BRITISH GEOLOGICAL SURVEY

Port Stanley Observatory *Monthly Magnetic Bulletin*

November 2015

15/11/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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Edinburgh EH9 3LA
Scotland, UK

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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°42'16.2"S* *302°06'24.9"E*
Geomagnetic: *42°18'36"S* *012°20'56"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 12th generation International Geomagnetic Reference Field (IGRF) at epoch 2015.5. 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

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

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 geomagneticallyuiet 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

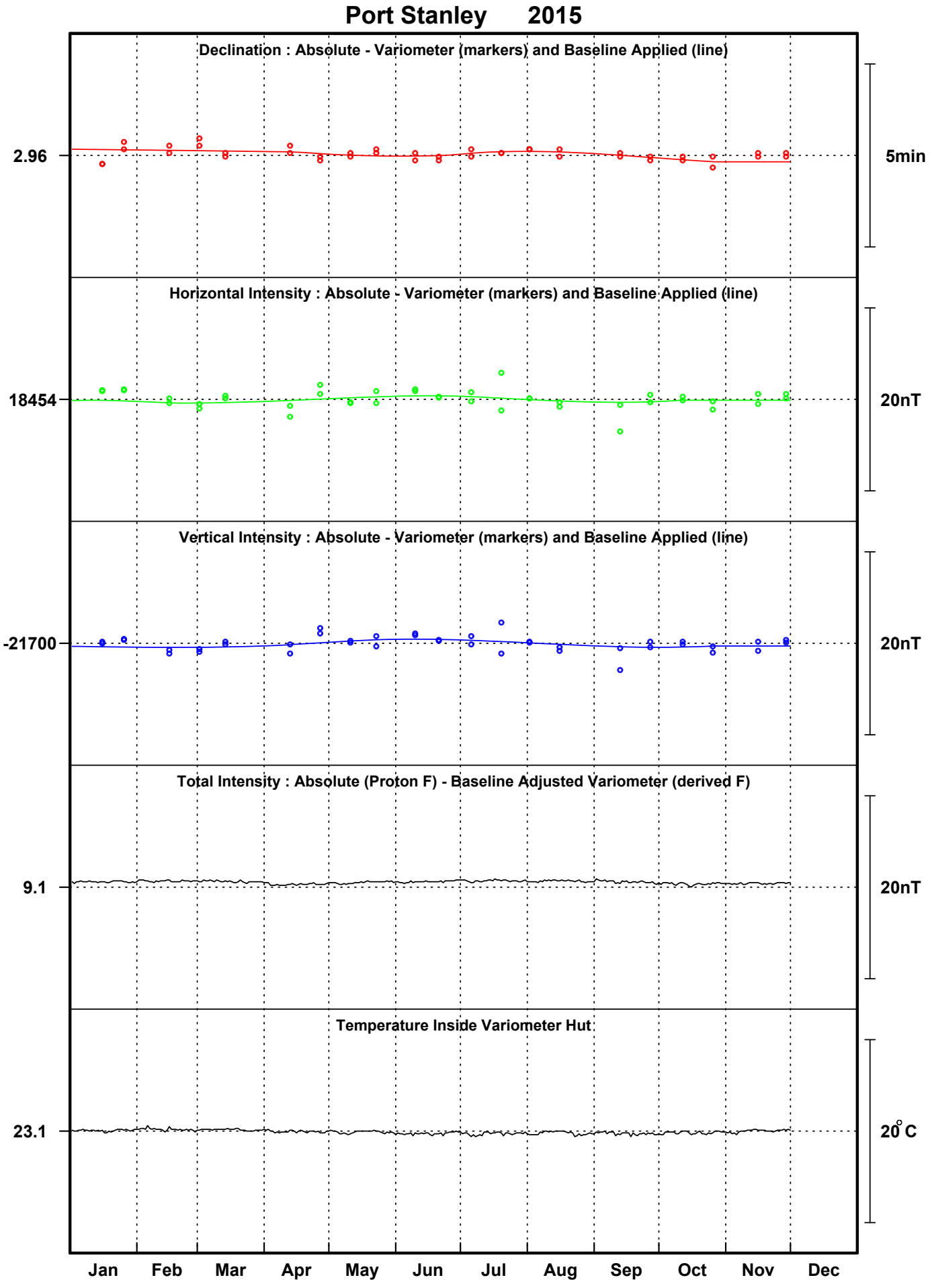
Daily mean values of *D*, *H*, *Z* and *F* are plotted throughout the year. In addition, a table of monthly mean values of all the geomagnetic elements is provided. These values depend on accurate specification of the fluxgate sensor baselines. It is anticipated that these provisional values will not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

