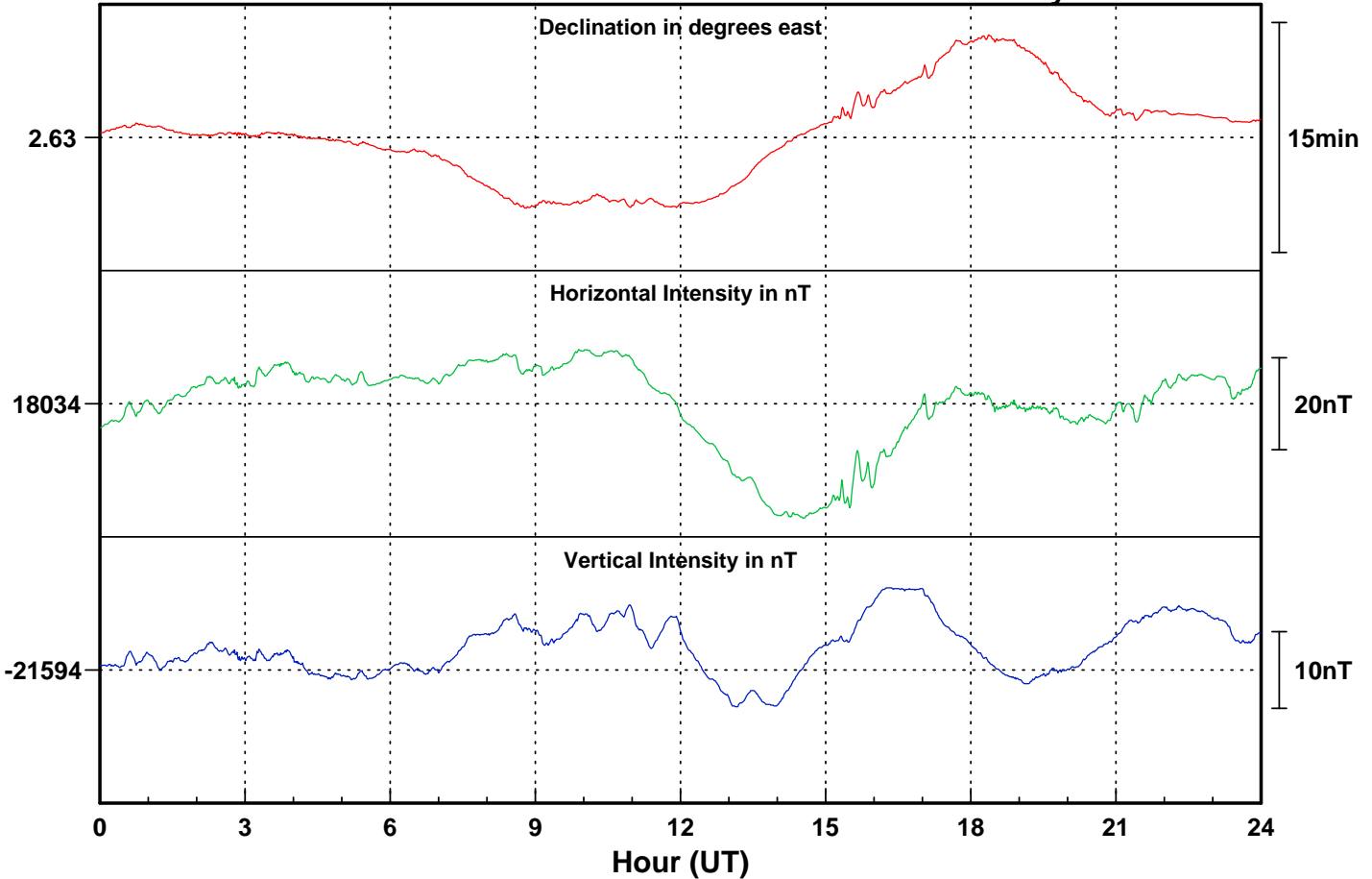
# Falkland Islands

Day number: 363



Date: 30-12-2019

