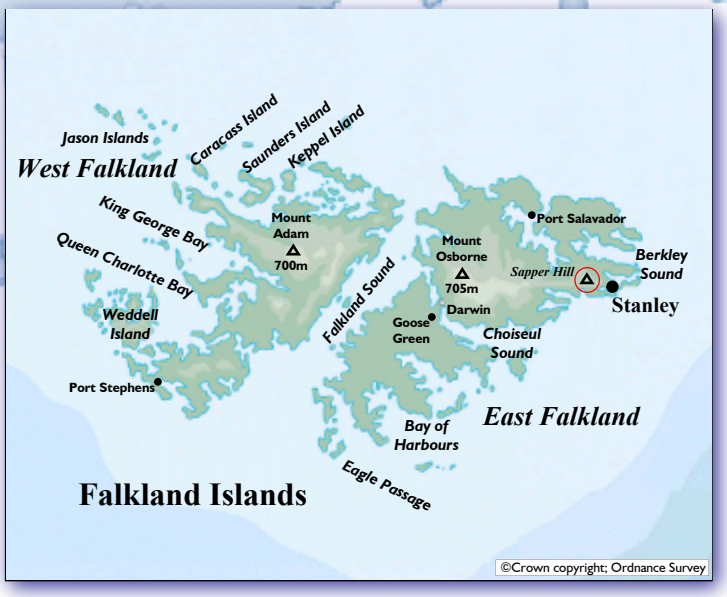
BRITISH GEOLOGICAL SURVEY

# Port Stanley Observatory *Monthly Magnetic Bulletin*

## December 2009

## 09/12/PS




British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

# PORT STANLEY OBSERVATORY MAGNETIC DATA

## 1. Introduction

Port Stanley Observatory was installed by BGS with financial support from a consortium of oil companies and became operational in February 1994.

This bulletin is published to meet the needs of users of geomagnetic data. Magnetic observatory data is presented as a series of plots of one-minute, hourly and daily values, followed by a tabulation 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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British Geological Survey
Murchison House, West Mains Road
Edinburgh EH9 3LA
Scotland, UK

Tel: +44 (0) 131 667 1000
Fax: +44 (0) 131 650 0265
E-mail: orba@bgs.ac.uk
Internet: *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. The observatory co-ordinates are:

| | | |
|---|---|---|
| *Geographic:* | *51°42.24′S* | *302°06.42′E* |
| *Geomagnetic:* | *41°40.92′S* | *11°25.98′E* |
| *Height above mean sea level:* | | *135 m* |

The geomagnetic co-ordinates are calculated using the 10th generation International Geomagnetic Reference Field at epoch 2009.5.

## 3. The Observatory Operation

### 3.1 GDAS

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

There are two sets of sensors used for making magnetic measurements. A triaxial 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 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 whilst the total field intensity samples are filtered using a 7-point cosine filter.

### 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 once per week. 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. Data Presentation

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 a page and show the 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 on the surface of the Sun may recur after 27 days: the same is true for geomagnetically quiet intervals. Plotting the data in this way highlights this recurrence, and also illustrates seasonal and diurnal variations throughout the year.

### 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. This data is provisional. It is anticipated that provisional values will not be altered by more than a few nT or tenths of arcminutes before being made definitive.

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# PORT STANLEY OBSERVATORY

ABSOLUTE OBSERVATIONS

| | | DECLINATION | | | INCLINATION | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Day Number** | **Time (UT)** | **Absolute (º)** | **Baseline (º)** | **Time (UT)** | **Inclination (º)** | **Total Field Intensity (nT)** | **H Absolute (nT)** | **H Baseline (nT)** | **Z Absolute (nT)** | **Z Baseline (nT)** | **Observer** |
| 12-Dec-09 | 346 | 16:36 | 3.4742 | 3.6733 | 16:43 | -49.2830 | 28764.7 | 18763.9 | 18857.1 | -21801.9 | -21931.0 | NB |
| 12-Dec-09 | 346 | 16:51 | 3.4800 | 3.6683 | 16:57 | -49.2845 | 28766.3 | 18764.4 | 18856.3 | -21803.6 | -21931.4 | NB |
| 27-Dec-09 | 361 | 14:38 | 3.4986 | 3.6650 | 14:47 | -49.3343 | 28766.0 | 18745.2 | 18852.8 | -21819.7 | -21934.3 | NB |
| 27-Dec-09 | 361 | 14:55 | 3.4998 | 3.6600 | 15:01 | -49.3297 | 28763.3 | 18745.2 | 18853.1 | -21816.2 | -21934.6 | NB |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
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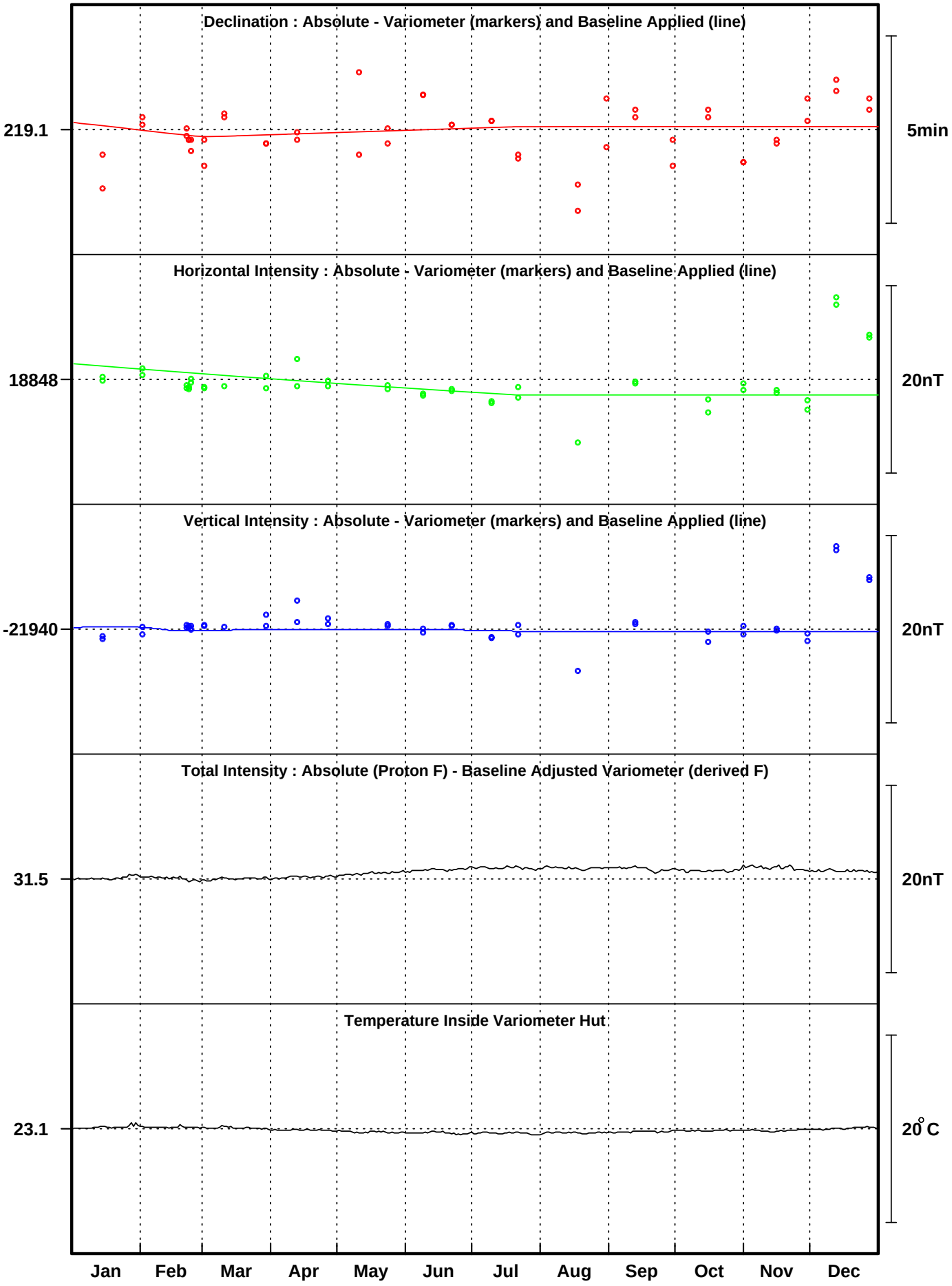
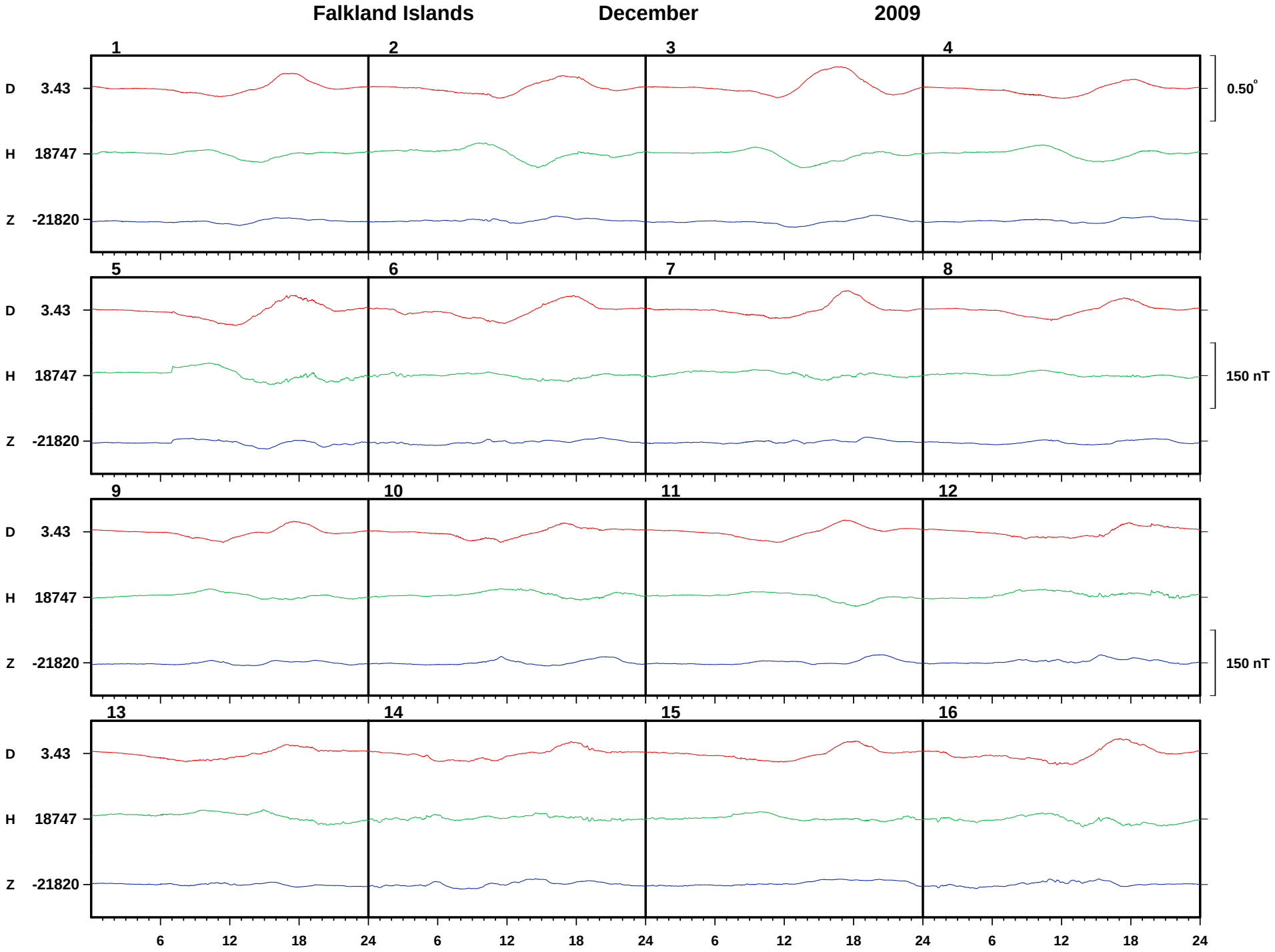
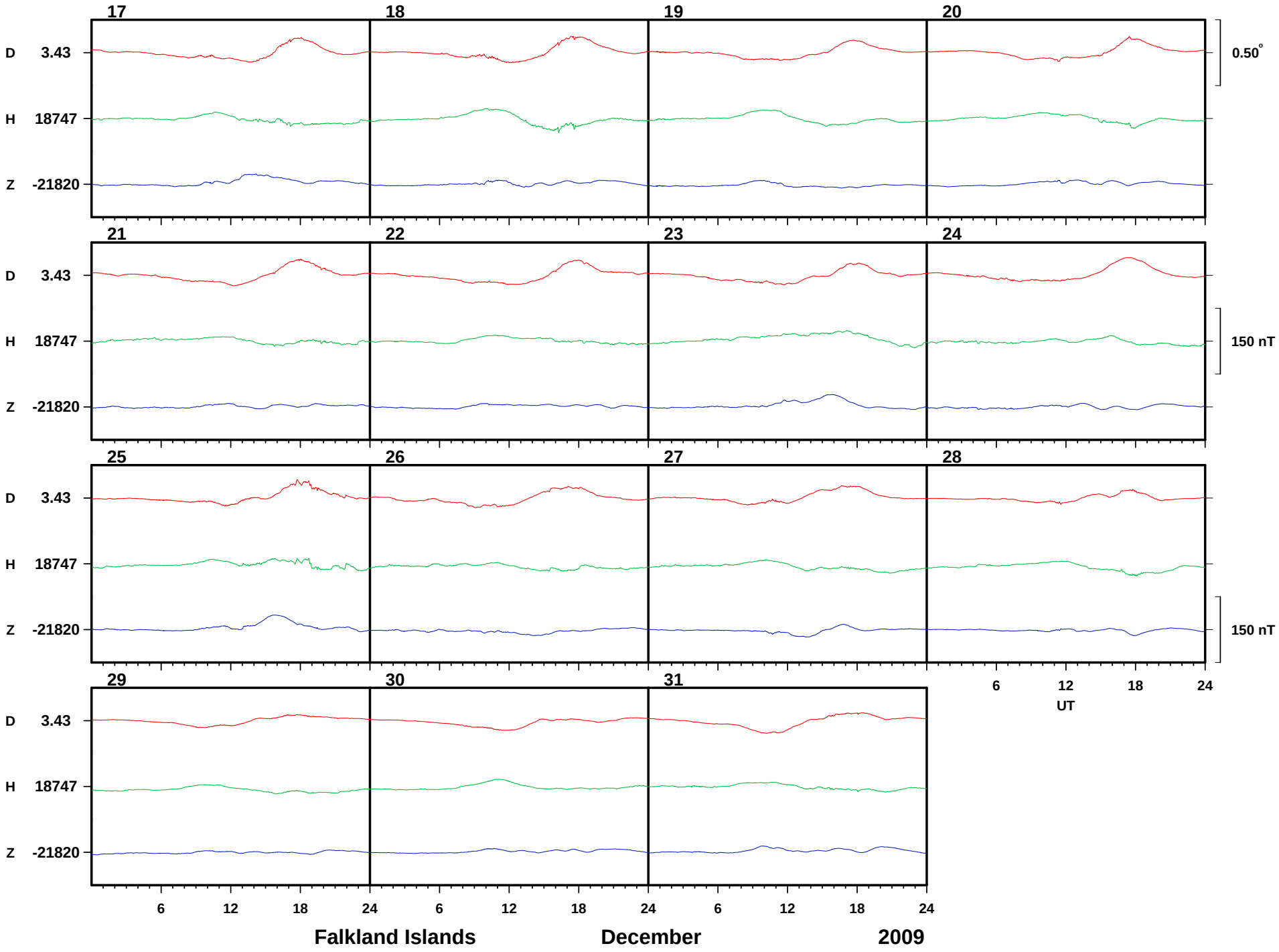
| | | | | | | | | | | | | |