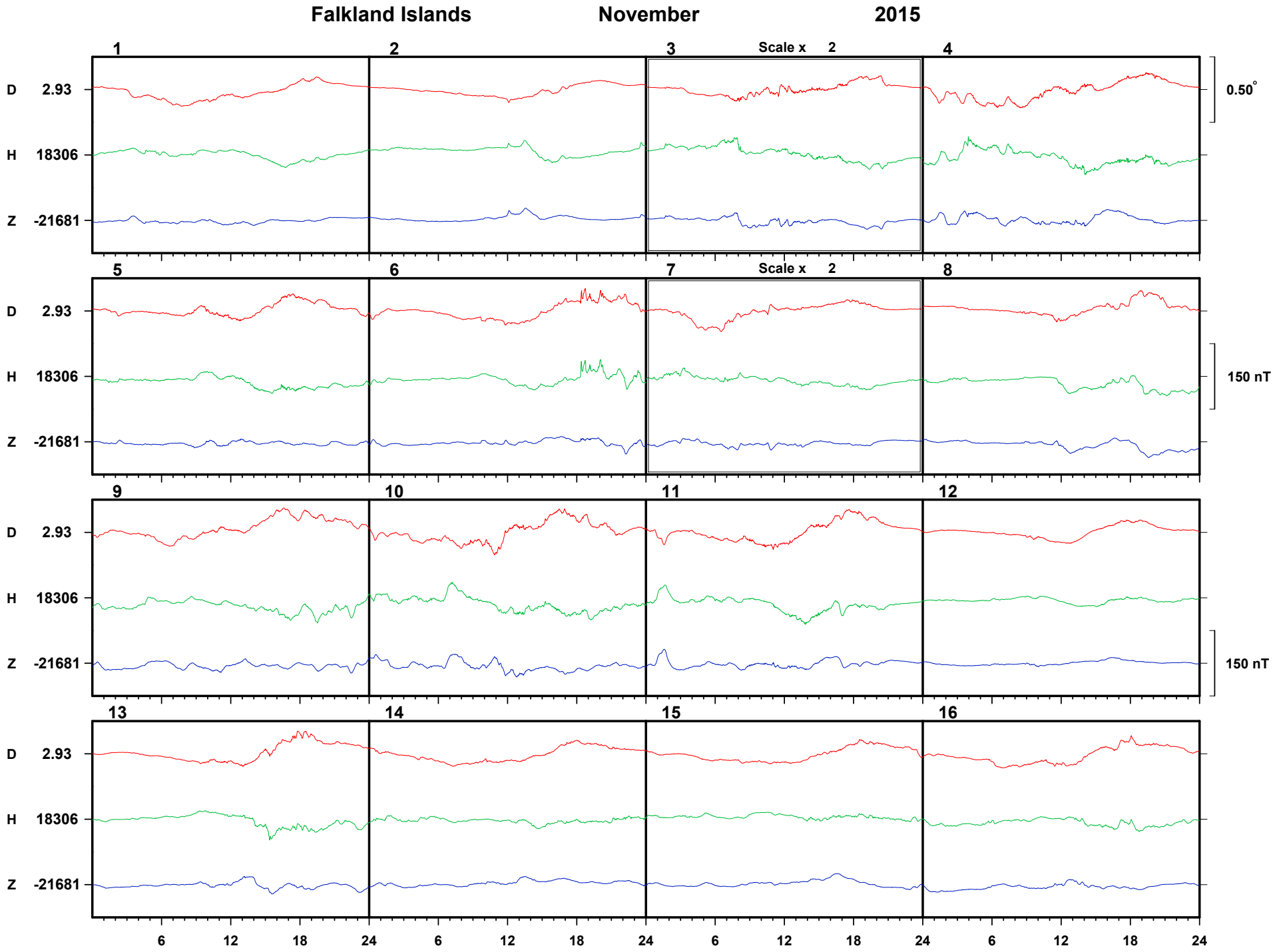
5. Conditions of Use

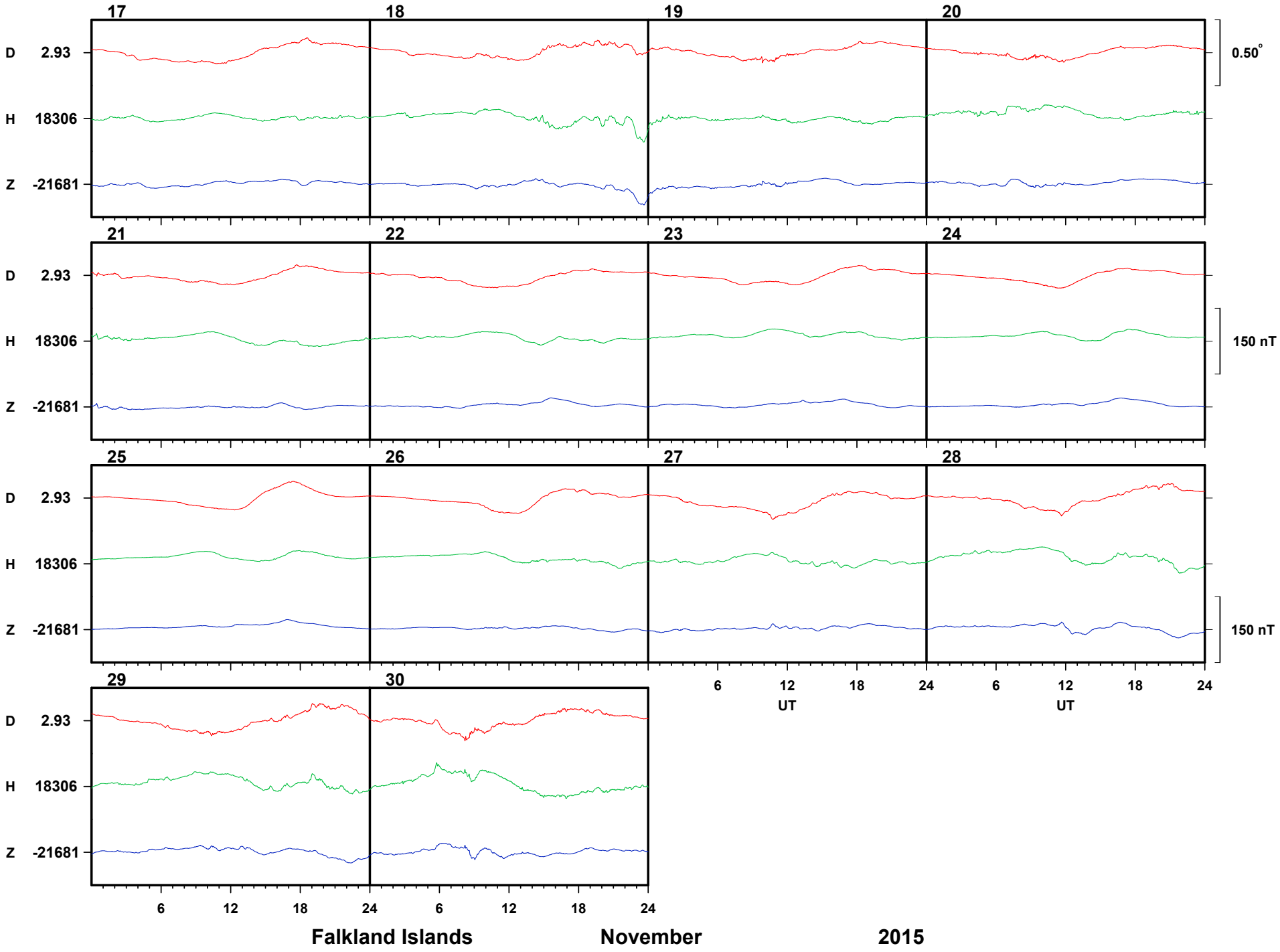
PORT STANLEY OBSERVATORY

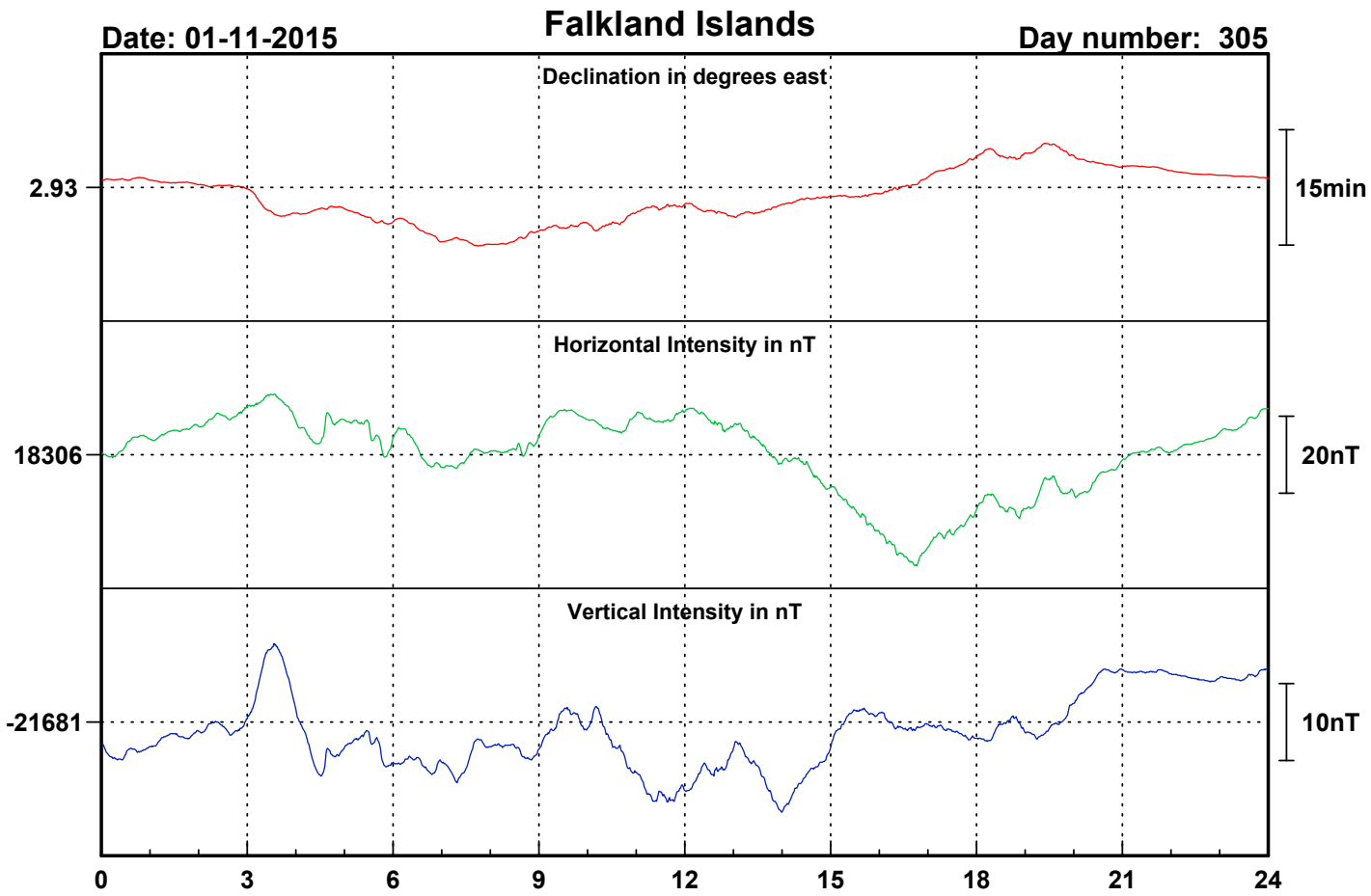
ABSOLUTE OBSERVATIONS

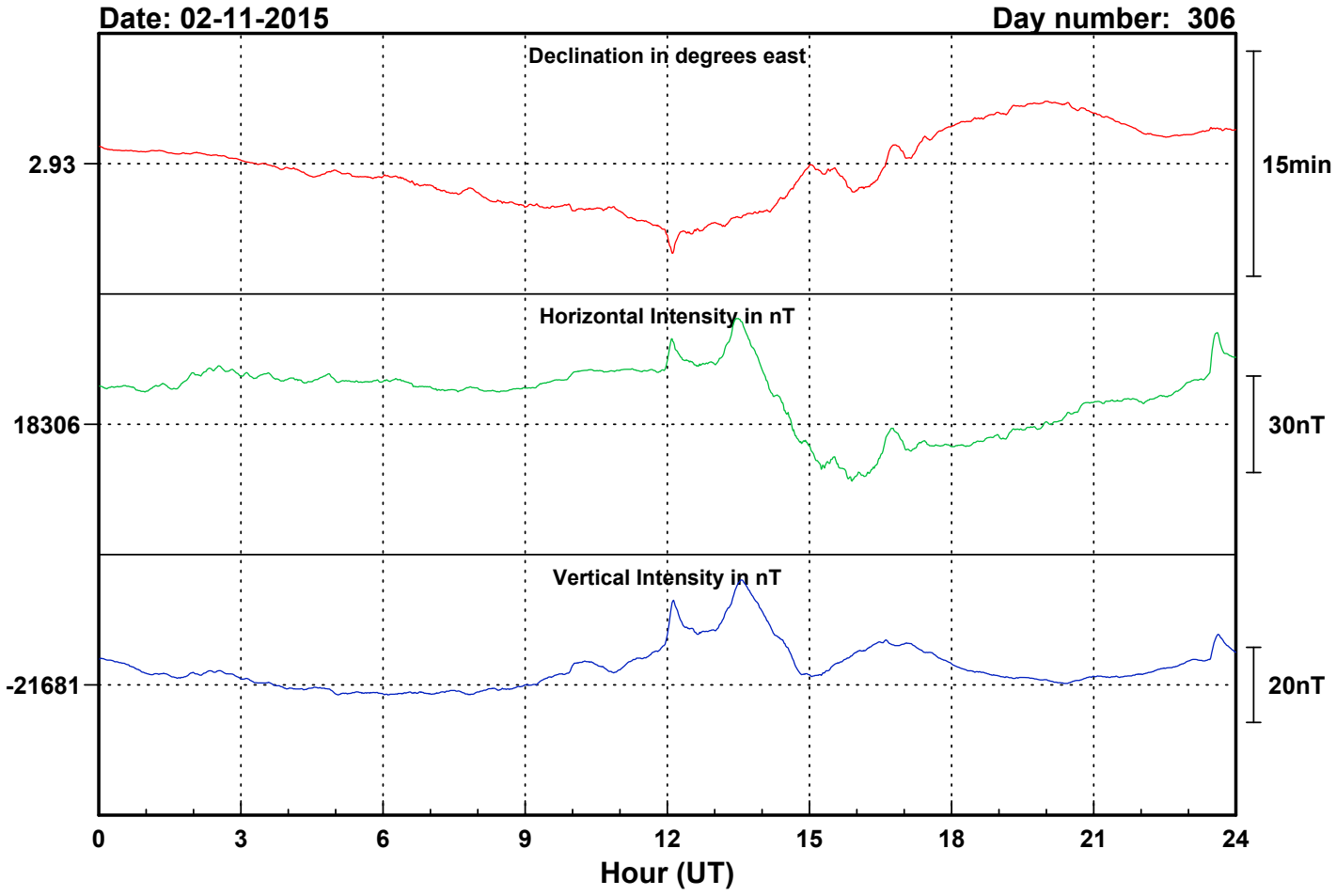
		Declination			Inclination		Total Field		Horizontal Intensity		Vertical Intensity		
Date	**Day Number**	**Time (UT)**	**Absolute (º)**	**Baseline (º)**	**Time (UT)**	**Absolute (º)**	**Site difference (nT)**	**Absolute corrected (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Observer**
15-Nov-15	319	12:48	2.8663	2.9650	12:54	-49.8058	-9.7	28375.7	18313.1	18454.5	-21675.1	-21700.3	NB
15-Nov-15	319	13:00	2.8675	2.9633	13:07	-49.8108	-9.7	28374.6	18310.5	18453.4	-21675.8	-21701.3	NB
28-Nov-15	332	17:20	2.9788	2.9633	17:27	-49.7862	-9.7	28378.0	18322.0	18454.0	-21670.6	-21700.4	NB
28-Nov-15	332	17:33	2.9821	2.9650	17:38	-49.7867	-9.7	28379.8	18323.0	18454.5	-21672.1	-21700.1	NB