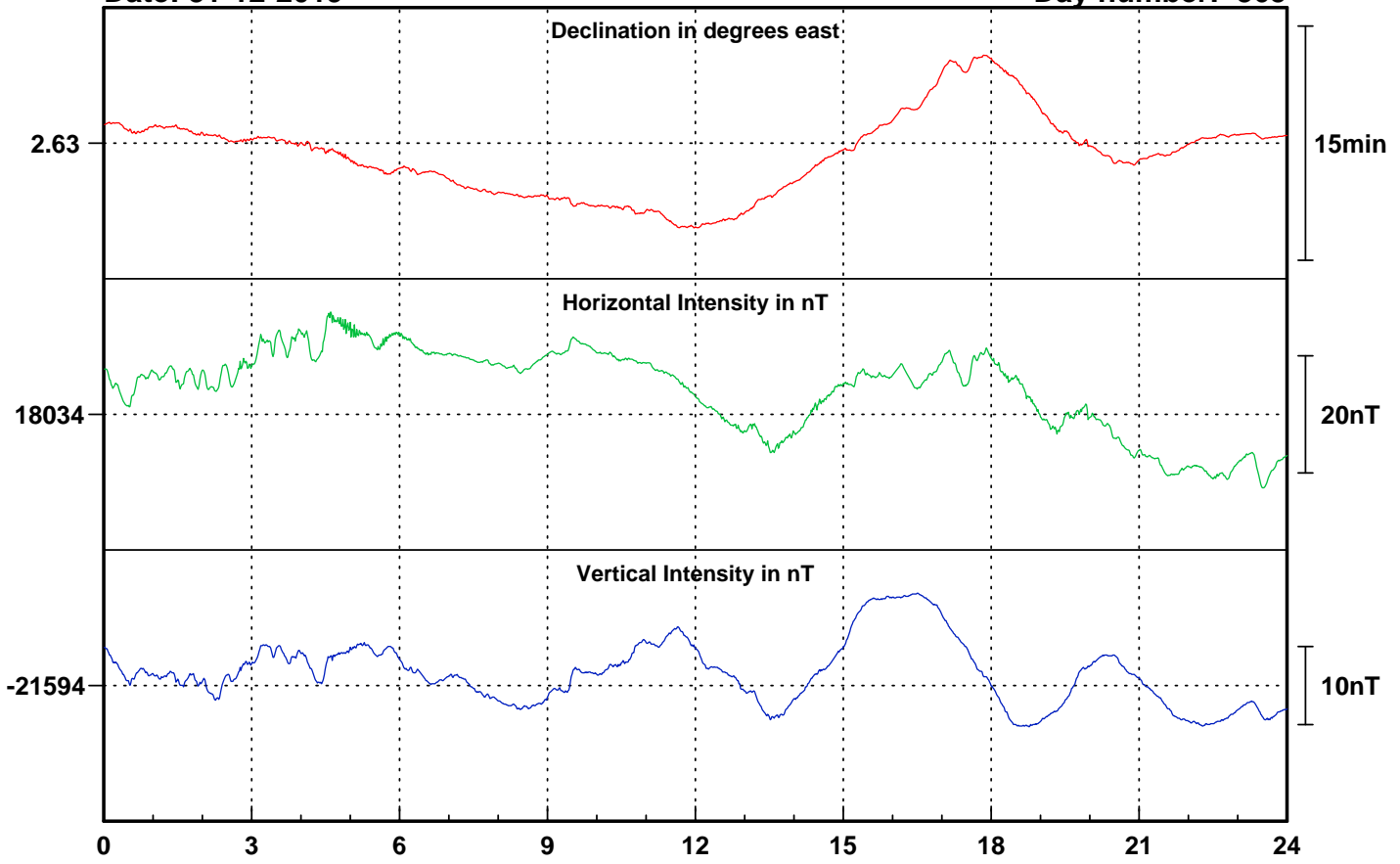
Day number: 364



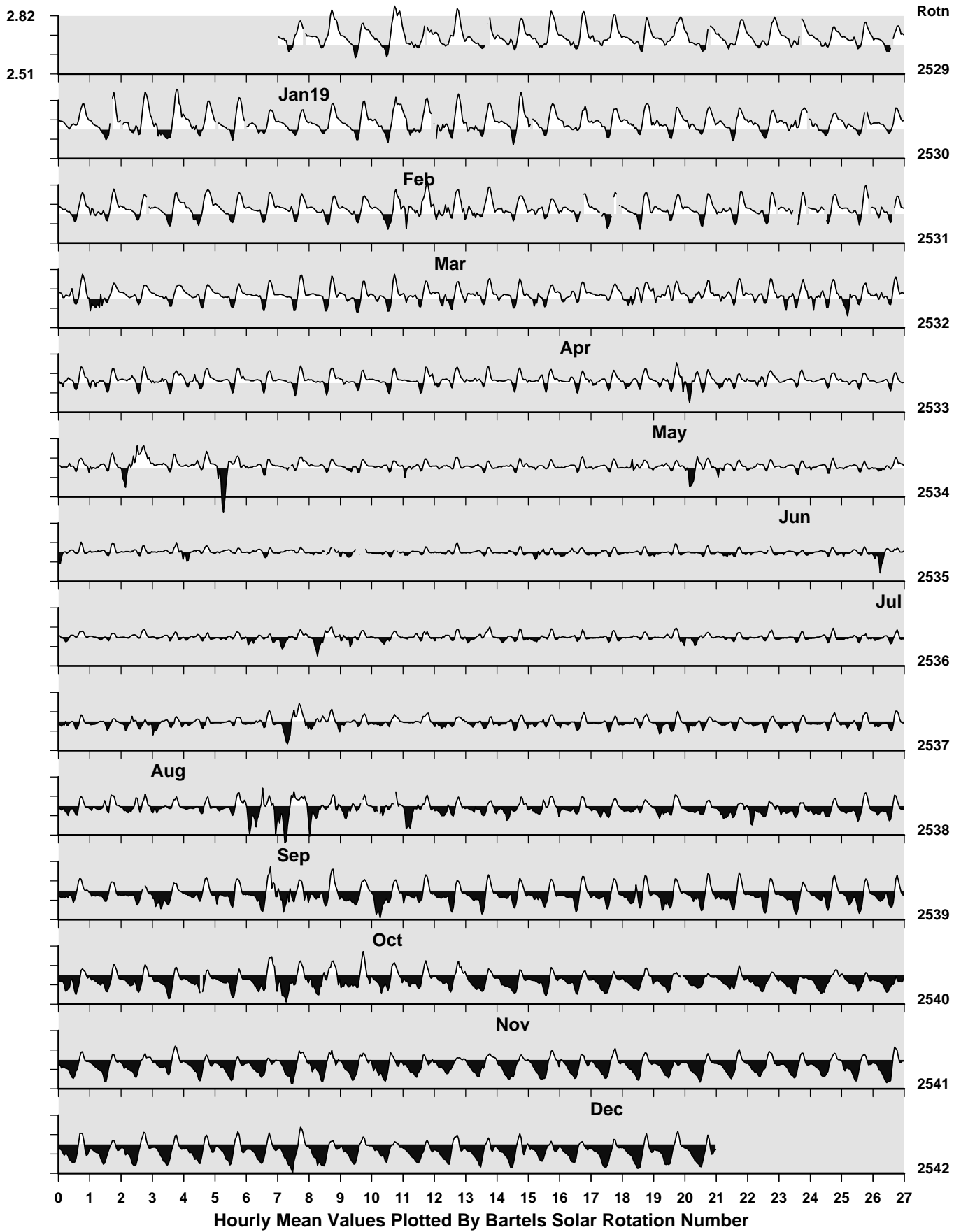