# Falkland Island 2009




Falkland Islands
December
2009
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
D
3.43
H
18747
Z
-21820
0.50°
150 nT
150 nT
6
12
18
24


17
18
19
20
D 3.43
H 18747
Z -21820
0.50°
21
22
23
24
150 nT
25
26
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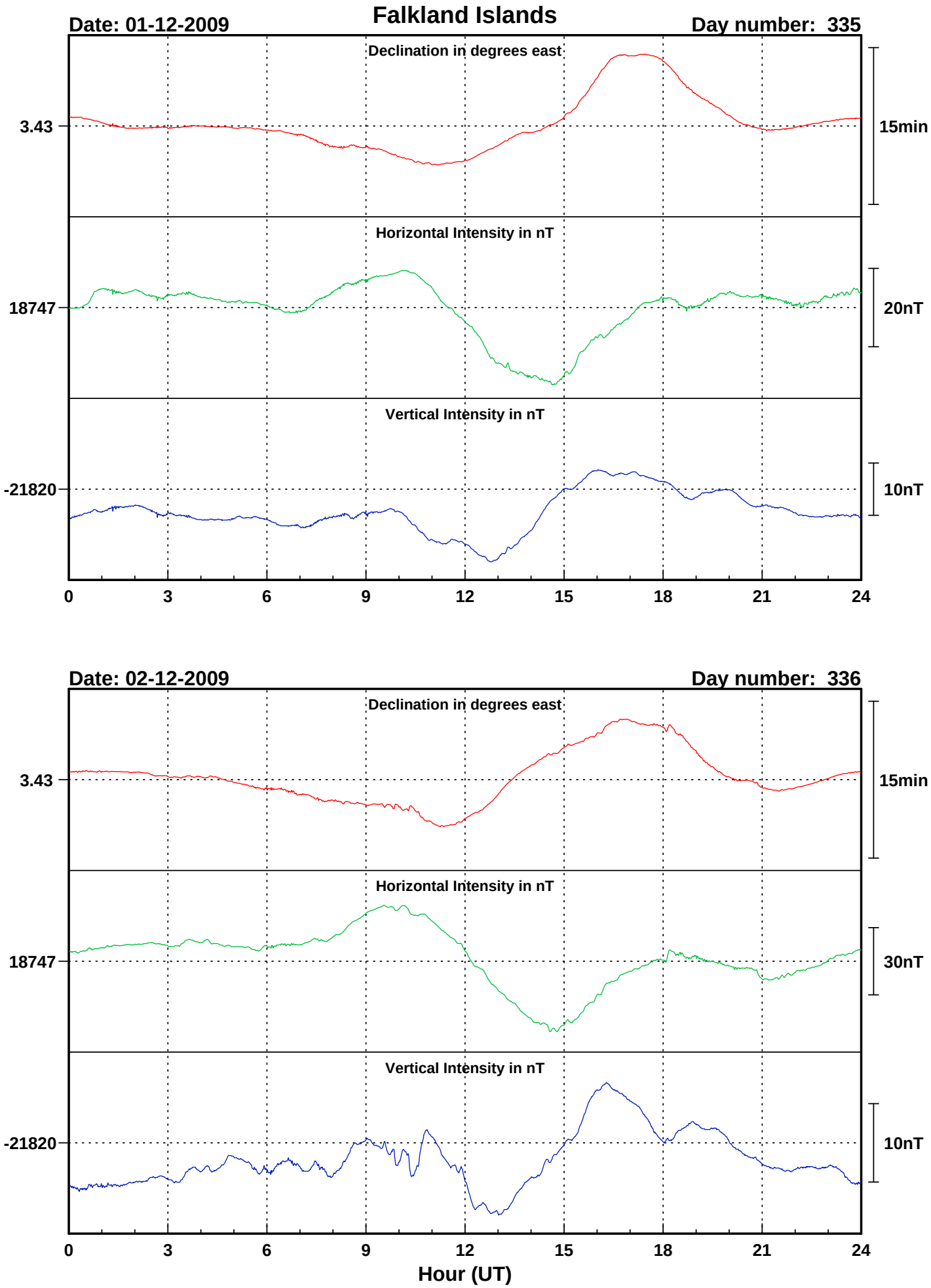
28
29
30
31
6
12
18
24
UT
Falkland Islands
December
2009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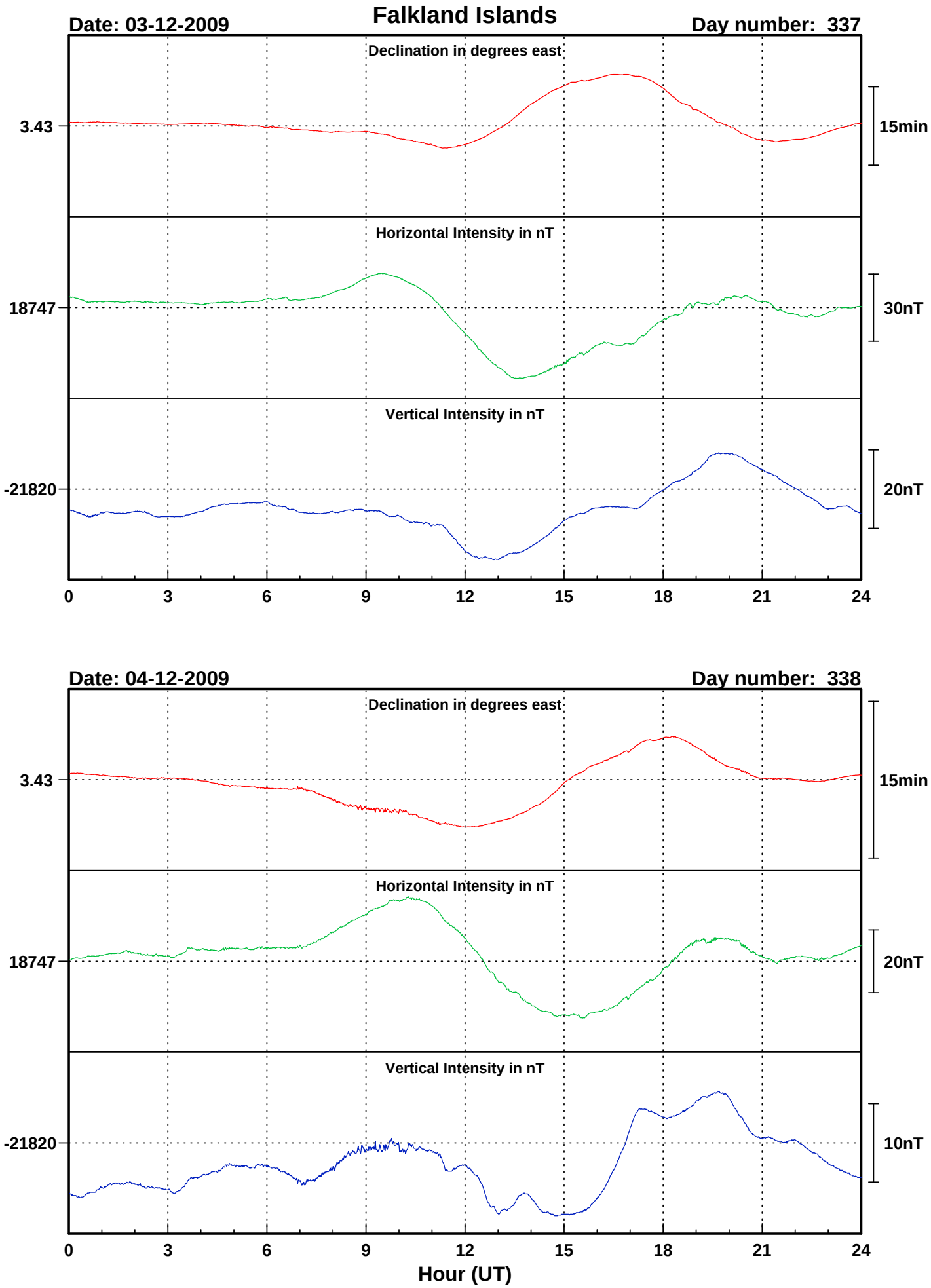
Day number: 335
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
0
3
6
9
12
15
18
21
24
Date: 02-12-2009
Day number: 336
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
30nT
Vertical Intensity in nT
-21820
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)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Day number: 337
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
30nT
Vertical Intensity in nT
-21820
20nT
0
3
6
9
12
15
18
21
24
Date: 04-12-2009
Day number: 338
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
0
3
6
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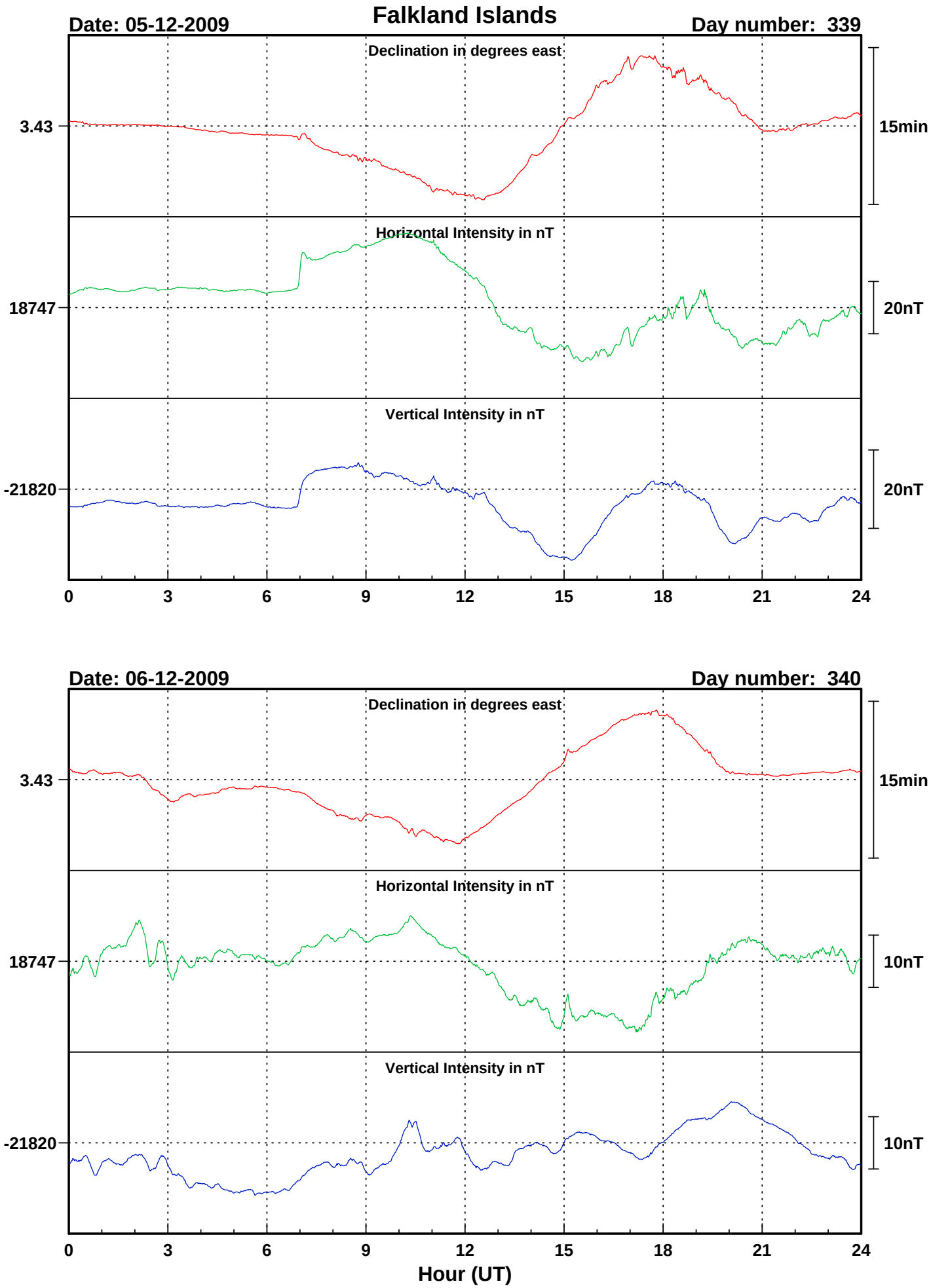
12
15
18
21
24
Hour (UT)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Day number: 339
Declination in degrees east
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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
20nT
0
3
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24
Date: 06-12-2009
Day number: 340
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
0
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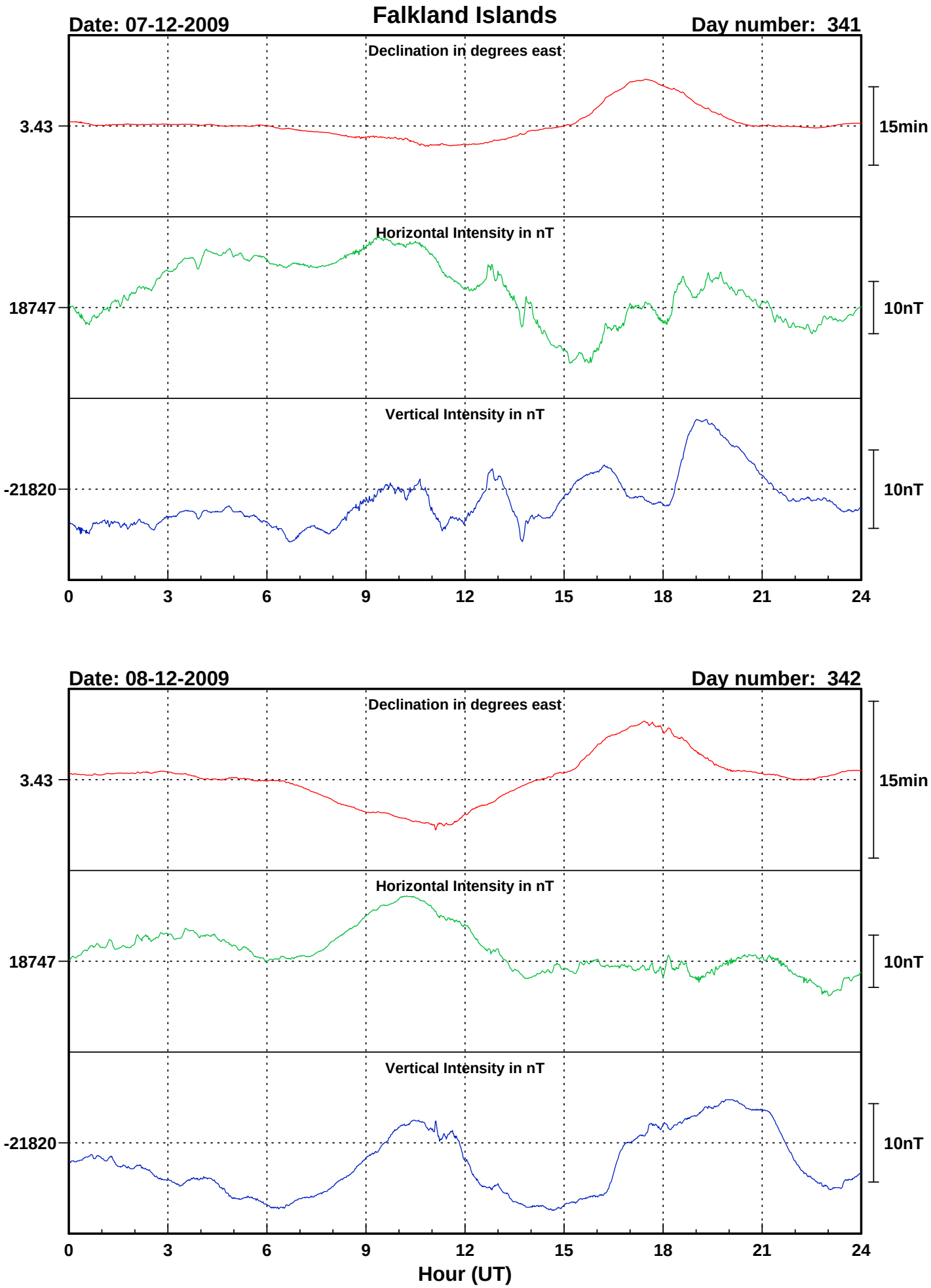
Hour (UT)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15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
0
3
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24
Date: 08-12-2009
Day number: 342
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
0
3
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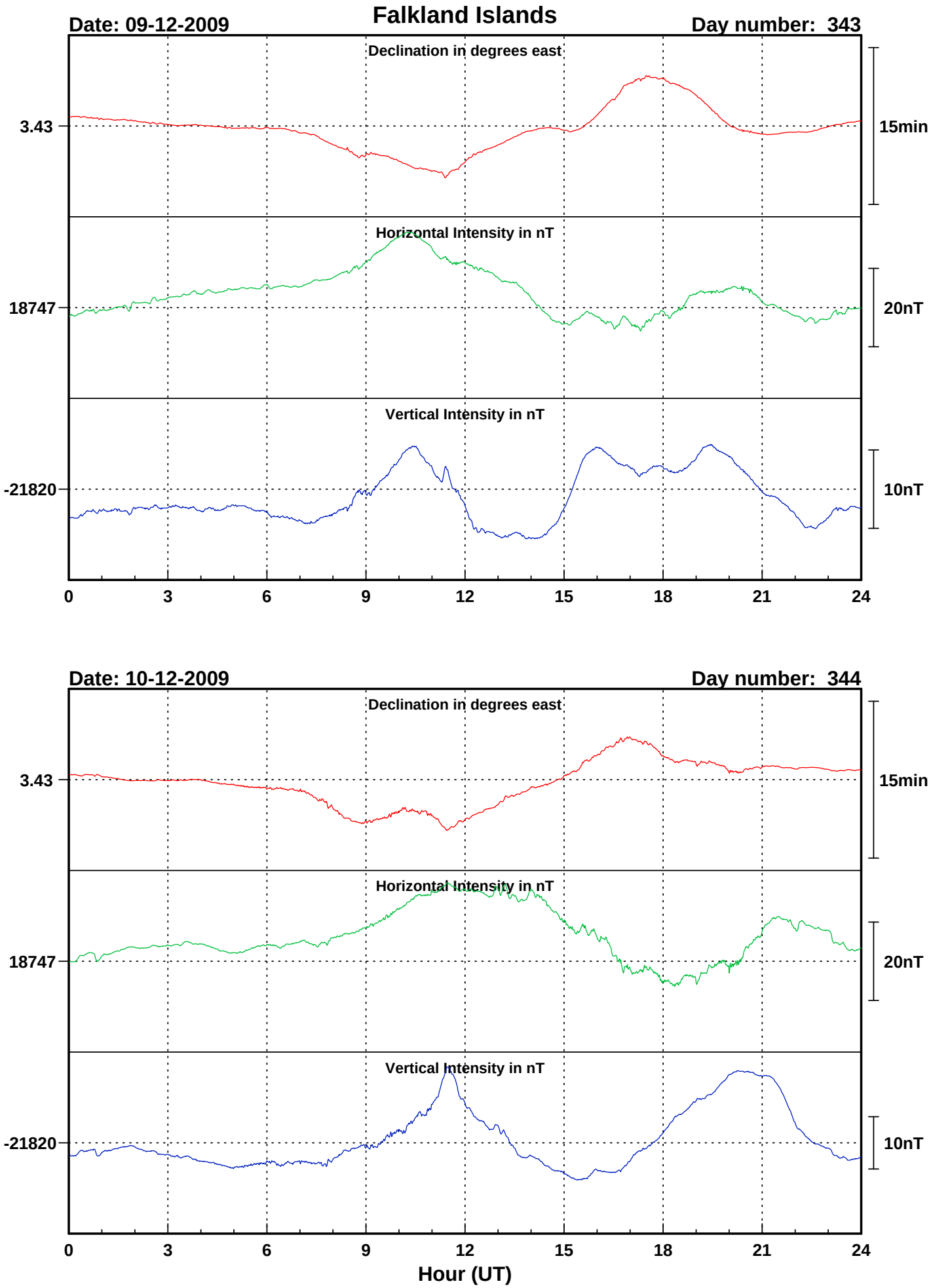
Hour (UT)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Day number: 343
Declination in degrees east
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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
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Date: 10-12-2009
Day number: 344
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
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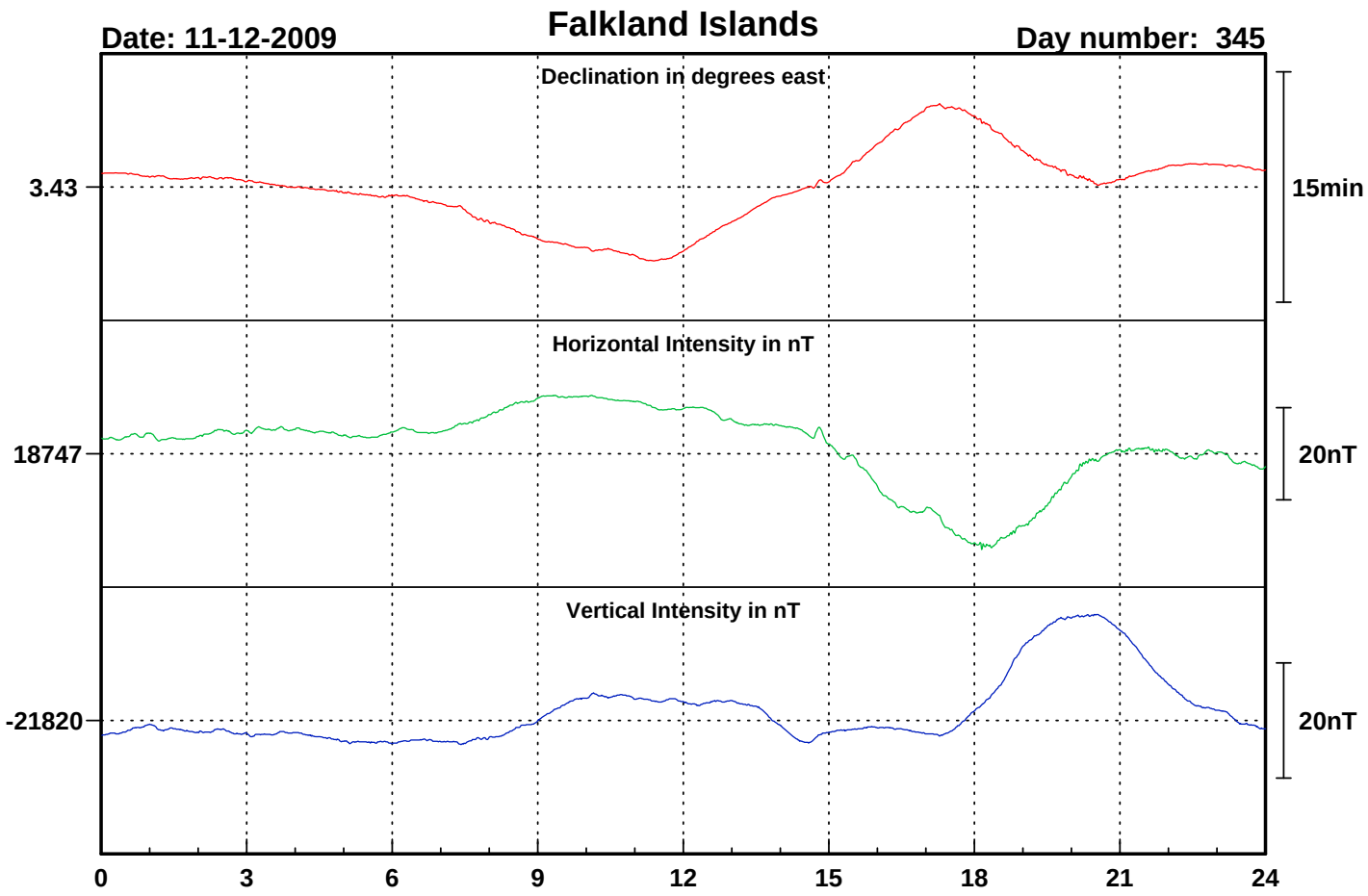
Hour (UT)