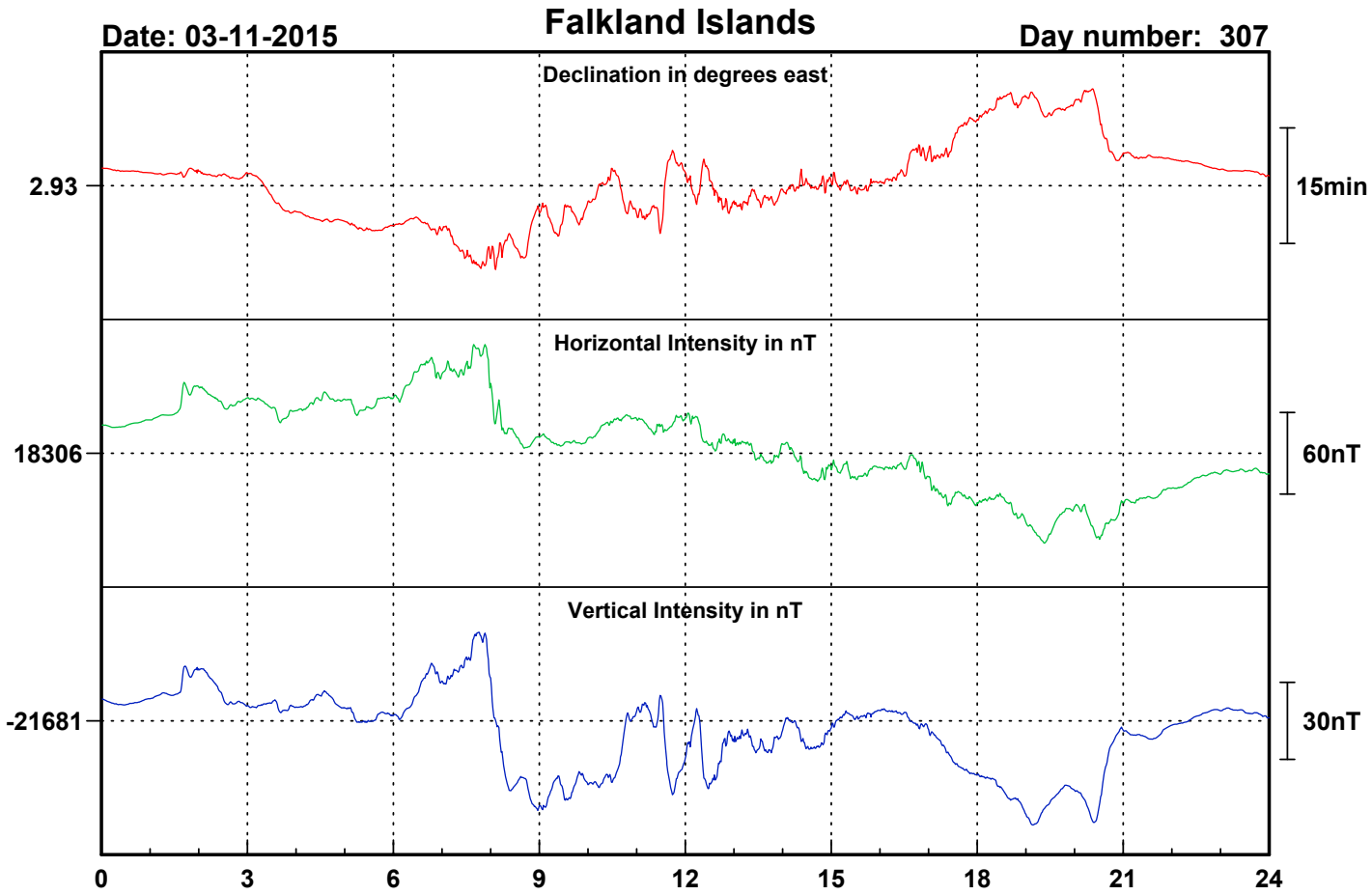

Port Stanley 2015
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
2.96
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
18454
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
-21700
20nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
9.1
20nT
Temperature Inside Variometer Hut
23.1
20°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

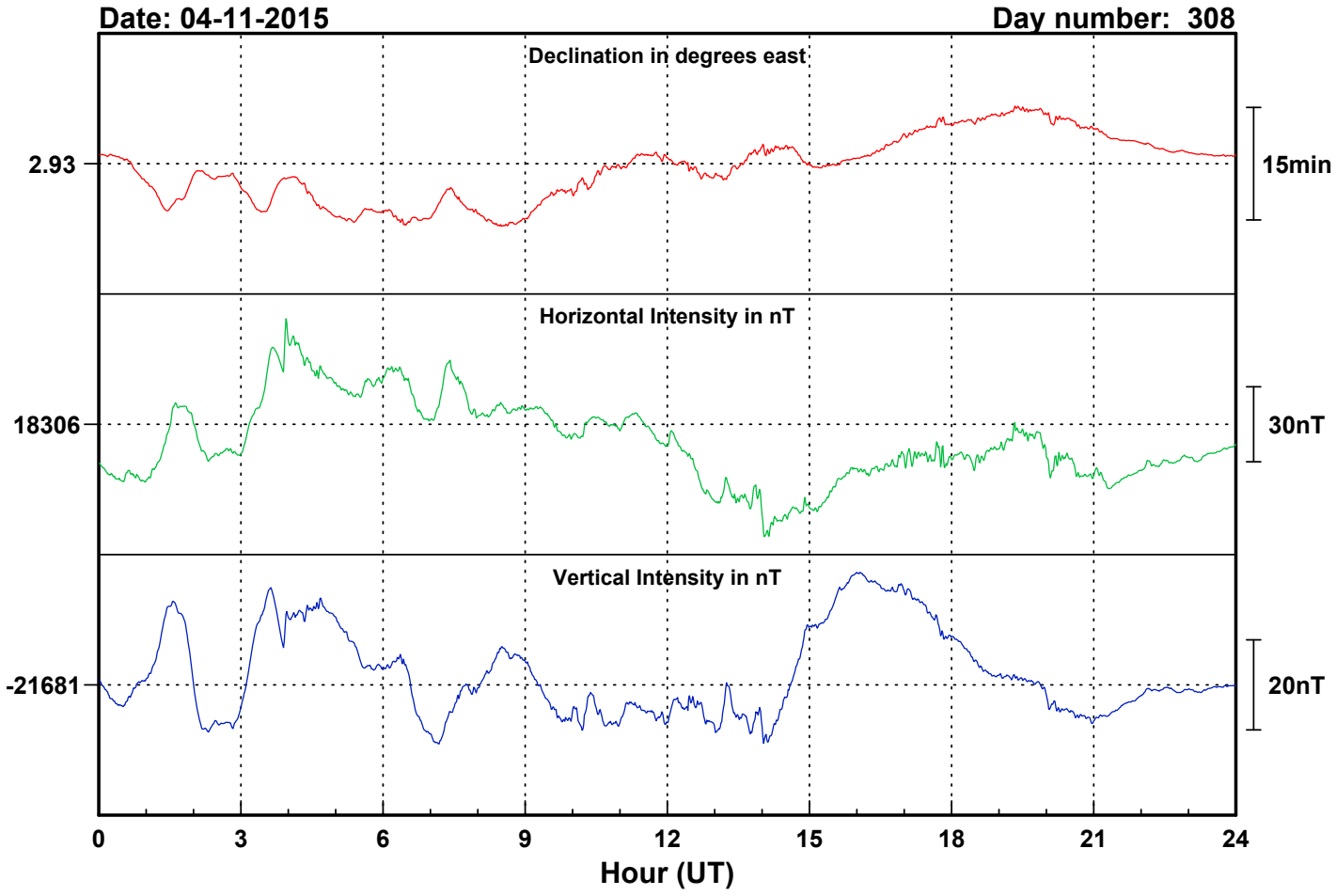

Falkland Islands
November
2015
Scale x 2
Scale x 2
D 2.93
H 18306
Z -21681
0.50°
150 nT
150 nT
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
6
12
18
24


17
18
19
20
D 2.93
H 18306
Z -21681
0.50°
21
22
23
24
150 nT
25
26
27
28
29
30
6
12
18
24
UT
Falkland Islands
November
2015


Falkland Islands
Date: 01-11-2015
Day number: 305
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
10nT
0
3
6
9
12
15
18
21
24


Date: 02-11-2015
Day number: 306
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)


Falkland Islands
Date: 03-11-2015
Day number: 307
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
60nT
Vertical Intensity in nT
-21681
30nT
0
3
6
9
12
15
18
21
24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Day number: 308
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
20nT
0
3
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12
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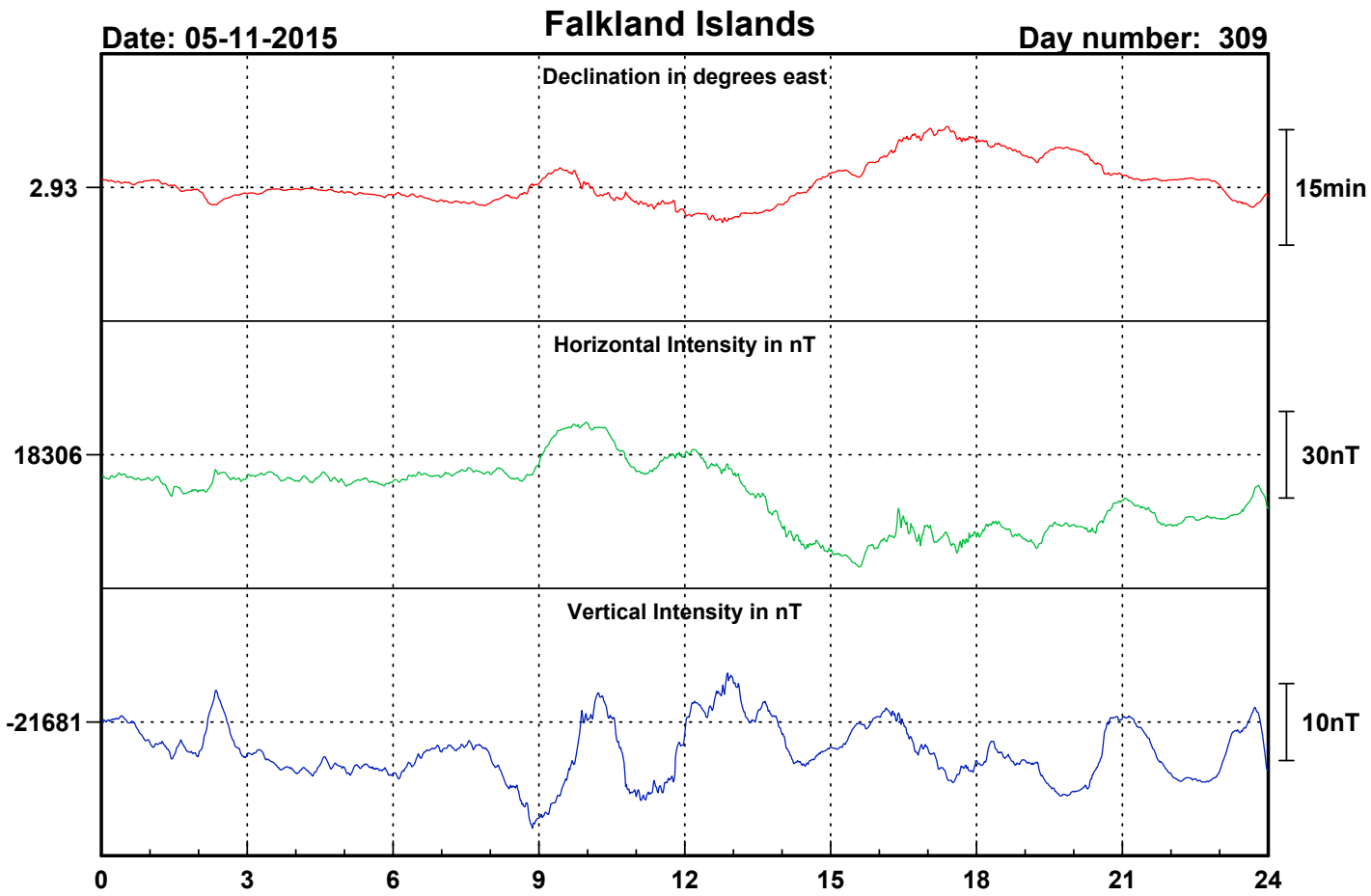
24
Hour (UT)