Date: 31-12-2019

# Falkland Islands

Day number: 365



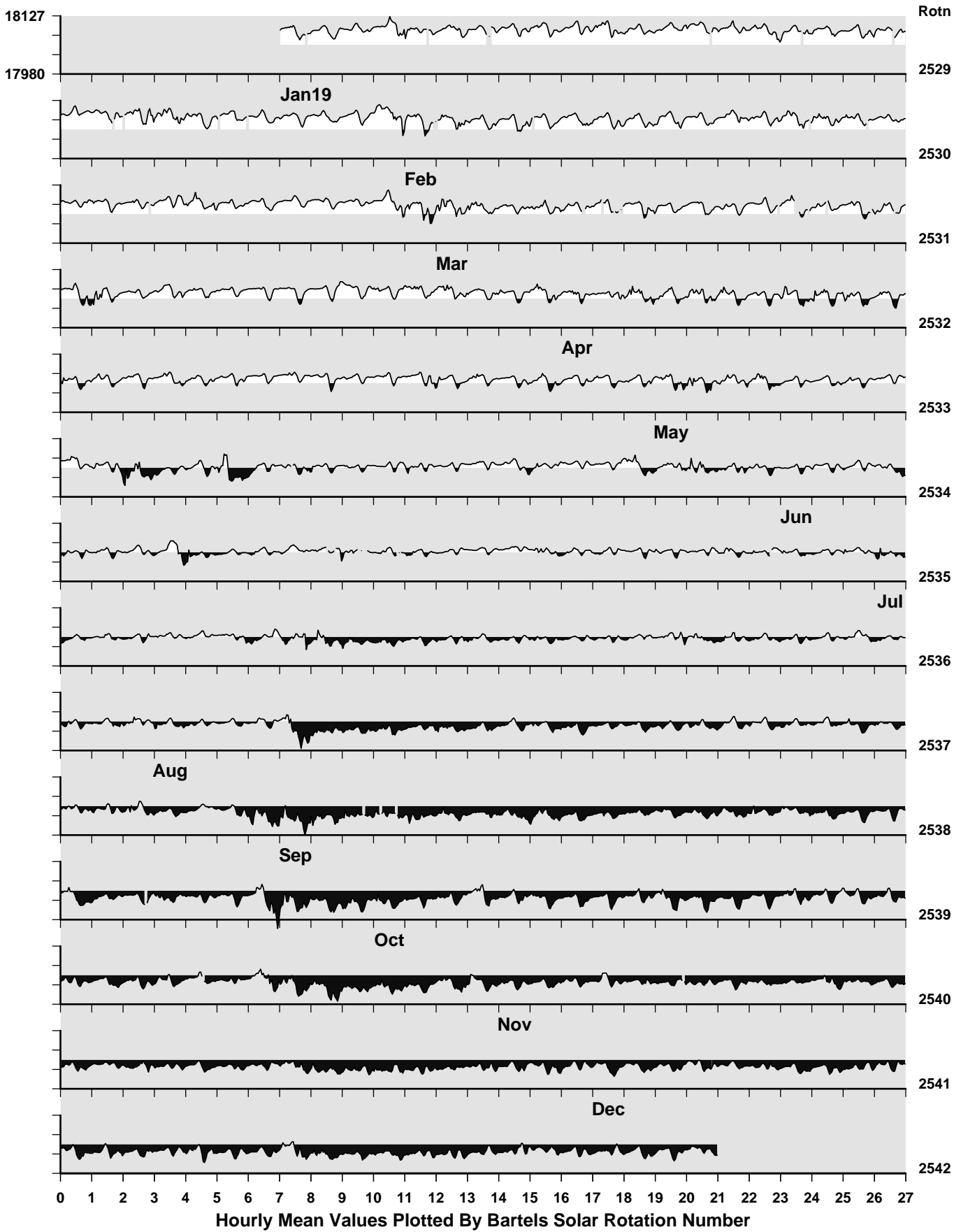
# Falkland Islands Observatory: Declination (degrees)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