Falkland Islands
Date: 11-12-2009
Day number: 345
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
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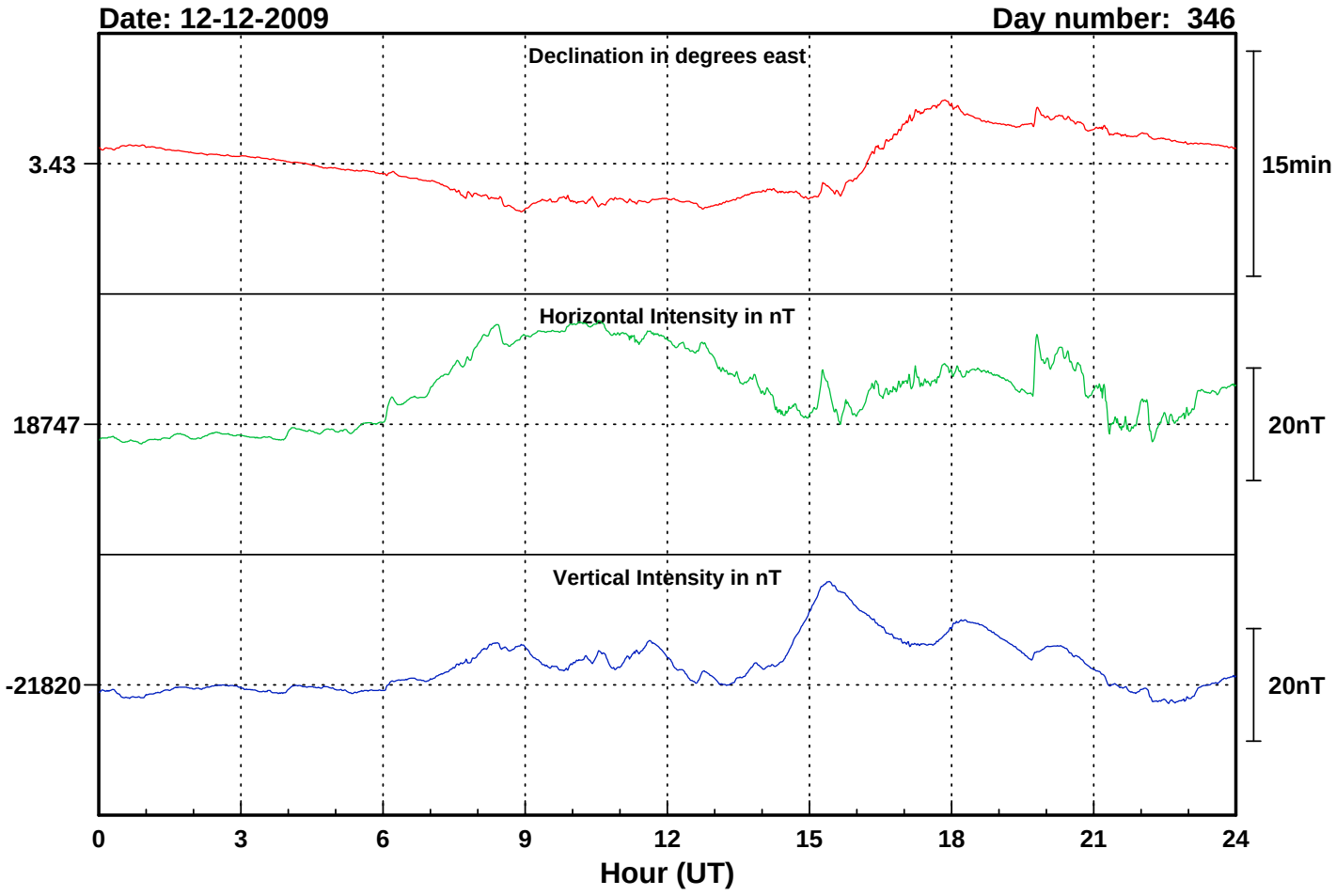
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Day number: 346
Declination in degrees east
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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
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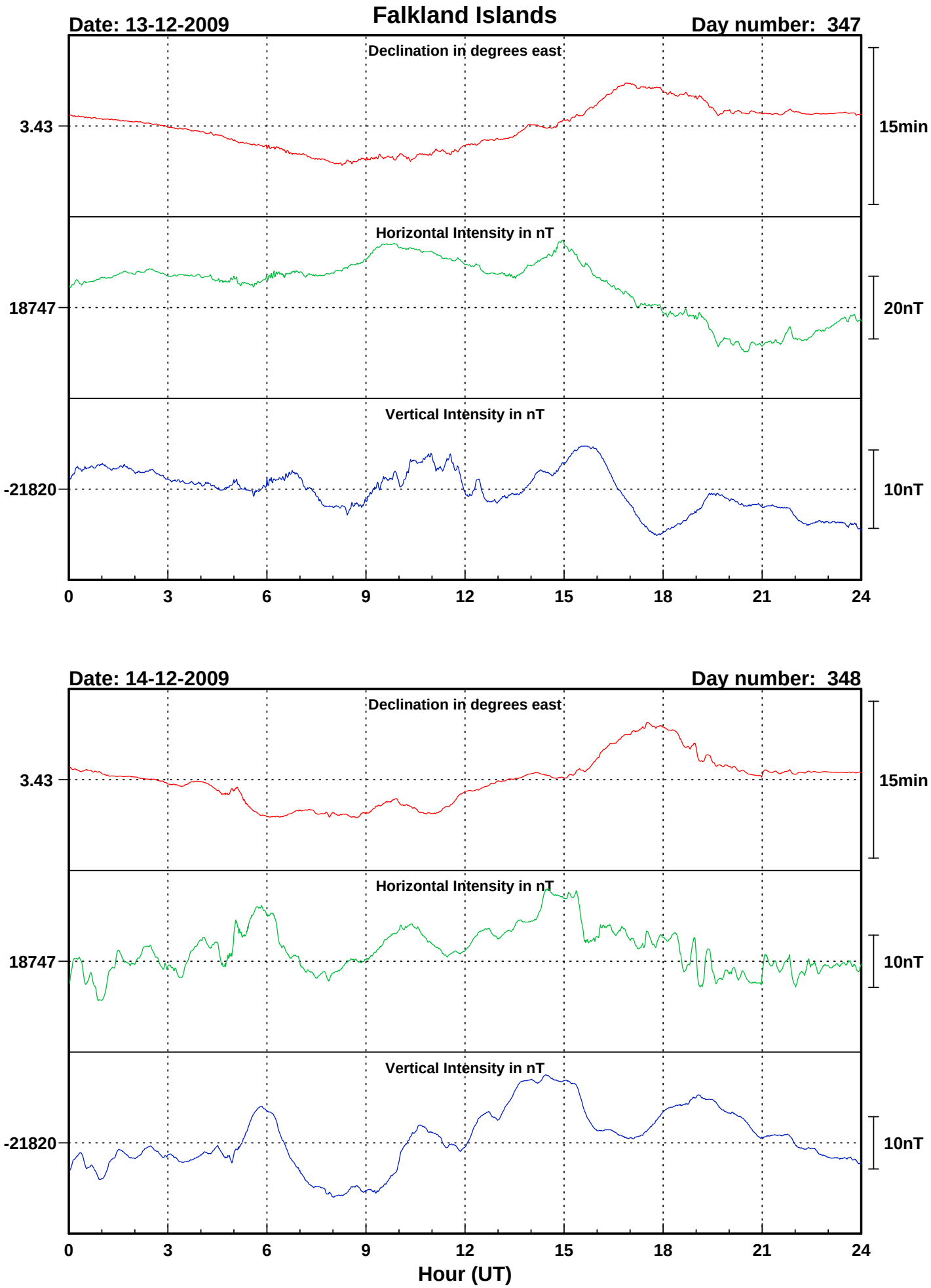
Hour (UT)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Day number: 347
Declination in degrees east
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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
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Date: 14-12-2009
Day number: 348
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
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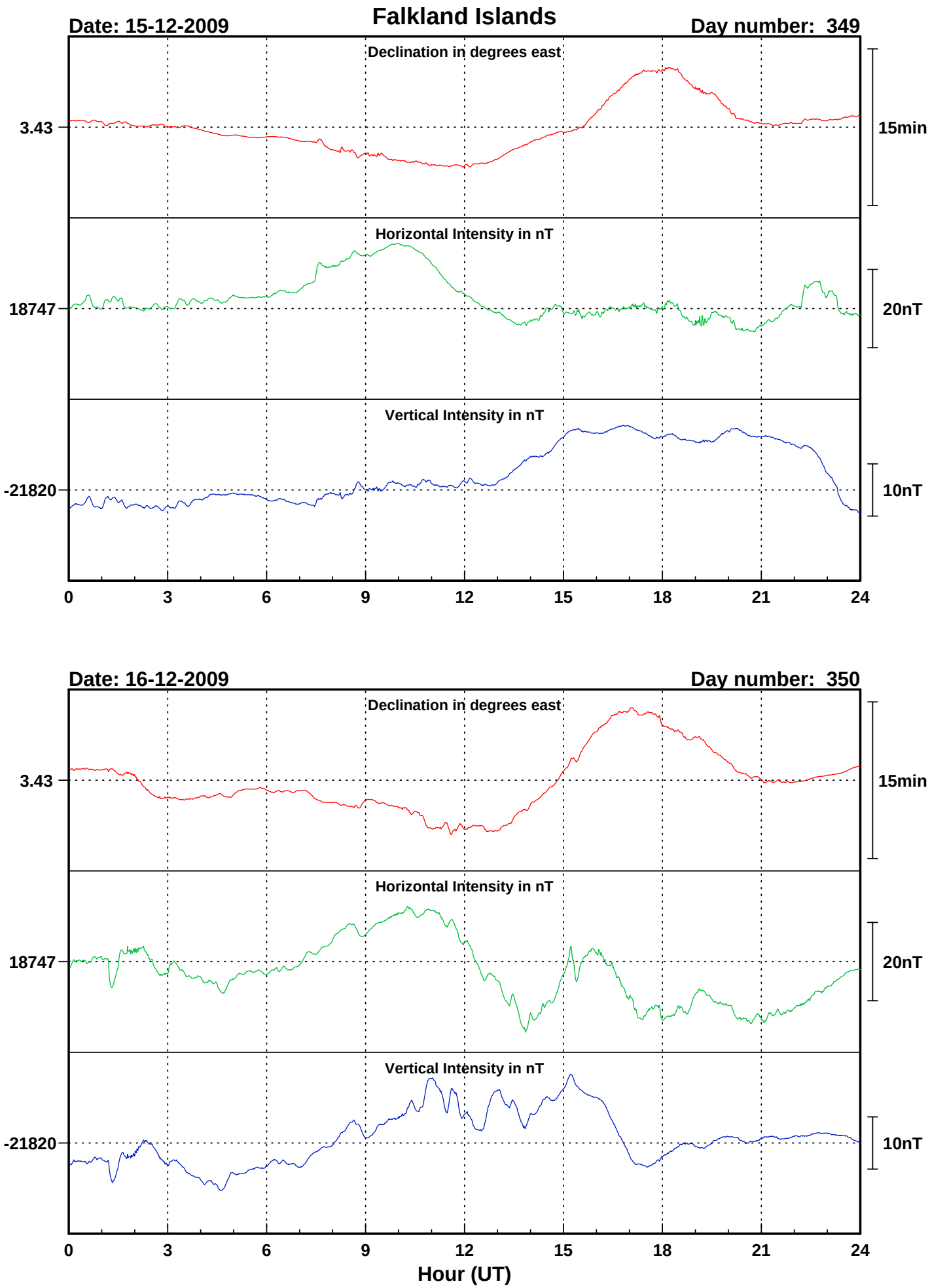
Hour (UT)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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
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Date: 16-12-2009
Day number: 350
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
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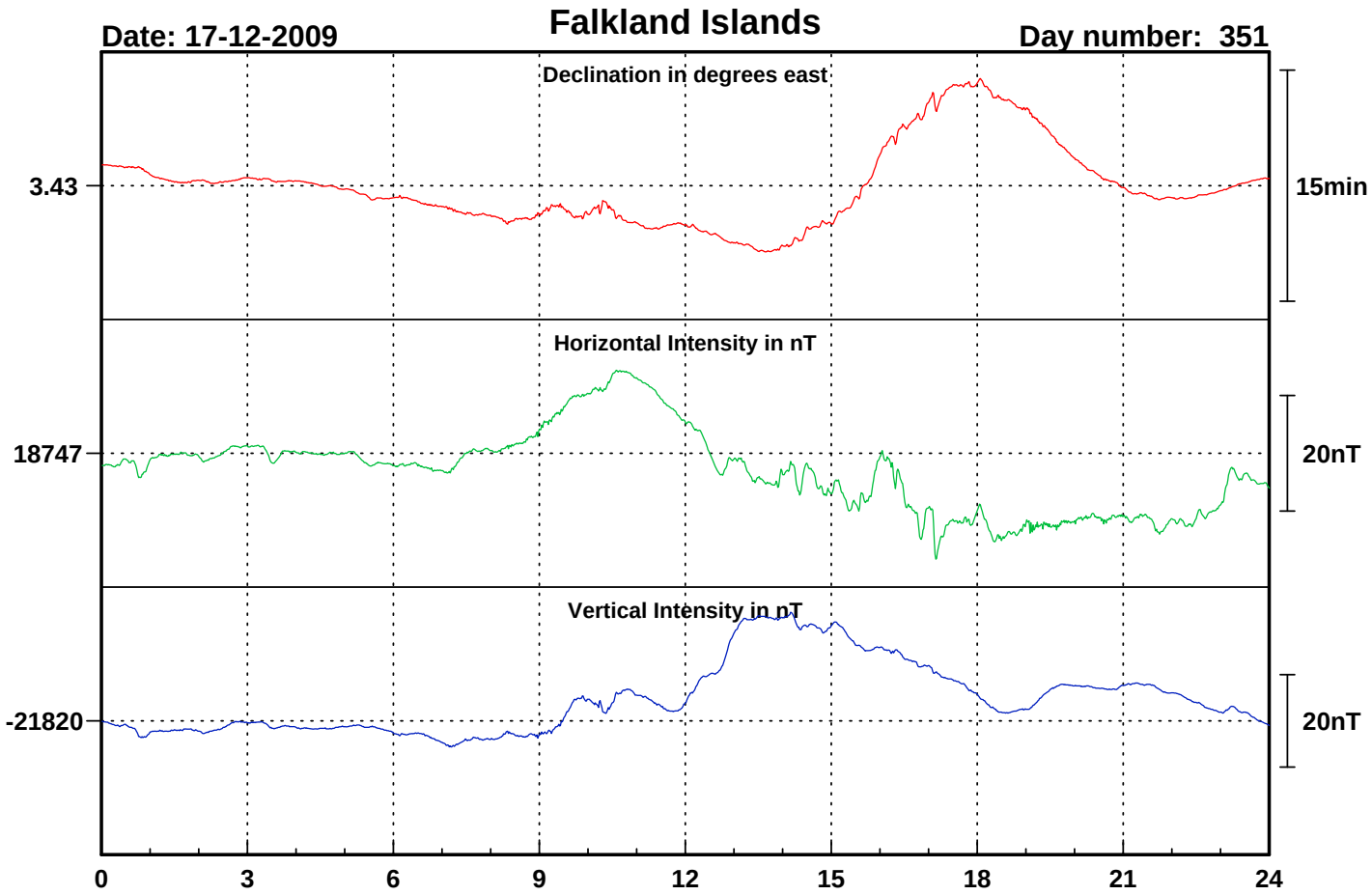
Hour (UT)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Day number: 351
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15min