Falkland Islands
Date: 05-11-2015
Day number: 309
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
10nT
0
3
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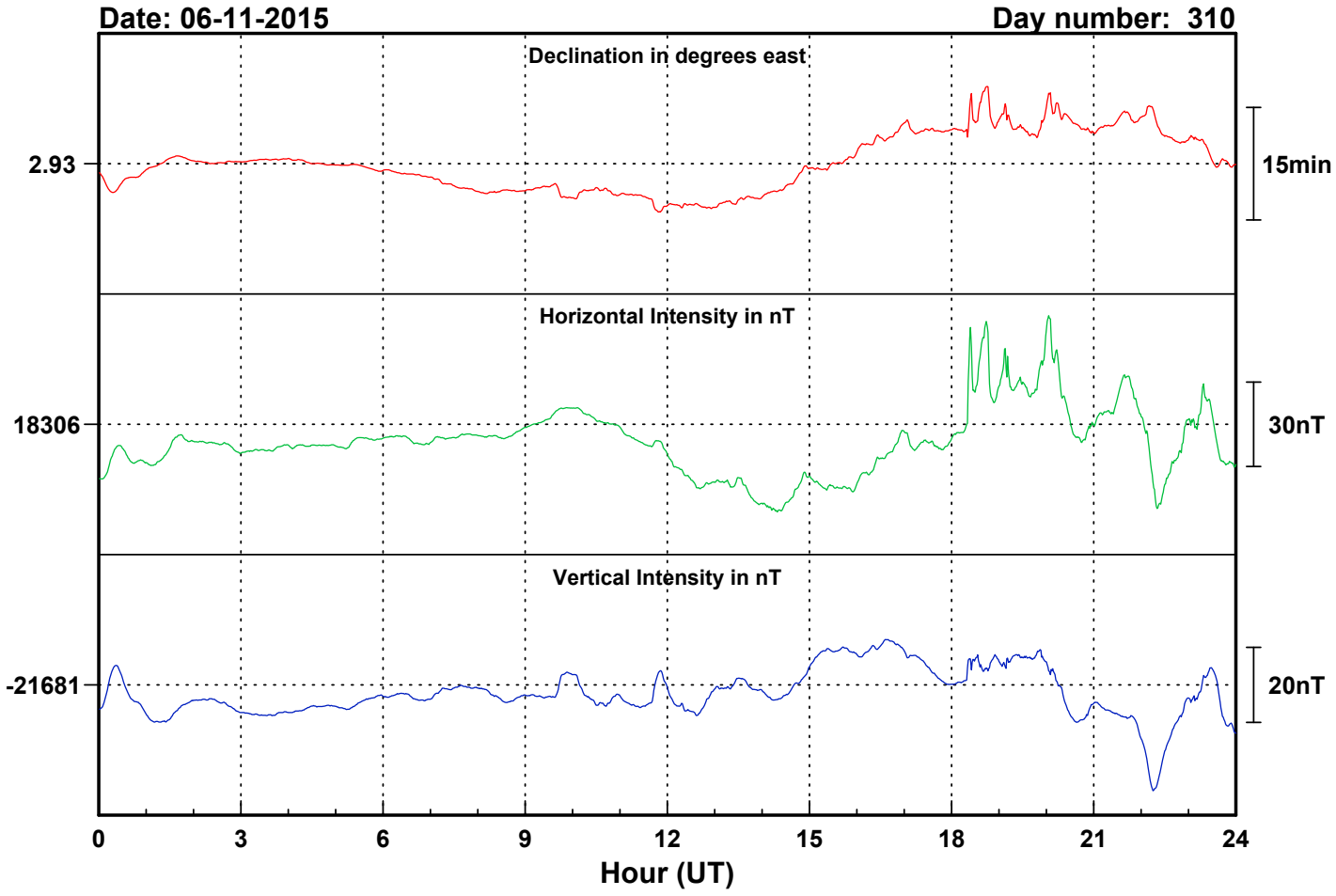
9
12
15
18
21
24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Day number: 310
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
20nT
0
3
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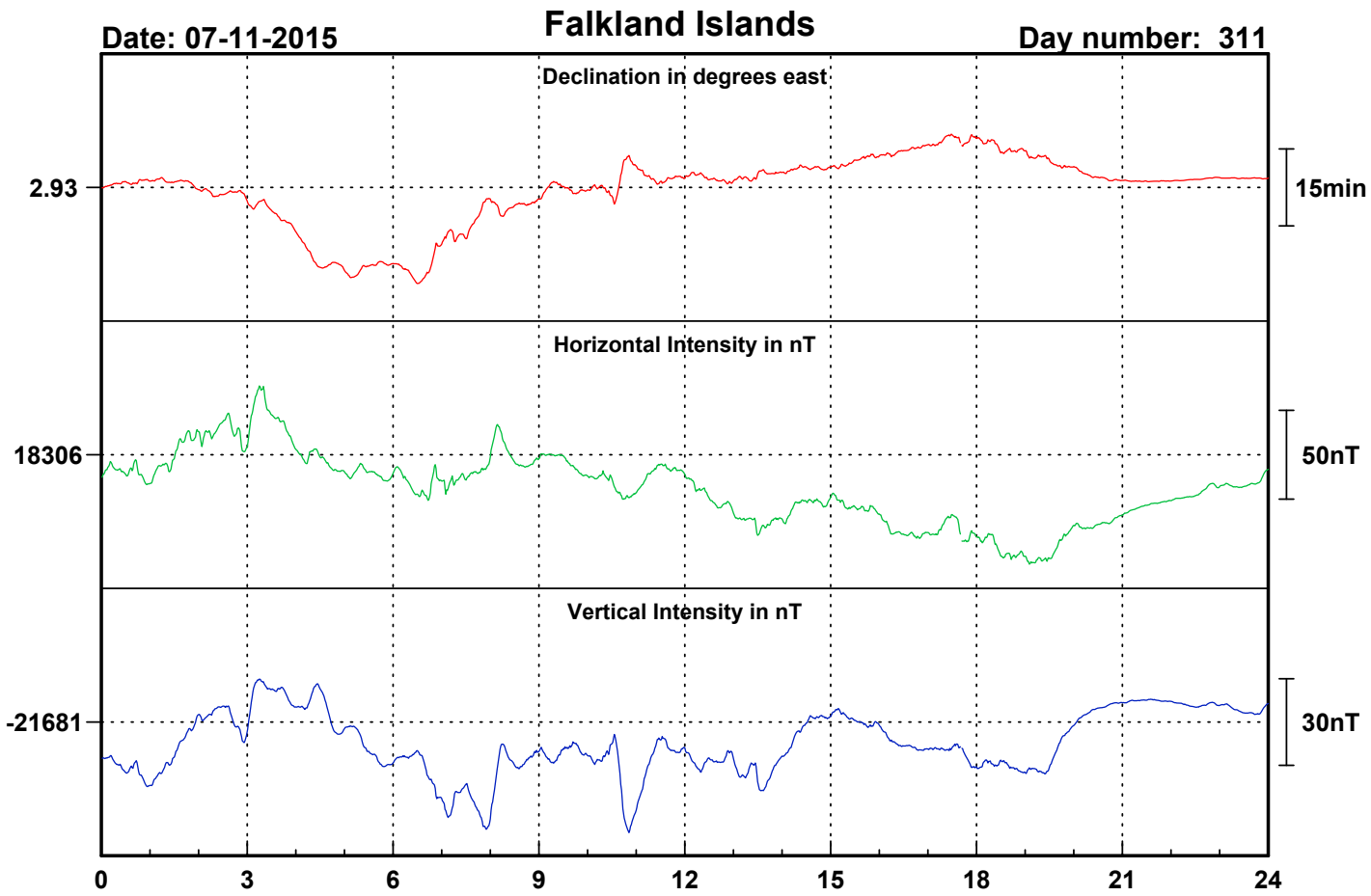
Hour (UT)