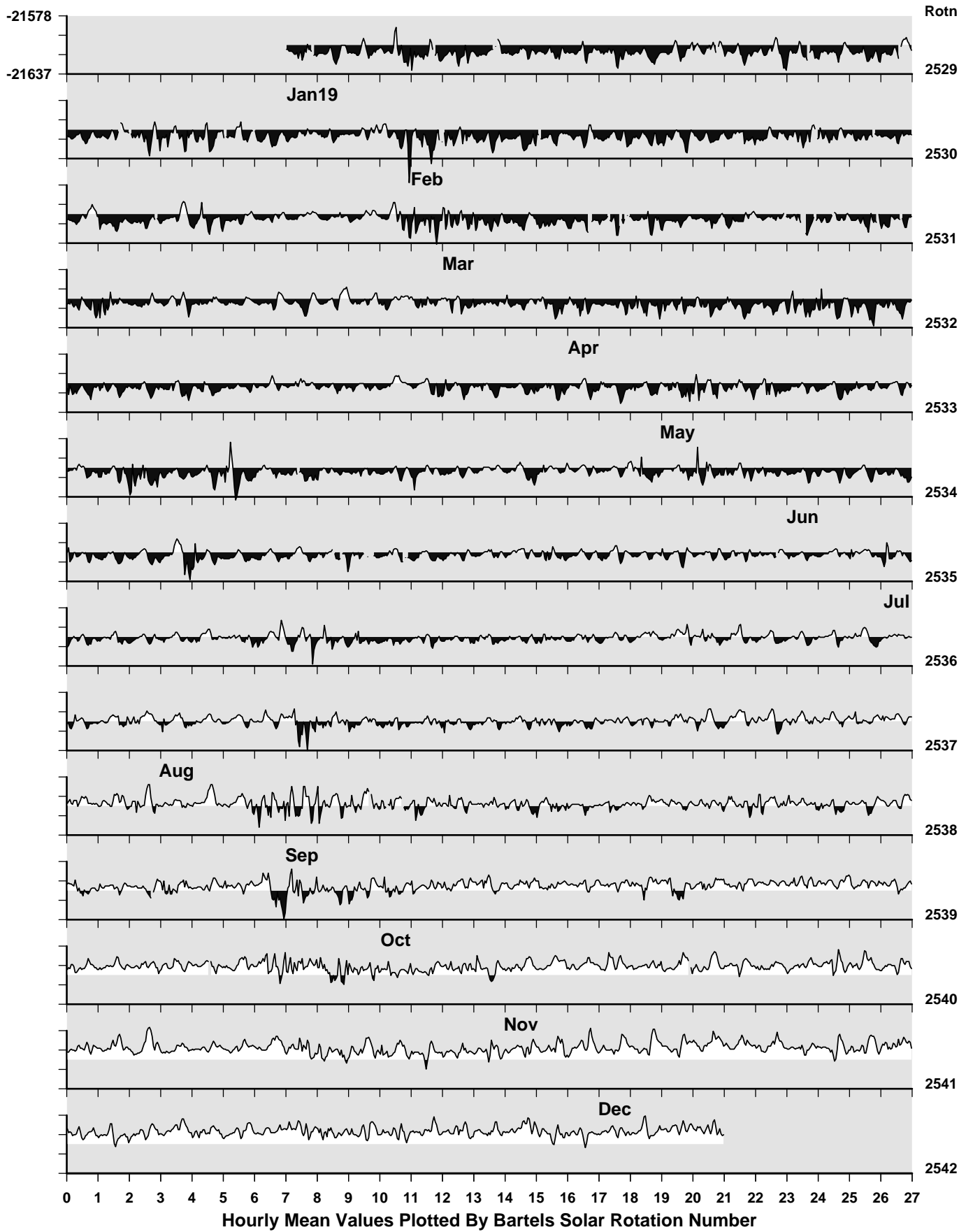


# Falkland Islands Observatory: Horizontal Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

# Falkland Islands Observatory: Vertical Intensity (nT)



# Falklands Is Observatory 2019

Daily Mean Declination (deg)

2.66

10min

Daily Mean Horizontal Intensity (nT)

18053

100nT

Daily Mean Vertical Intensity (nT)