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18747
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Vertical Intensity in nT
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20nT
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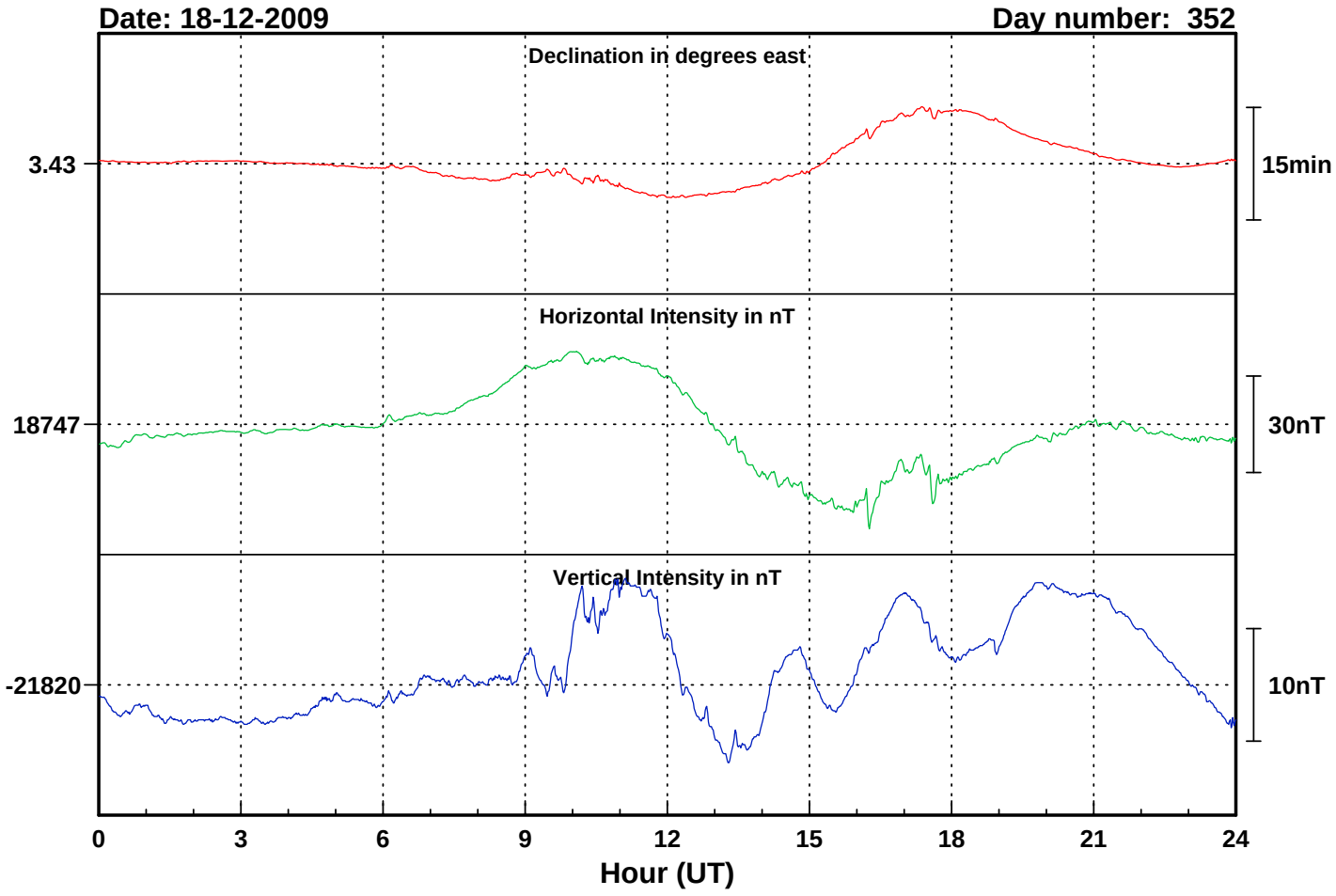
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Declination in degrees east
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15min
Horizontal Intensity in nT
18747
30nT
Vertical Intensity in nT
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10nT
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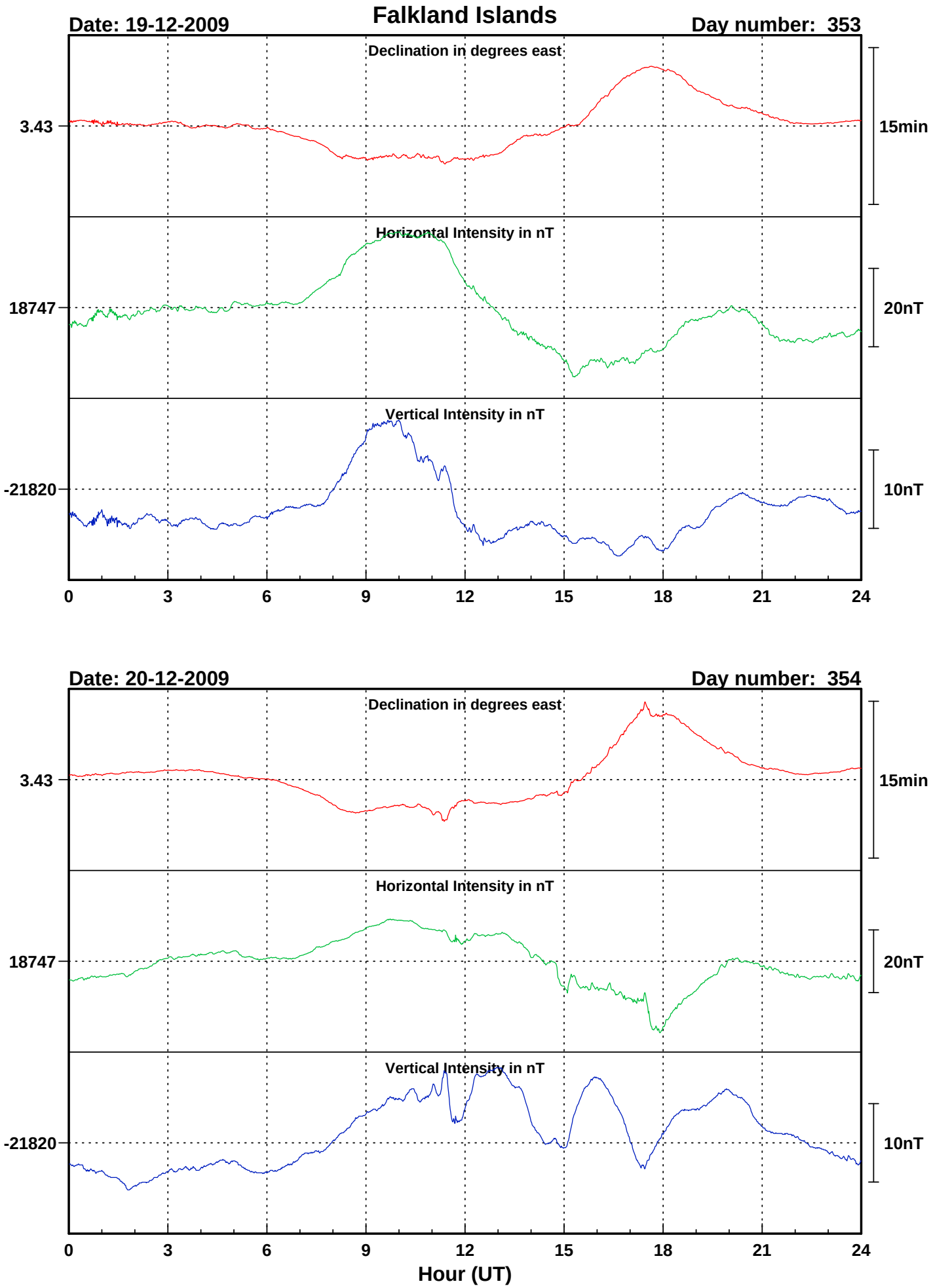
Hour (UT)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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
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Date: 20-12-2009
Day number: 354
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
10nT
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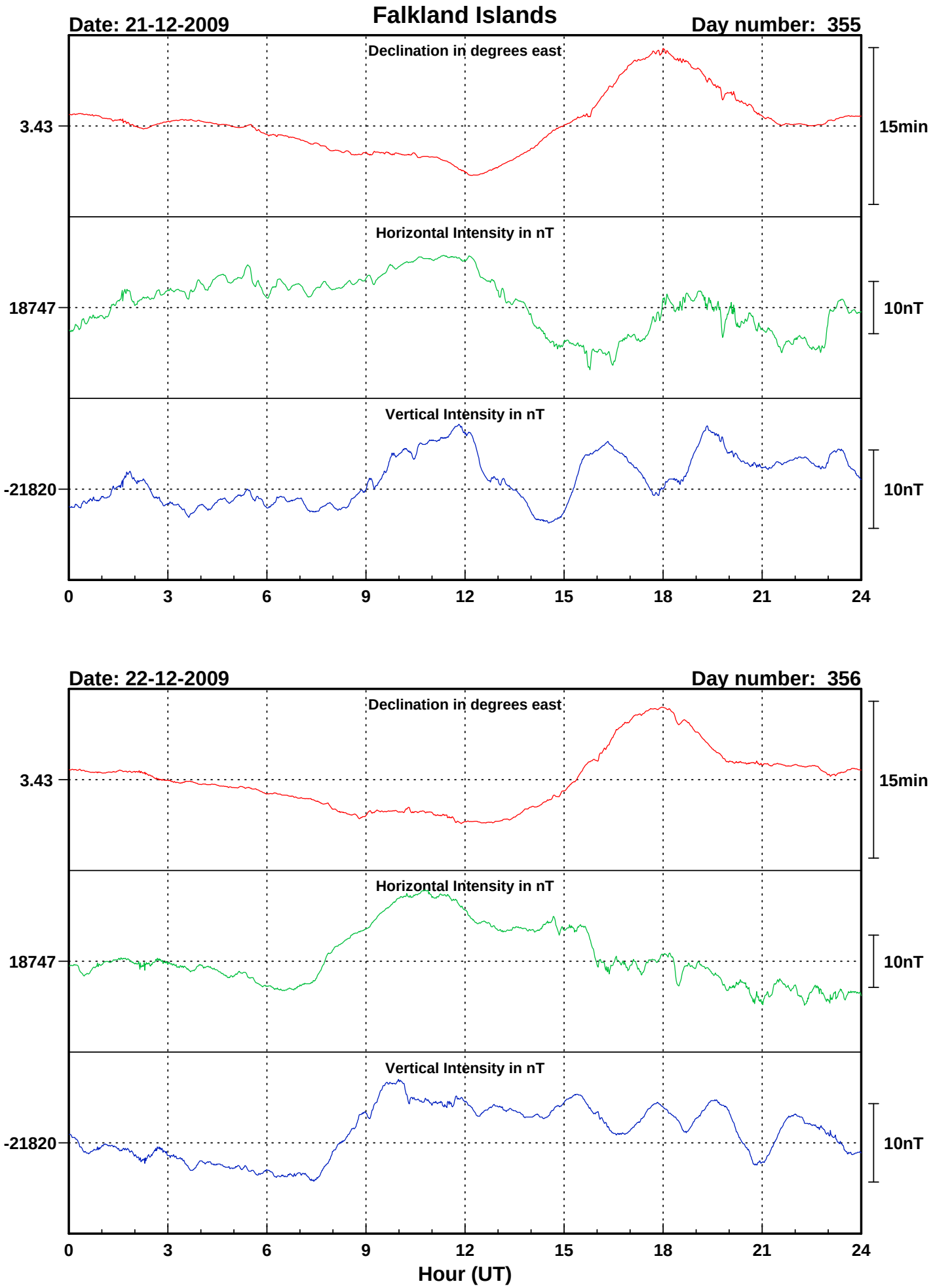
Hour (UT)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Day number: 355
Declination in degrees east
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15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
0
3
6
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24
Date: 22-12-2009
Day number: 356
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