Falkland Islands
Date: 07-11-2015
Day number: 311
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
50nT
Vertical Intensity in nT
-21681
30nT
0
3
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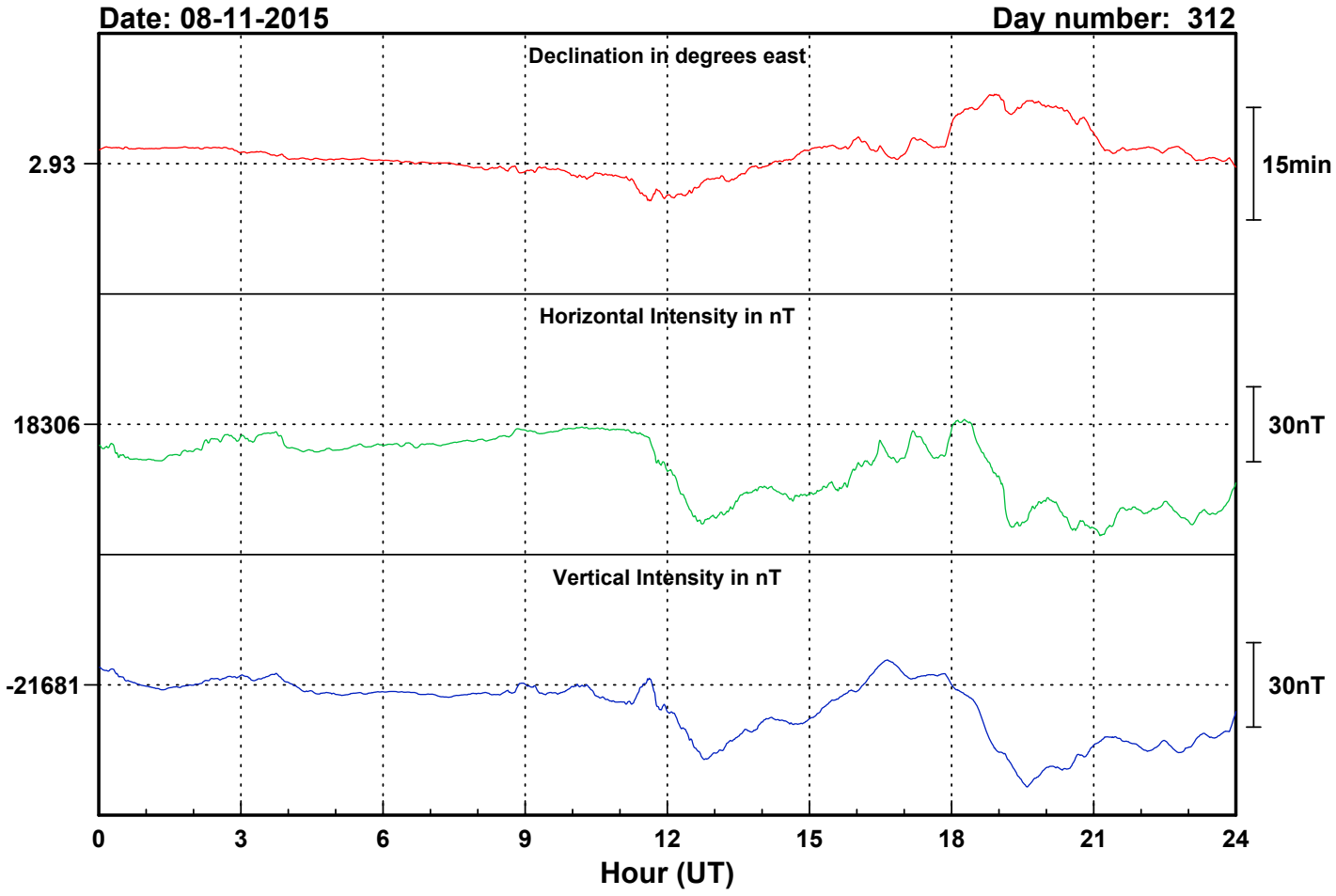
Date: 08-11-2015
Day number: 312
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
30nT
0
3
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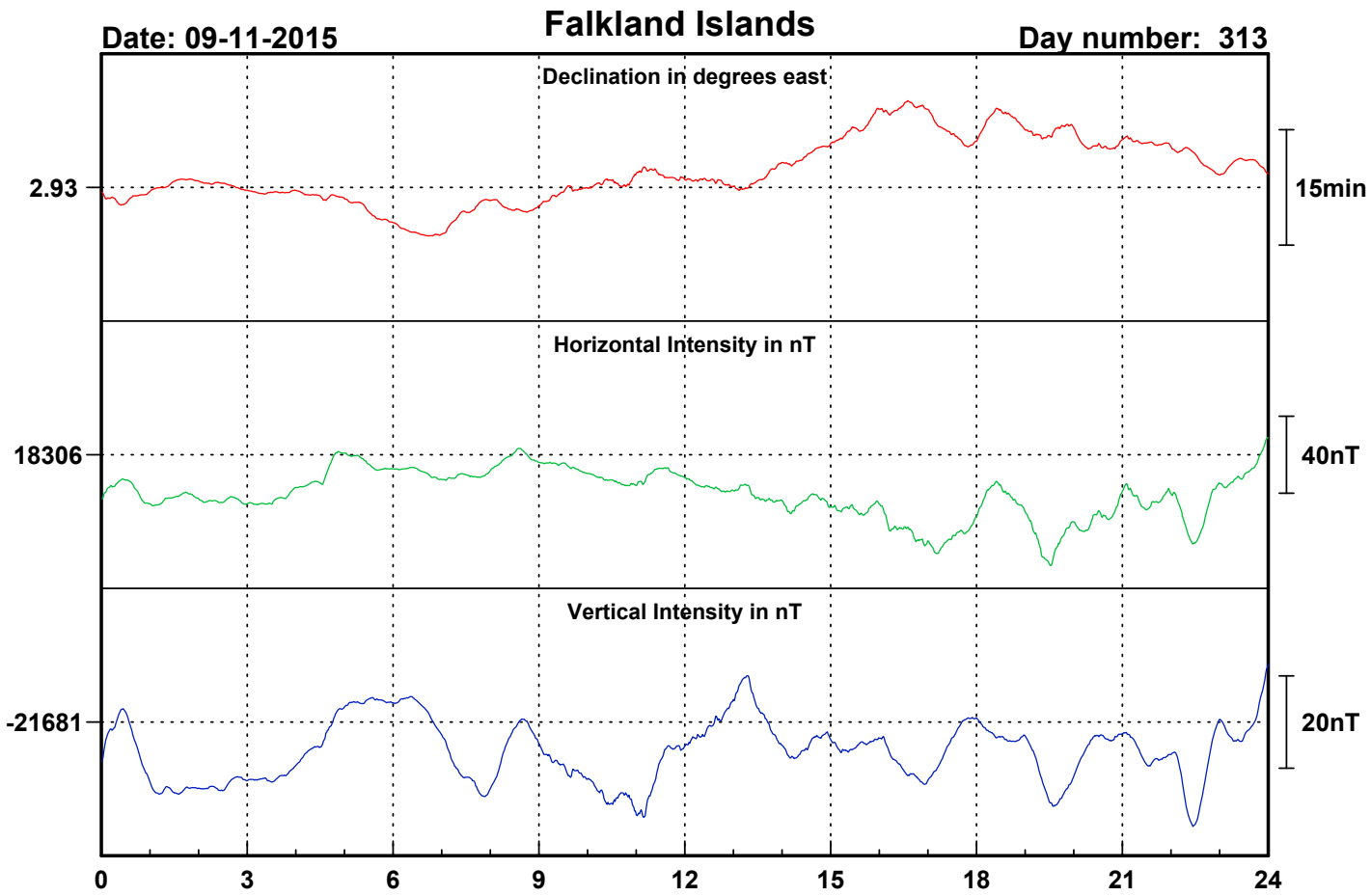
15
18
21
24
Hour (UT)


Falkland Islands
Date: 09-11-2015
Day number: 313
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
40nT
Vertical Intensity in nT
-21681
20nT
0
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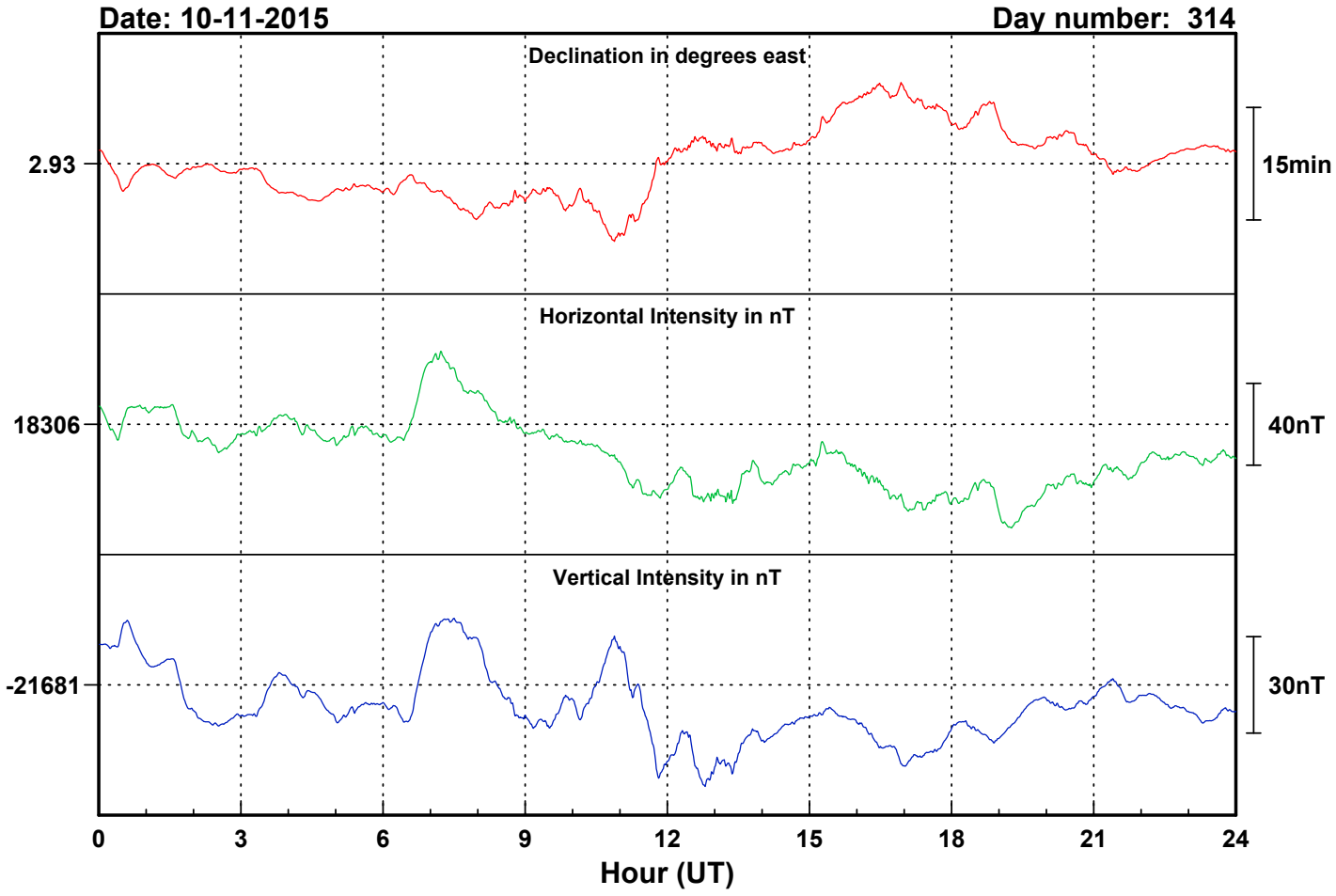
Date: 10-11-2015
Day number: 314
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
40nT
Vertical Intensity in nT
-21681
30nT
0
3
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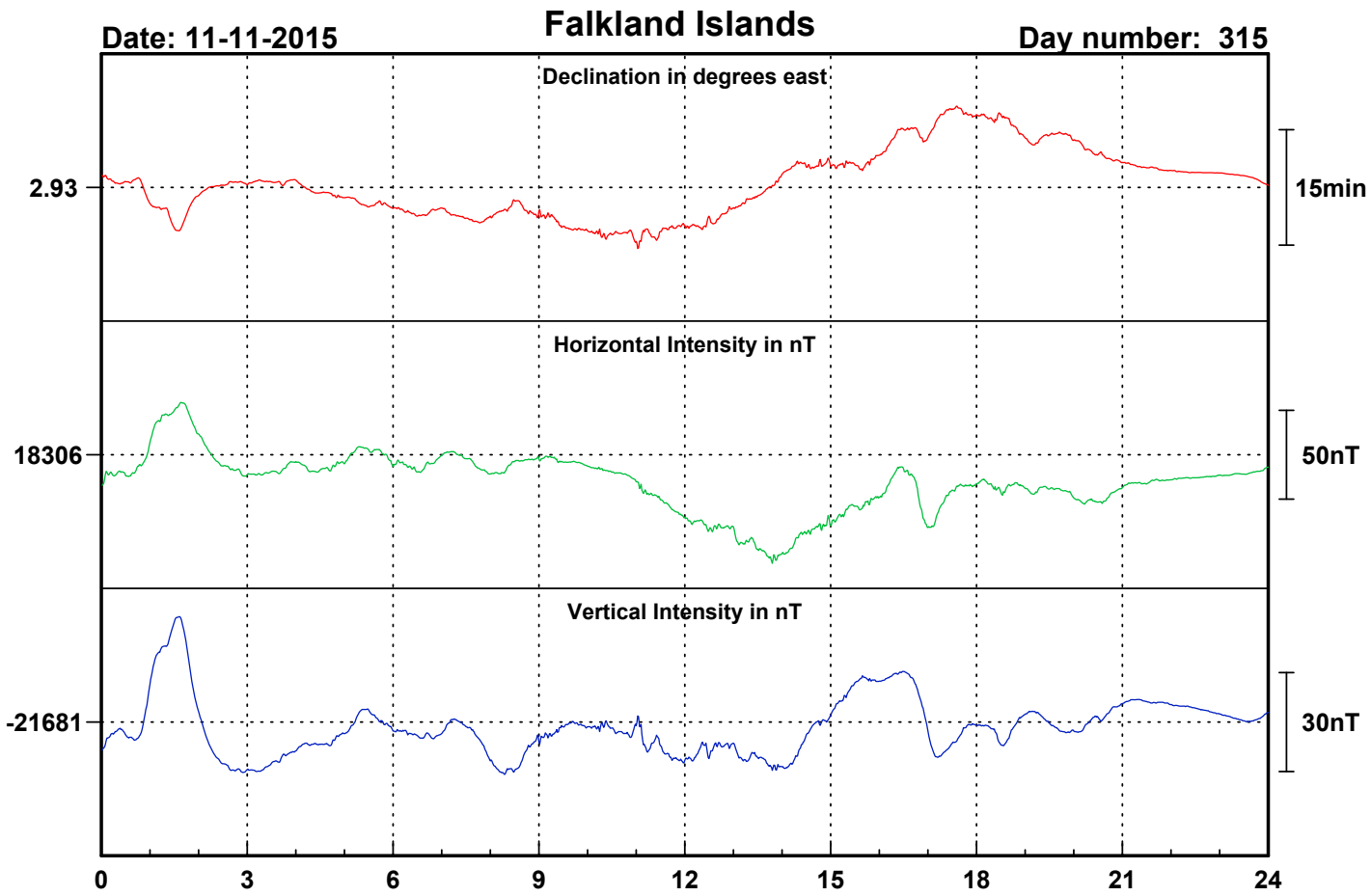
Hour (UT)