-21608

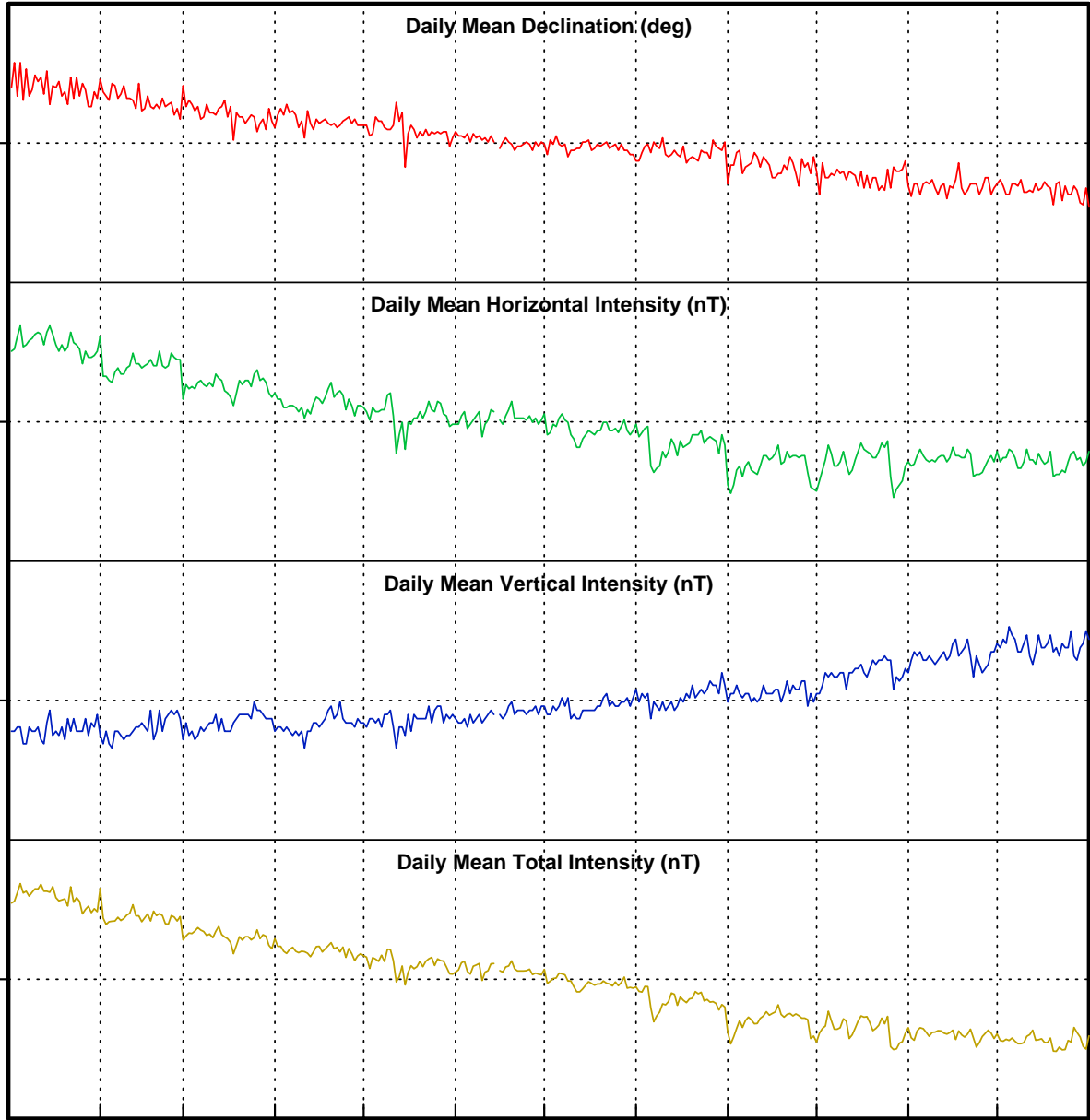
50nT

Daily Mean Total Intensity (nT)

28157

75nT

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



### Monthly Mean Values for Port Stanley Observatory 2019

Month	<i>D</i>	<i>H</i>	<i>I</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>
January	2° 42.5′	18091 nT	-50° 04.3′	18070 nT	855 nT	-21615 nT	28186 nT
February	2° 41.9′	18079 nT	-50° 05.4′	18059 nT	851 nT	-21614 nT	28179 nT
March	2° 41.2′	18071 nT	-50° 06.1′	18051 nT	847 nT	-21613 nT	28172 nT
April	2° 40.9′	18062 nT	-50° 06.9′	18042 nT	845 nT	-21613 nT	28167 nT
May	2° 40.5′	18056 nT	-50° 07.4′	18036 nT	843 nT	-21612 nT	28162 nT
June	2° 39.9′	18055 nT	-50° 07.4′	18035 nT	840 nT	-21611 nT	28160 nT
July	2° 39.6′	18049 nT	-50° 07.7′	18030 nT	838 nT	-21609 nT	28155 nT
August	2° 39.4′	18042 nT	-50° 08.3′	18022 nT	836 nT	-21607 nT	28149 nT
September	2° 38.8′	18032 nT	-50° 09.1′	18013 nT	833 nT	-21606 nT	28142 nT
October	2° 38.2′	18034 nT	-50° 08.6′	18015 nT	830 nT	-21601 nT	28139 nT
November	2° 37.8′	18035 nT	-50° 08.1′	18016 nT	827 nT	-21597 nT	28137 nT
December	2° 37.6′	18034 nT	-50° 08.0′	18015 nT	826 nT	-21594 nT	28135 nT

#### Note

i. The values shown here are provisional.