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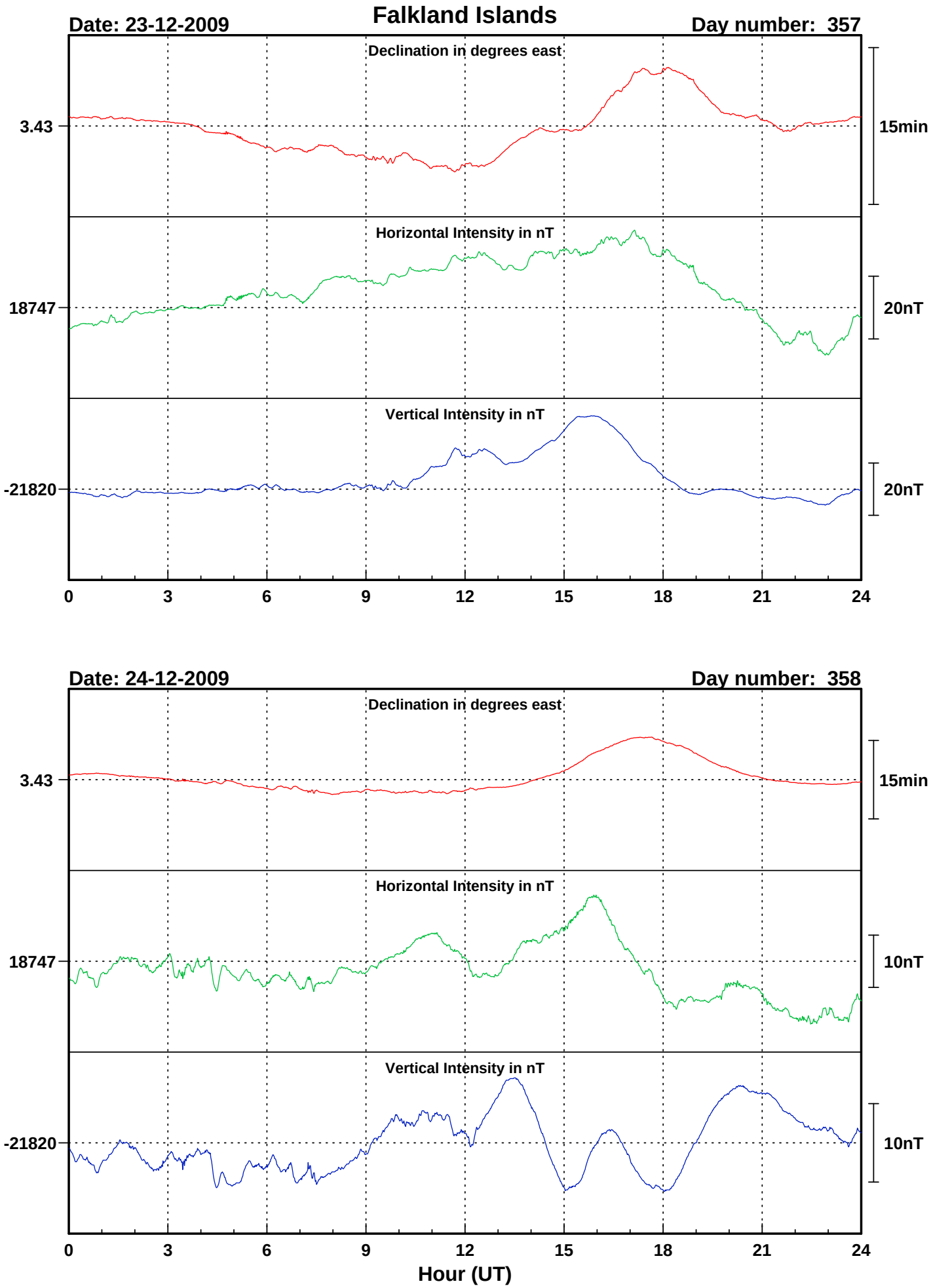
Hour (UT)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15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
-21820
20nT
0
3
6
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24
Date: 24-12-2009
Day number: 358
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
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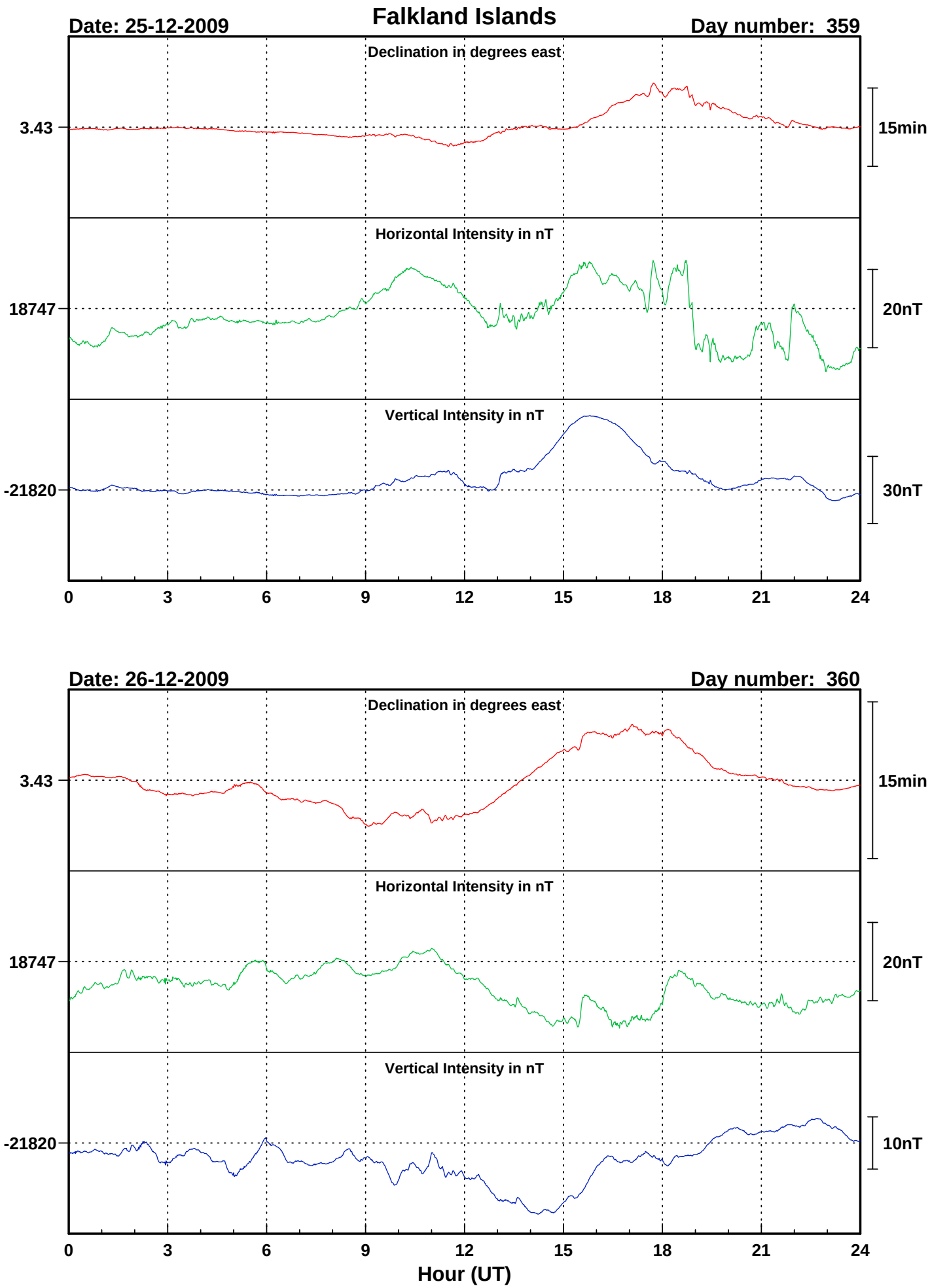
Hour (UT)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20nT
Vertical Intensity in nT
-21820
30nT
0
3
6
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18
21
24
Date: 26-12-2009
Day number: 360
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
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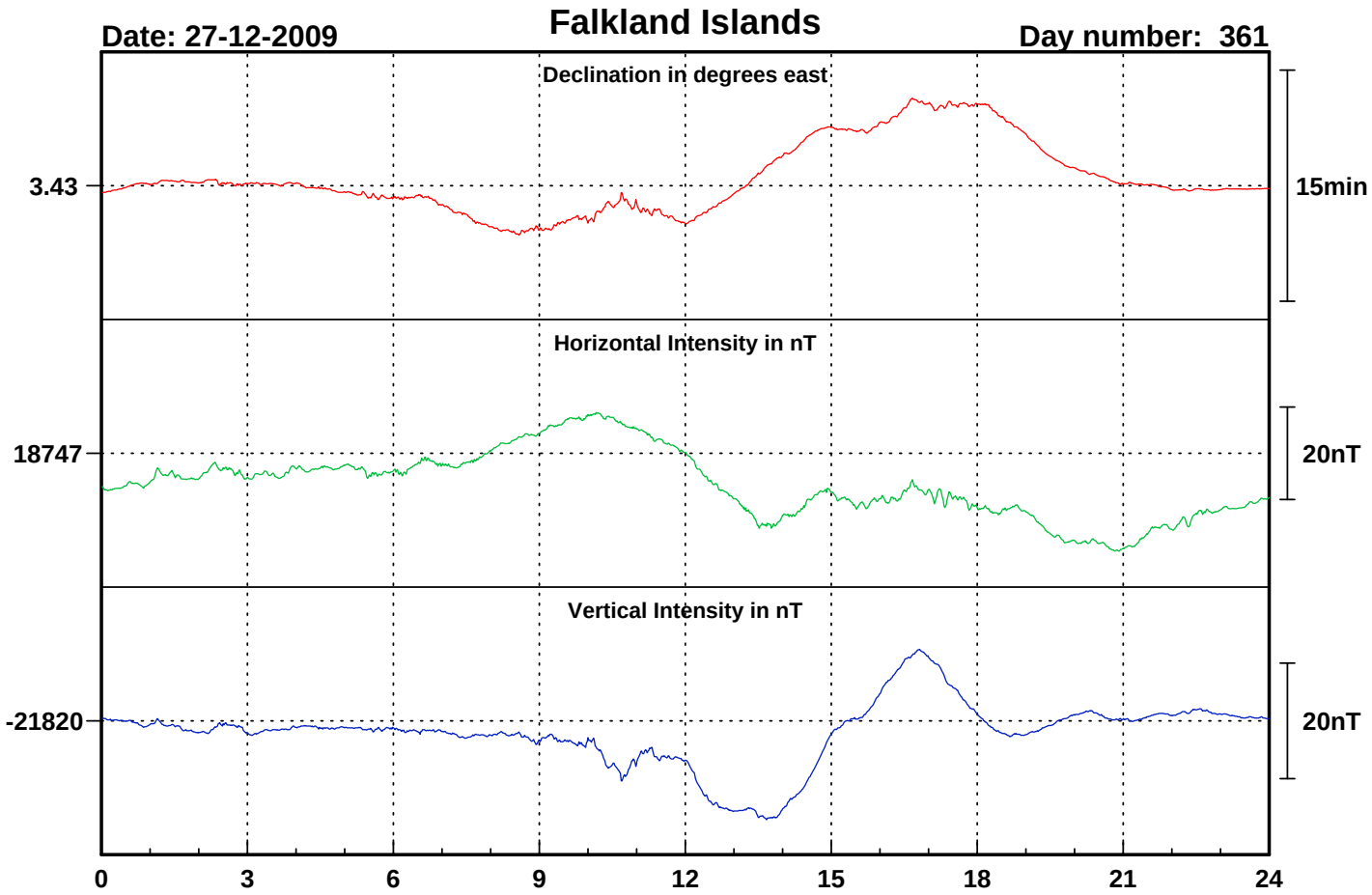
Hour (UT)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15min
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Vertical Intensity in nT
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0
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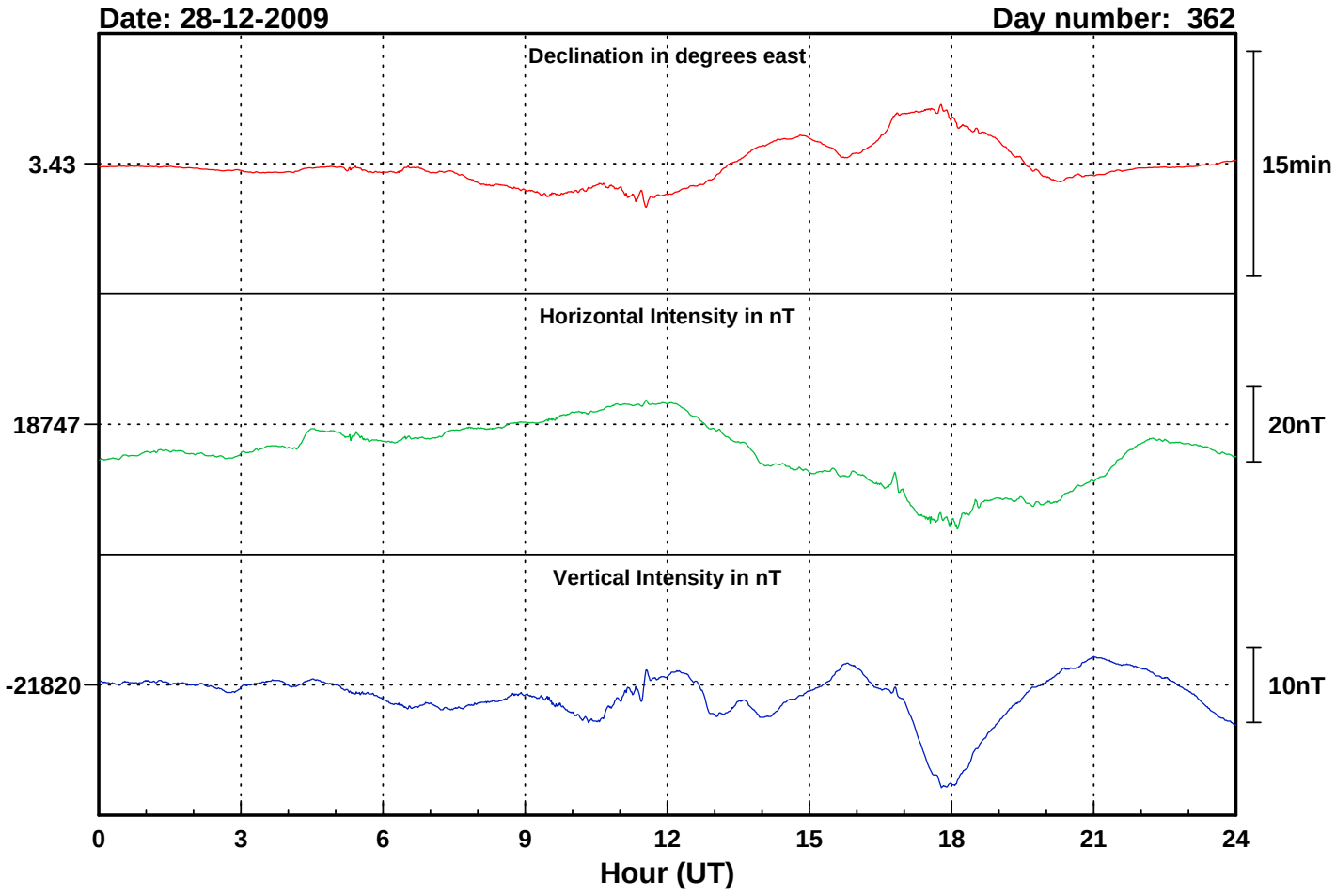
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Day number: 362
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15min
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18747
20nT
Vertical Intensity in nT
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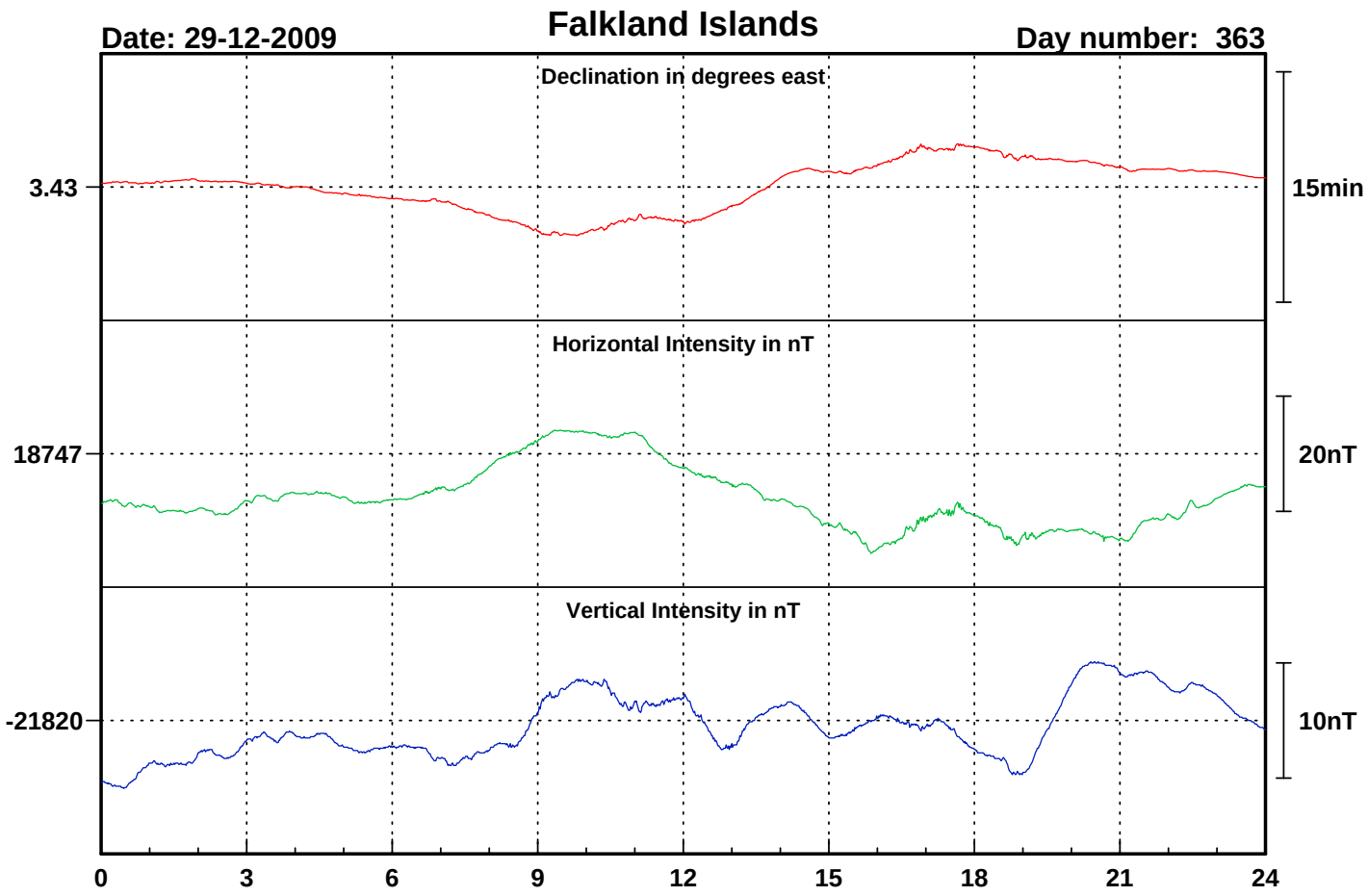
6
9
12
15
18
21
24
Hour (UT)