Falkland Islands
Date: 11-11-2015
Day number: 315
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
50nT
Vertical Intensity in nT
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30nT
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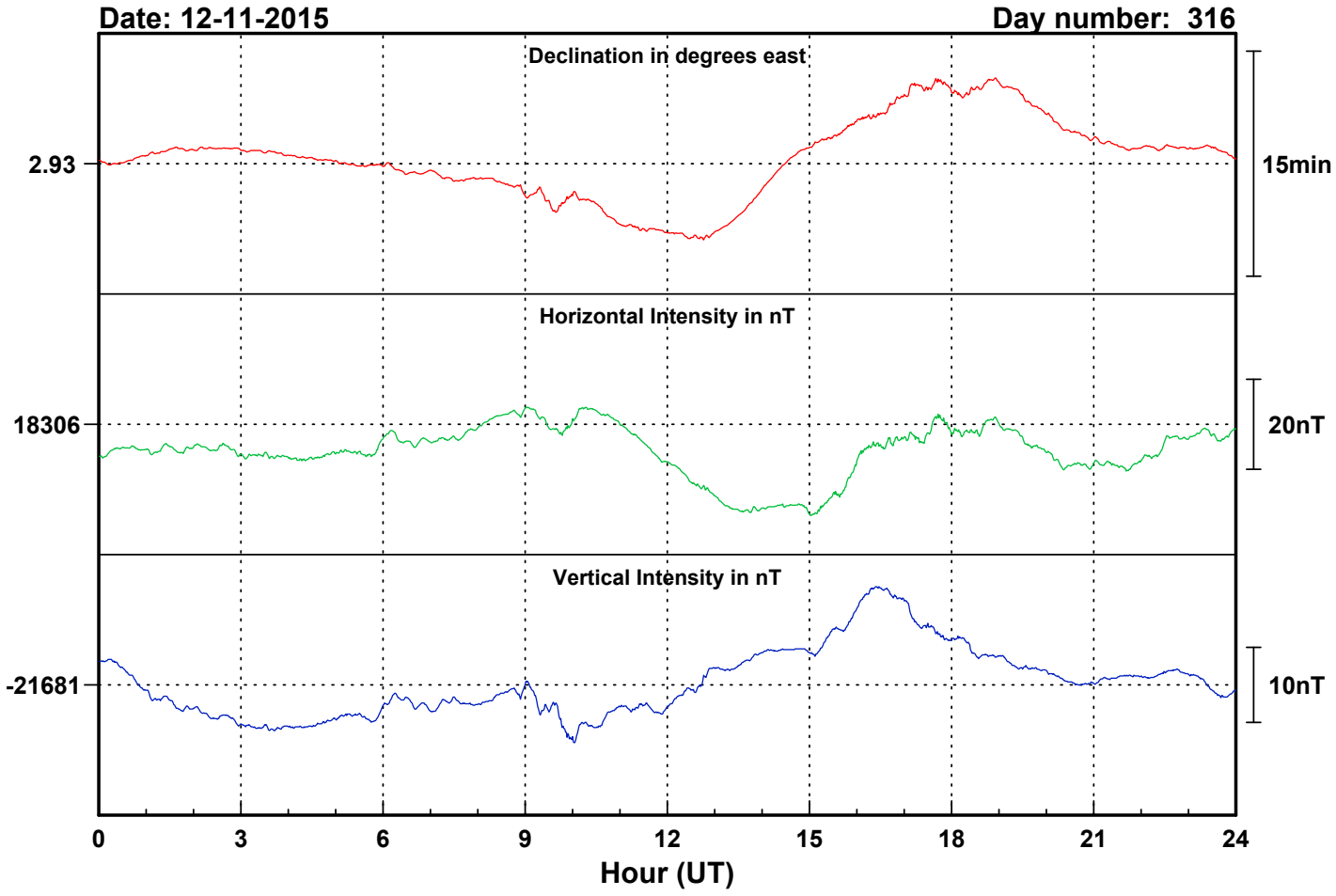
Date: 12-11-2015
Day number: 316
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
10nT
0
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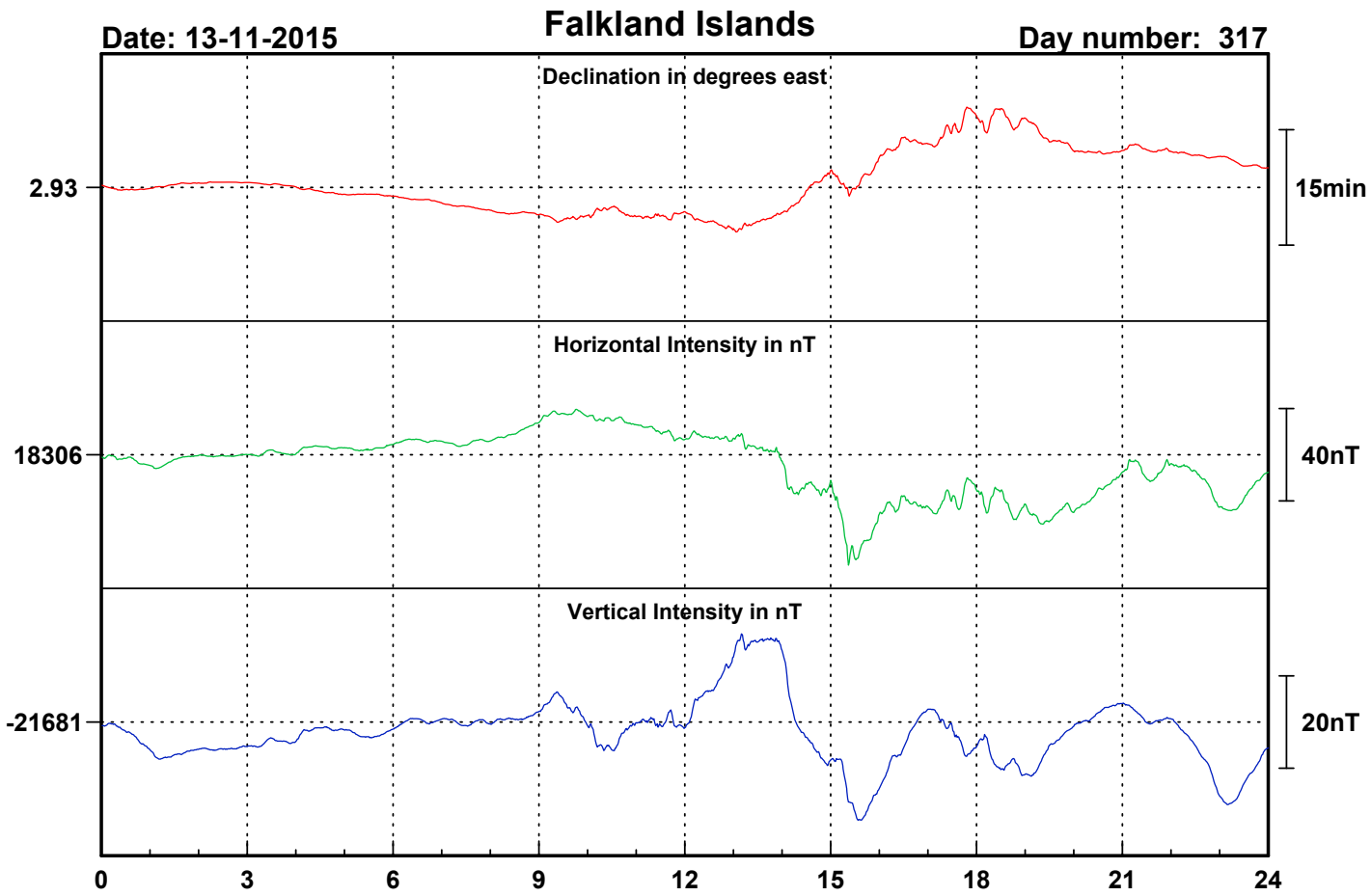
Hour (UT)