Falkland Islands
Date: 29-12-2009
Day number: 363
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
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3
6
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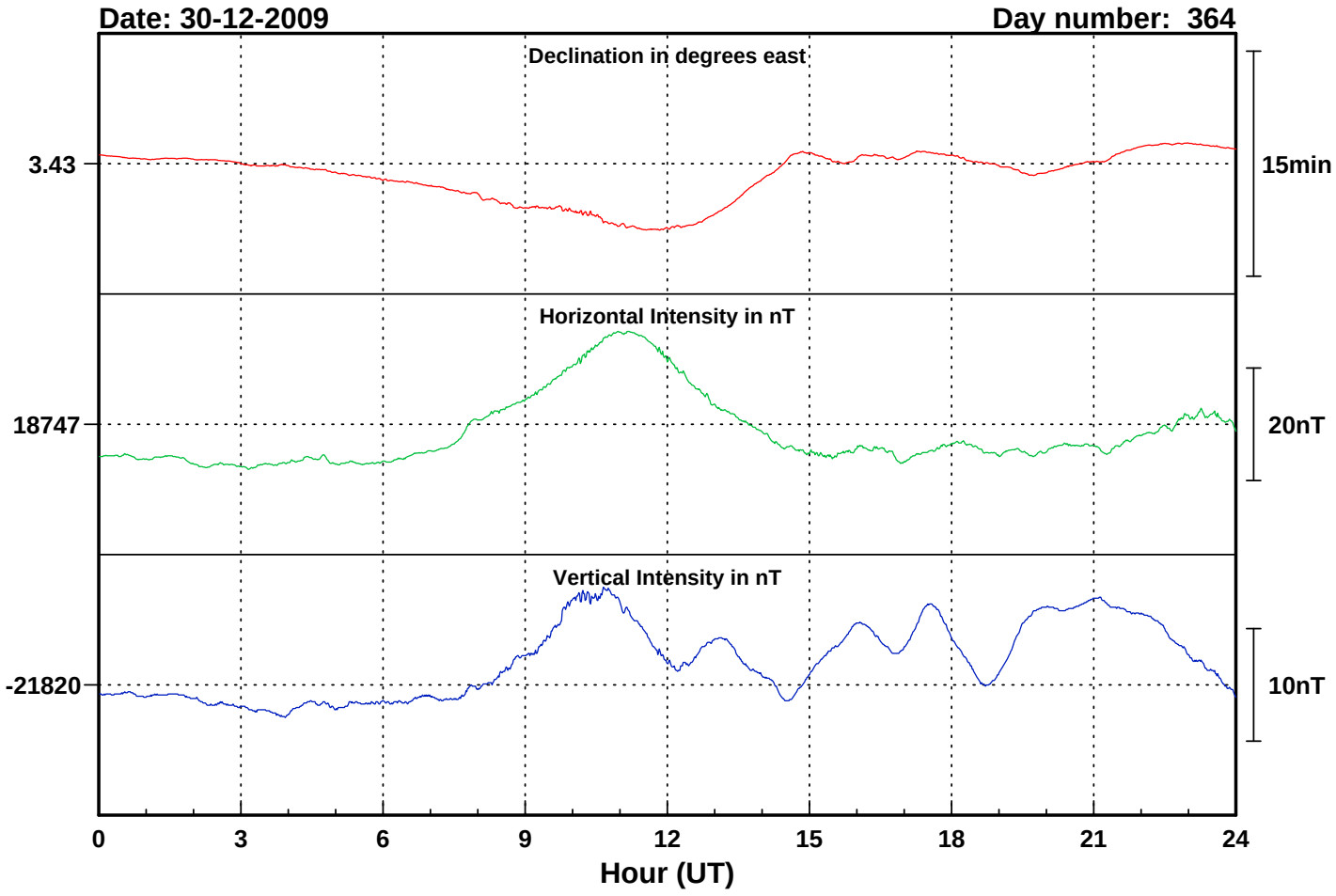
24


Date: 30-12-2009
Day number: 364
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3.43
15min
Horizontal Intensity in nT
18747
20nT
Vertical Intensity in nT
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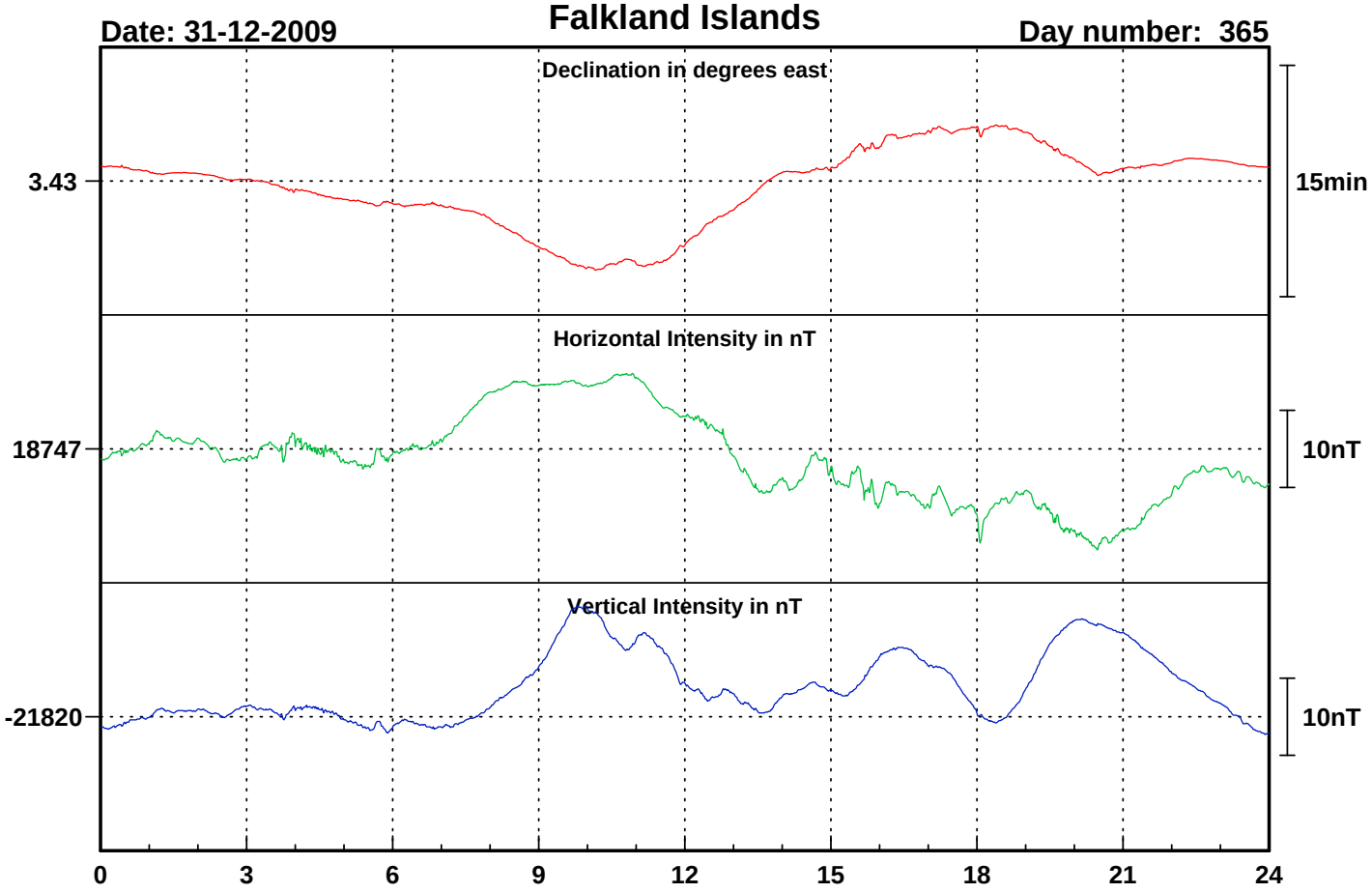
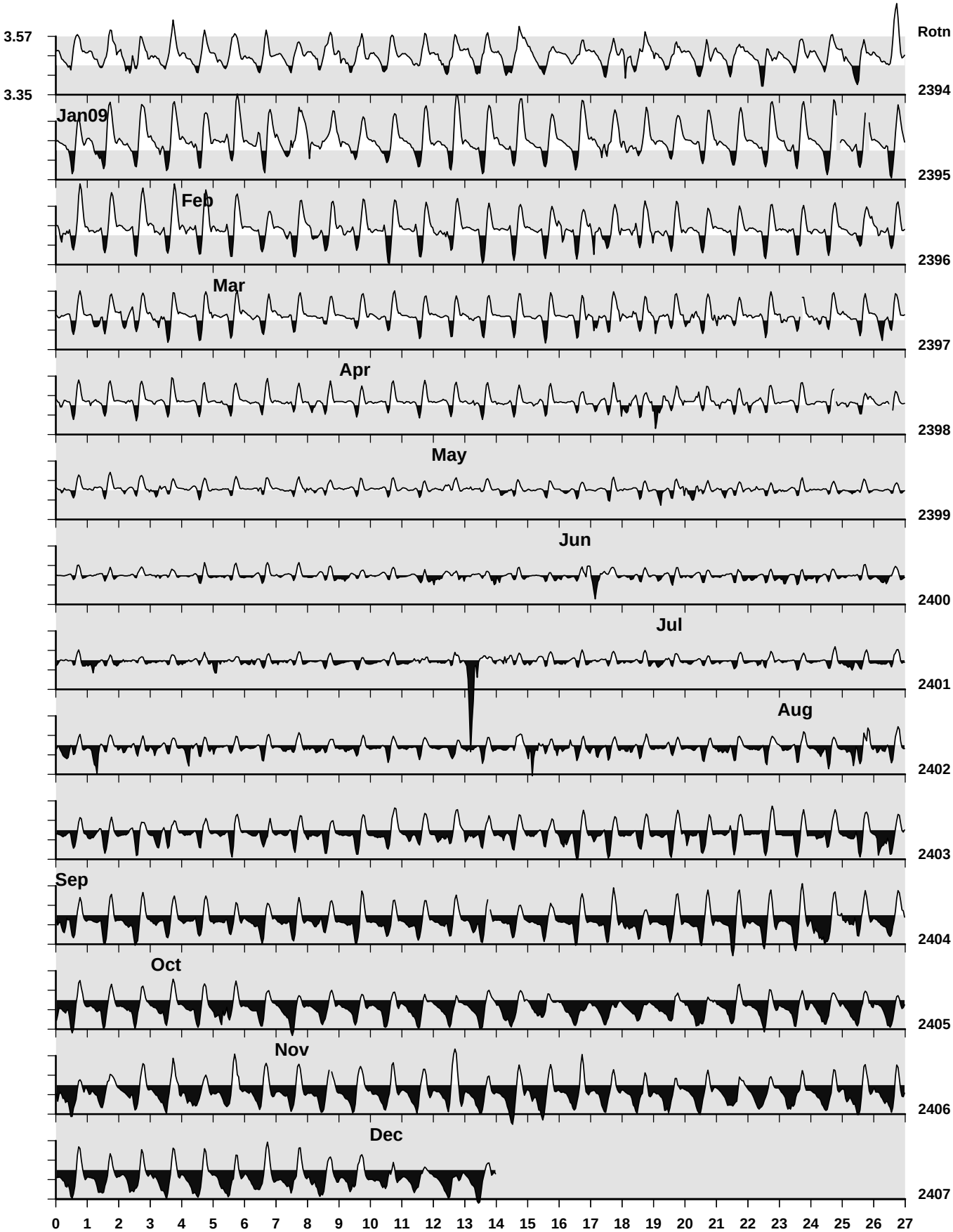
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