Falkland Islands
Date: 13-11-2015
Day number: 317
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
40nT
Vertical Intensity in nT
-21681
20nT
0
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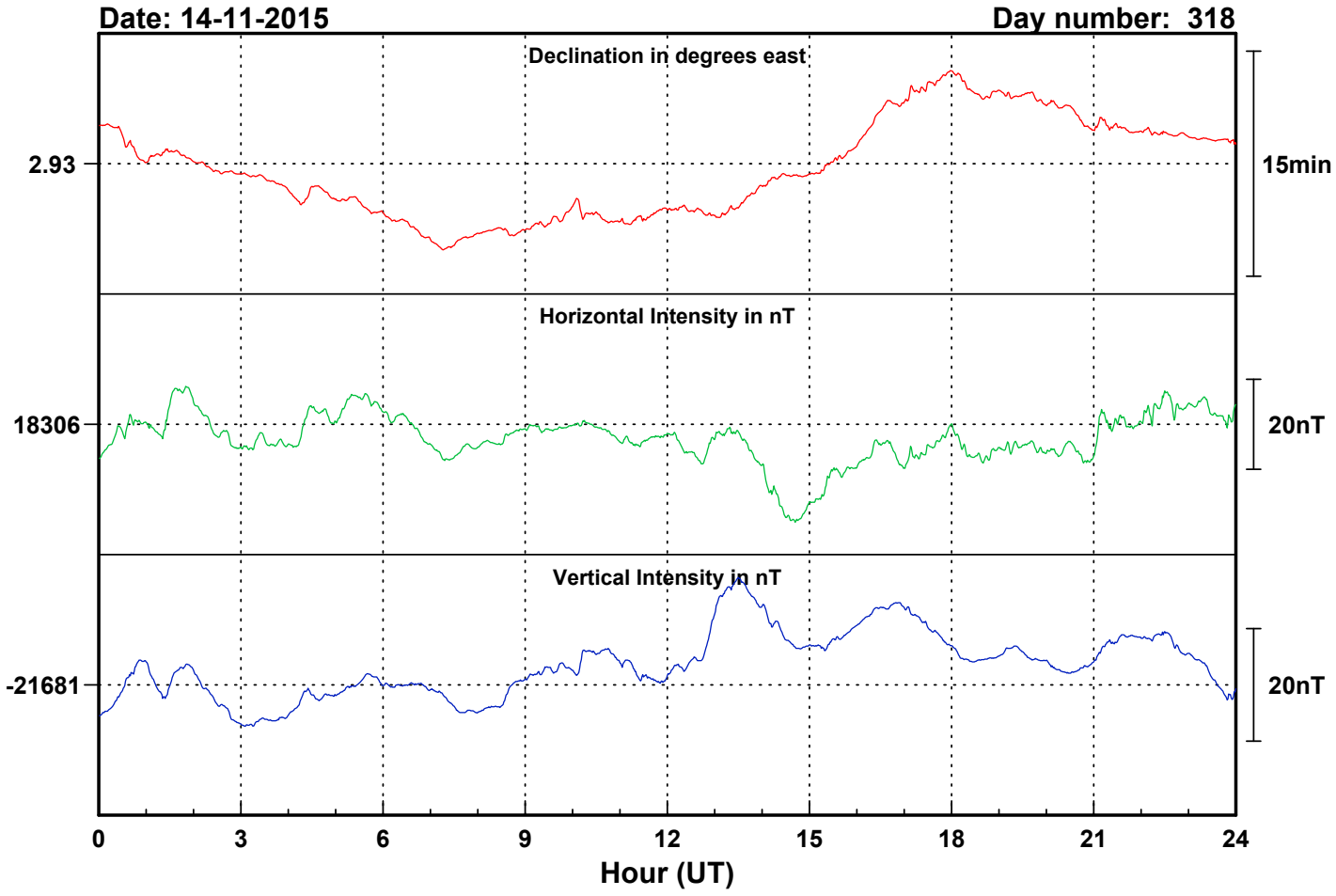
Date: 14-11-2015
Day number: 318
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
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20nT
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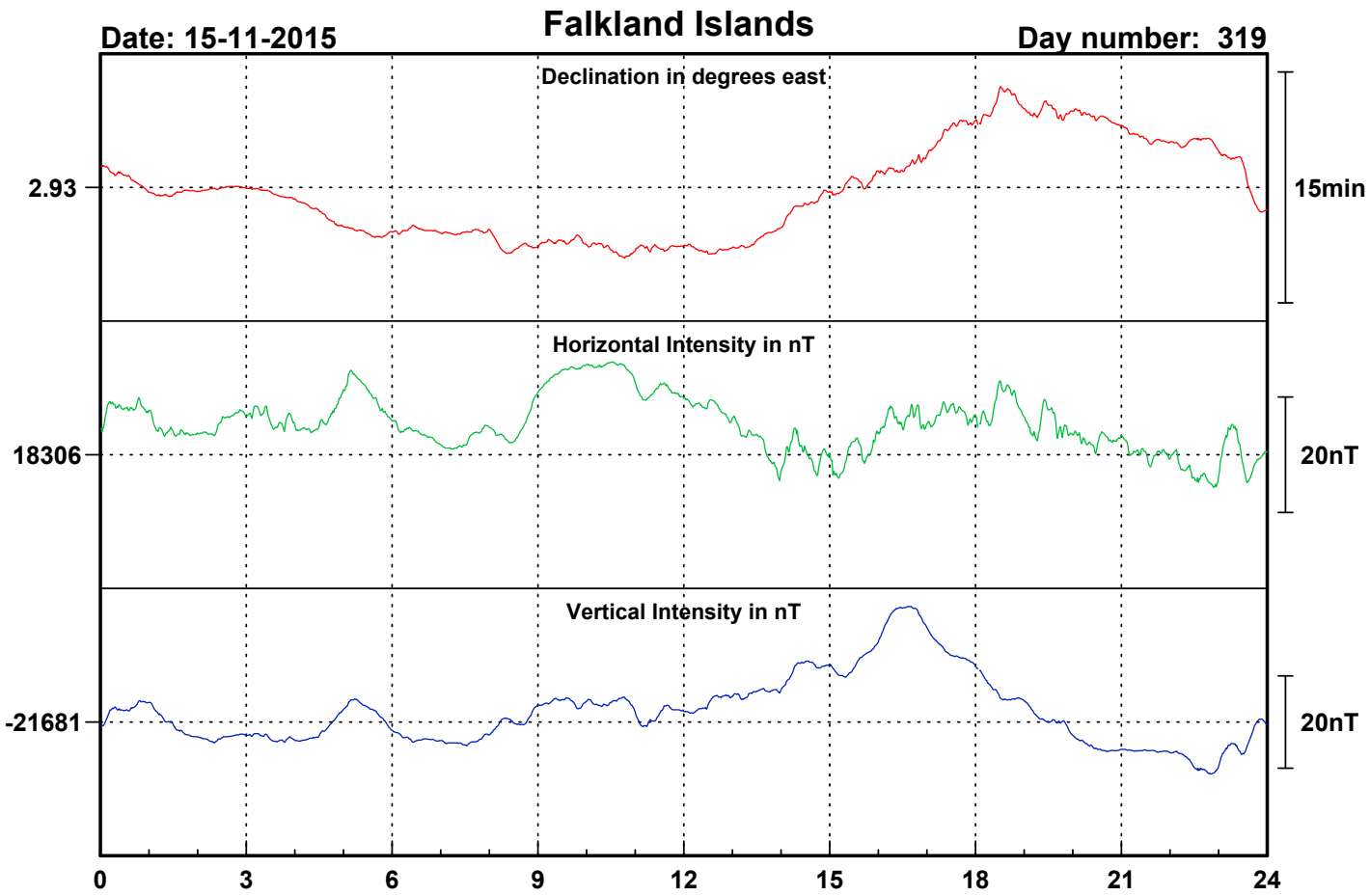
Hour (UT)


Falkland Islands
Date: 15-11-2015
Day number: 319
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
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20nT
0
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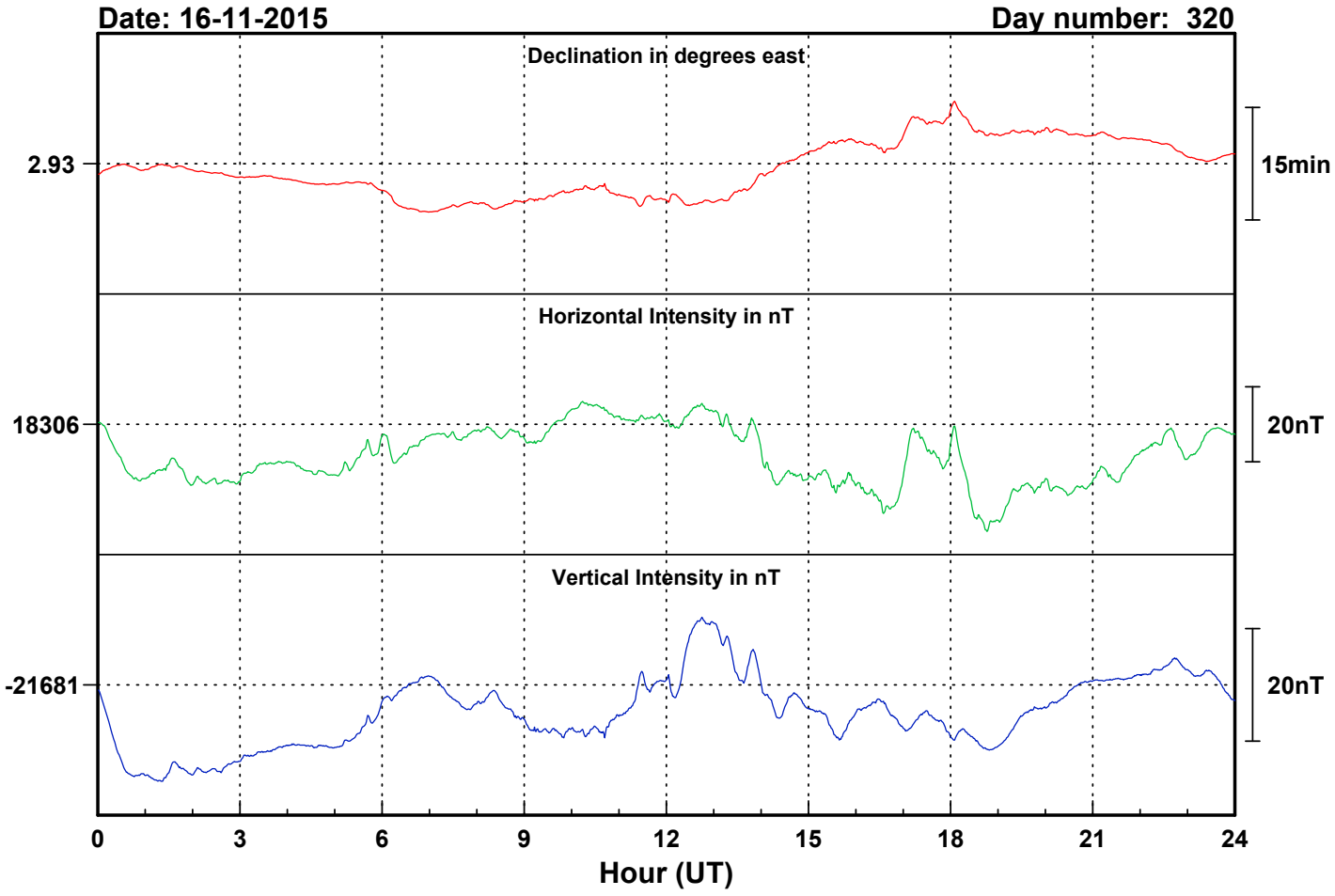
Date: 16-11-2015
Day number: 320
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
20nT
0
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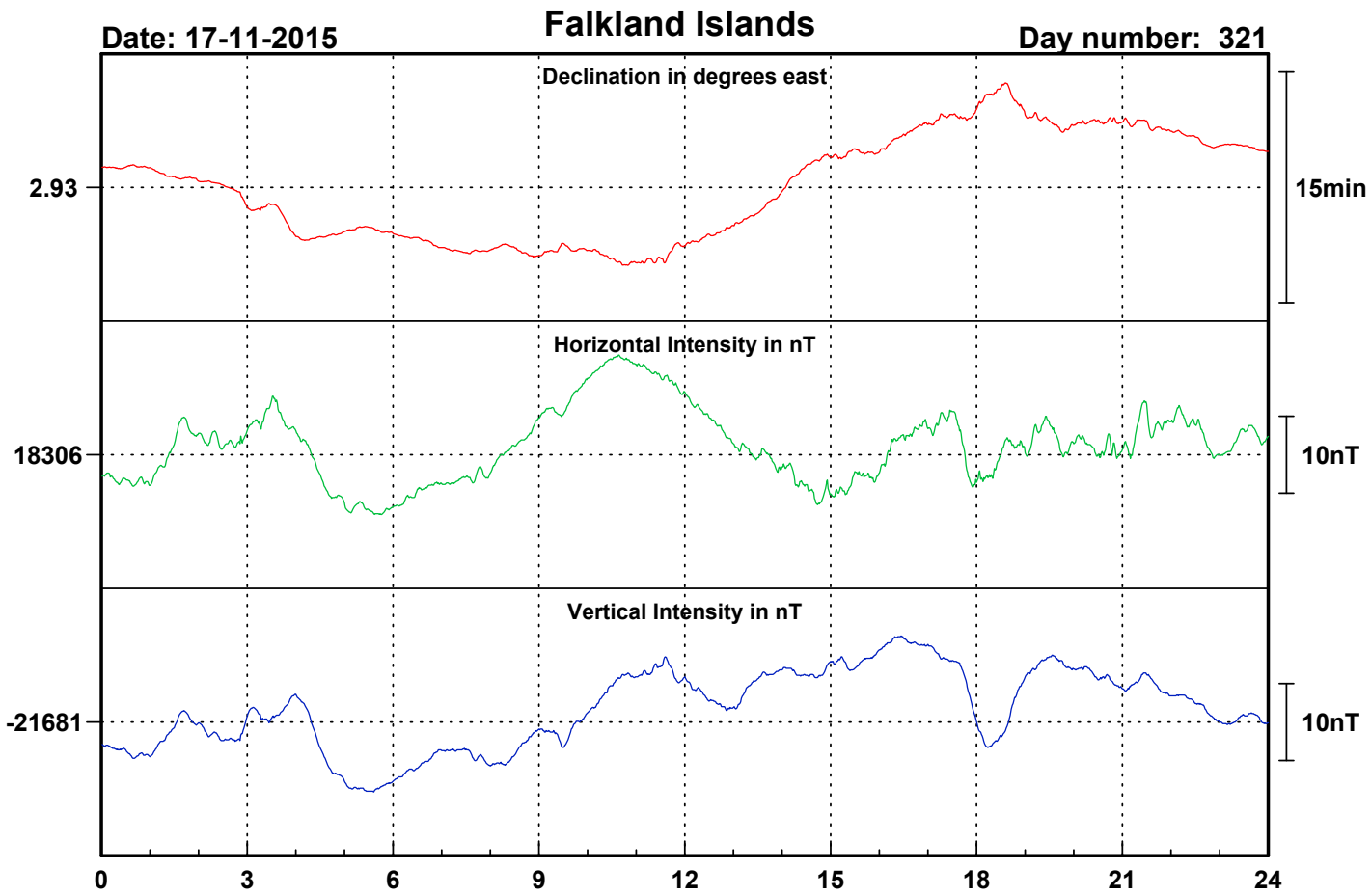
24
Hour (UT)