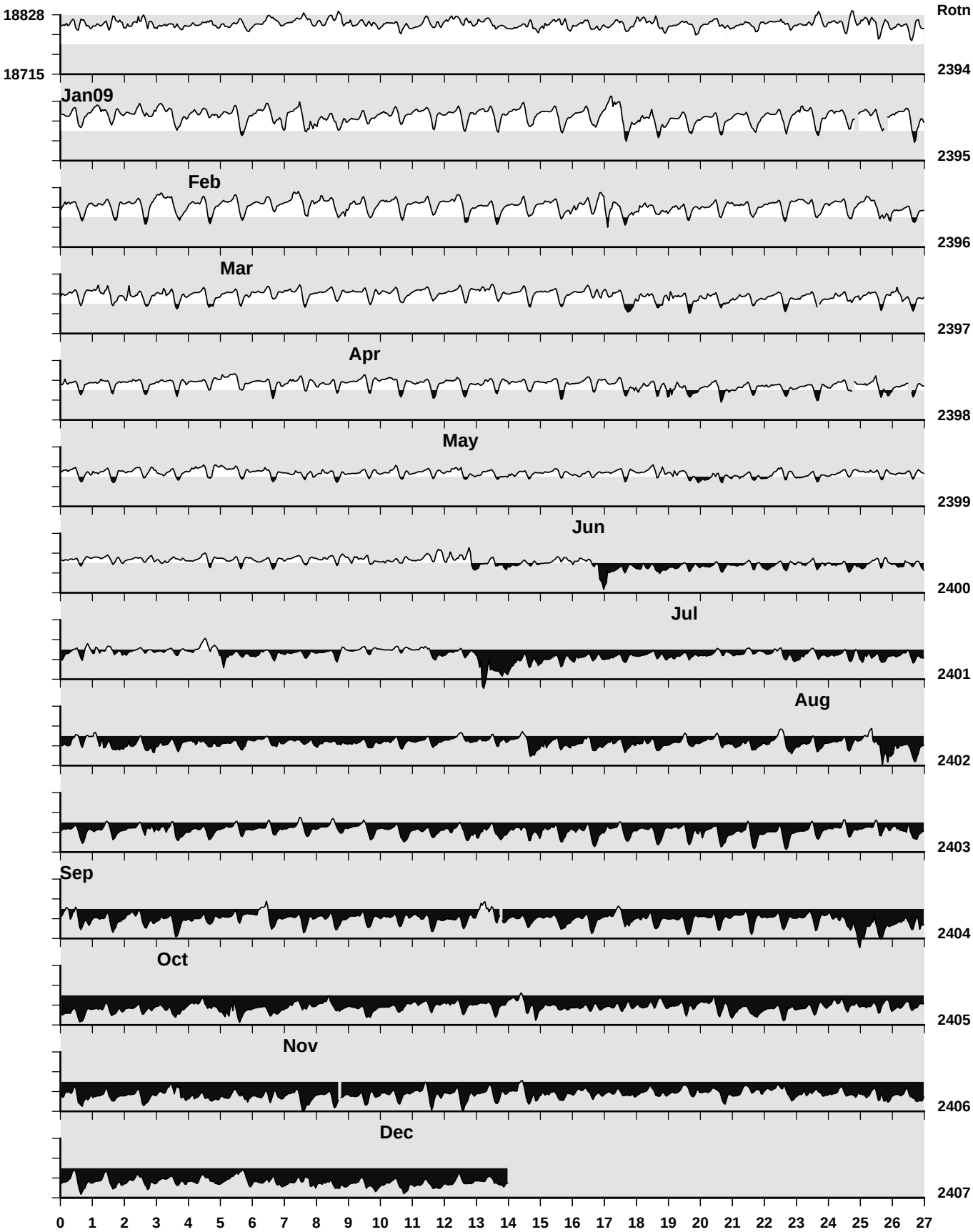

Falkland Islands
Date: 31-12-2009
Day number: 365
Declination in degrees east
3.43
15min
Horizontal Intensity in nT
18747
10nT
Vertical Intensity in nT
-21820
10nT
0
3
6
9
12
15
18
21
24

# Falkland Islands Observatory: Declination (degrees)



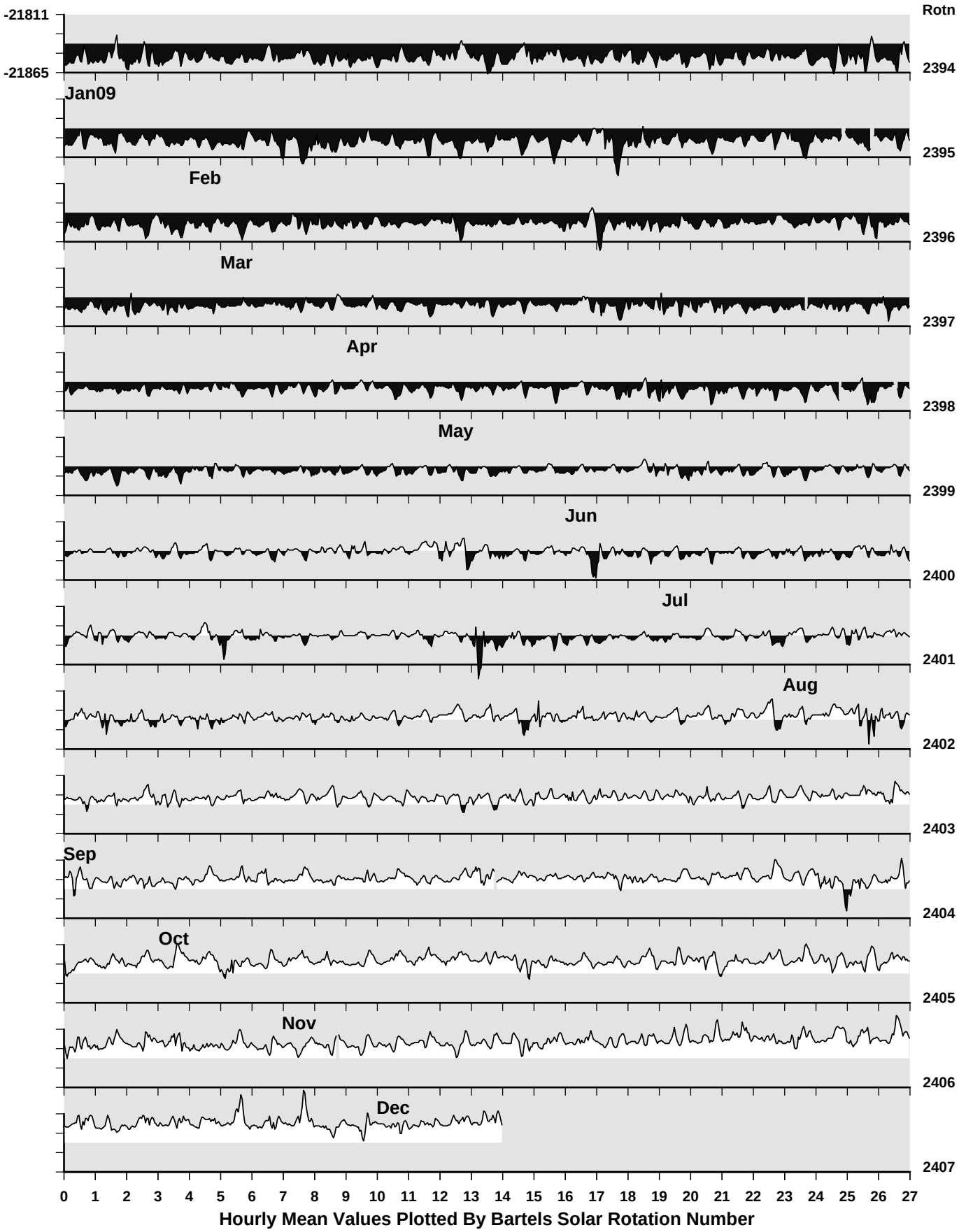

Hourly Mean Values Plotted By Bartels Solar Rotation Number

# Falkland Islands Observatory: Horizontal Intensity (nT)



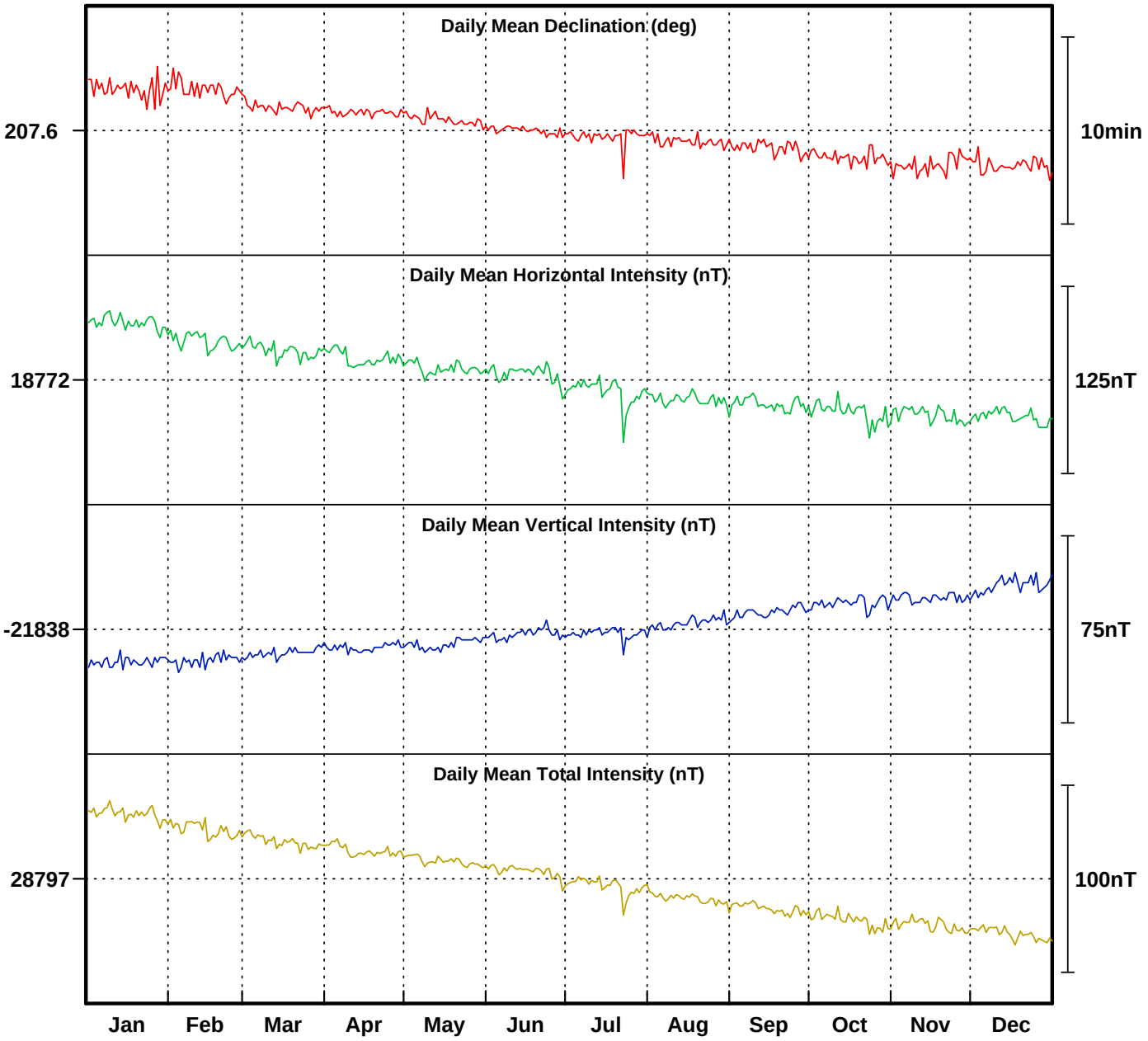

Hourly Mean Values Plotted By Bartels Solar Rotation Number

# Falkland Islands Observatory: Vertical Intensity (nT)




Hourly Mean Values Plotted By Bartels Solar Rotation Number

# Falklands Is Observatory 2009



## Monthly Mean Values for Port Stanley Observatory 2009

| Month | *D* | *H* | *I* | *X* | *Y* | *Z* | *F* |
|---|---|---|---|---|---|---|---|
| January | 3° 29.8′ | 18810 nT | -49° 16.6′ | 18775 nT | 1147 nT | -21851 nT | 28832 nT |
| February | 3° 29.8′ | 18798 nT | -49° 17.7′ | 18763 nT | 1146 nT | -21850 nT | 28823 nT |
| March | 3° 28.8′ | 18791 nT | -49° 18.0′ | 18757 nT | 1141 nT | -21847 nT | 28817 nT |
| April | 3° 28.5′ | 18786 nT | -49° 18.3′ | 18752 nT | 1139 nT | -21845 nT | 28812 nT |
| May | 3° 28.1′ | 18779 nT | -49° 18.8′ | 18745 nT | 1136 nT | -21844 nT | 28806 nT |
| June | 3° 27.6′ | 18776 nT | -49° 18.9′ | 18741 nT | 1133 nT | -21840 nT | 28801 nT |
| July | 3° 27.3′ | 18764 nT | -49° 19.9′ | 18730 nT | 1131 nT | -21839 nT | 28793 nT |
| August | 3° 27.0′ | 18758 nT | -49° 20.1′ | 18724 nT | 1129 nT | -21835 nT | 28786 nT |
| September | 3° 26.6′ | 18756 nT | -49° 20.0′ | 18722 nT | 1127 nT | -21831 nT | 28781 nT |
| October | 3° 26.1′ | 18750 nT | -49° 20.2′ | 18716 nT | 1124 nT | -21827 nT | 28775 nT |
| November | 3° 25.7′ | 18748 nT | -49° 20.2′ | 18715 nT | 1121 nT | -21825 nT | 28772 nT |
| December | 3° 25.7′ | 18747 nT | -49° 19.9′ | 18714 nT | 1121 nT | -21820 nT | 28767 nT |

Note

i. The values shown here are provisional.