Falkland Islands
Date: 17-11-2015
Day number: 321
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
10nT
Vertical Intensity in nT
-21681
10nT
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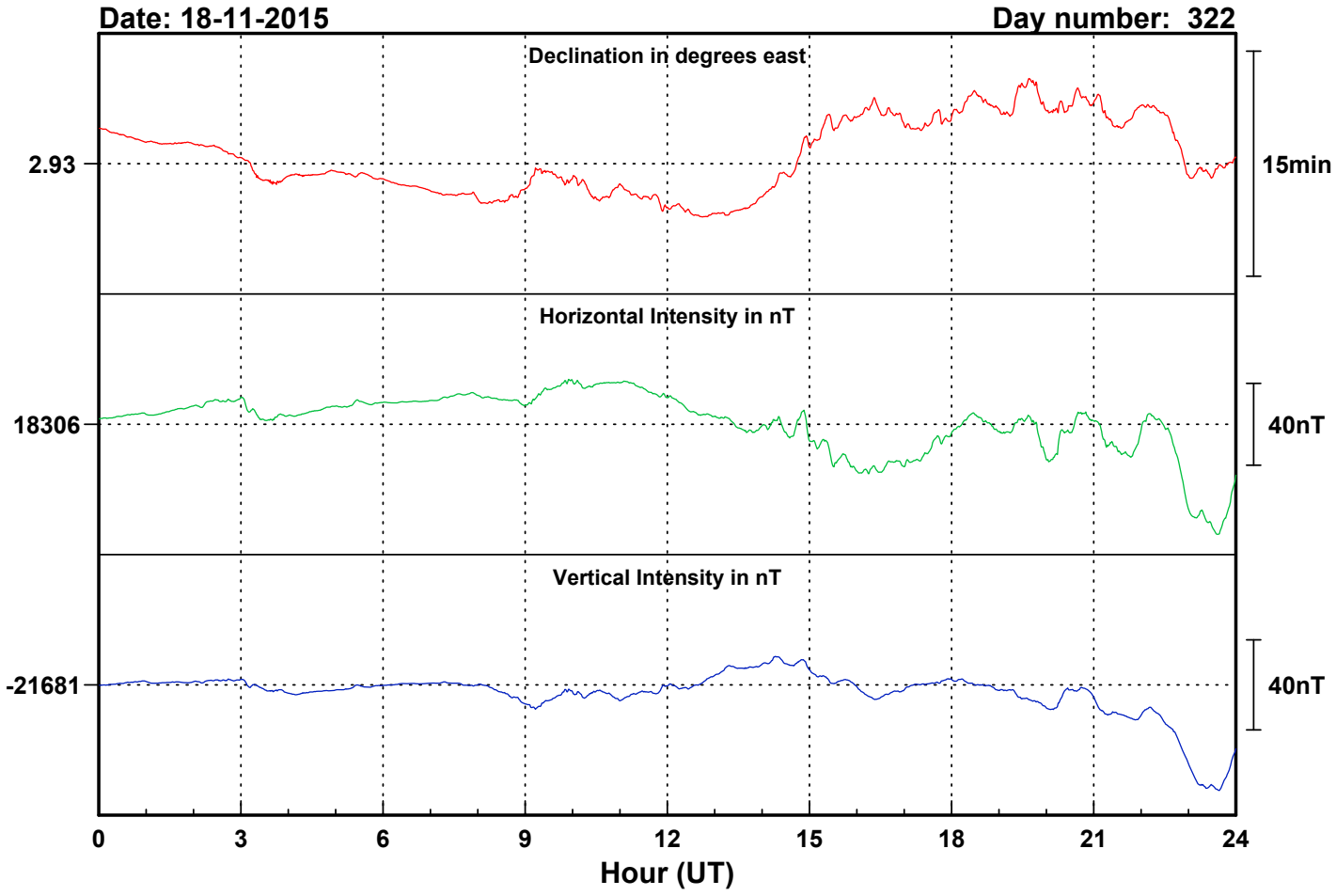
Date: 18-11-2015
Day number: 322
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
40nT
Vertical Intensity in nT
-21681
40nT
0
3
6
9
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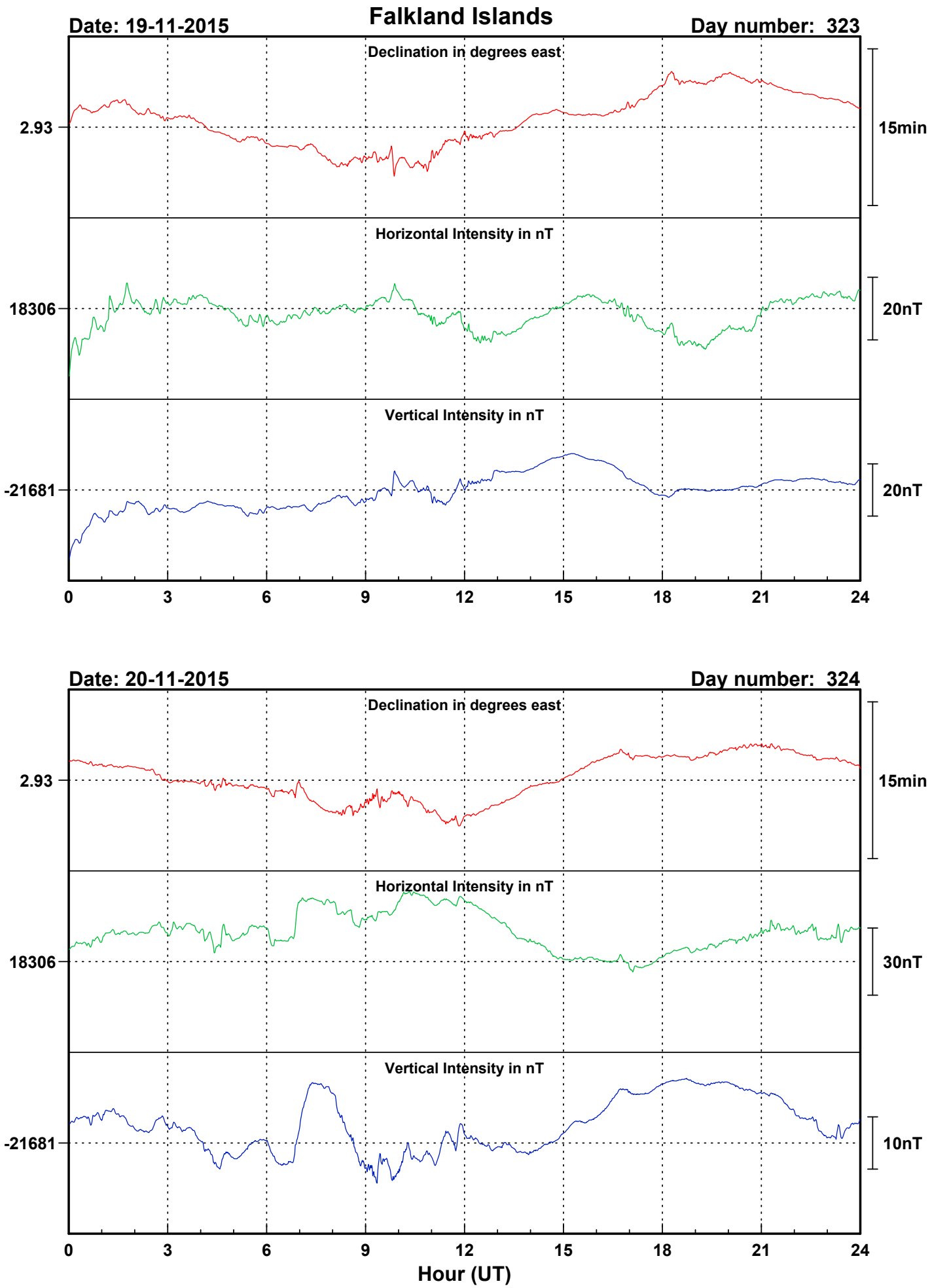
21
24
Hour (UT)


Falkland Islands
Date: 19-11-2015
Day number: 323
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24
Date: 20-11-2015
Day number: 324
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
10nT
0
3
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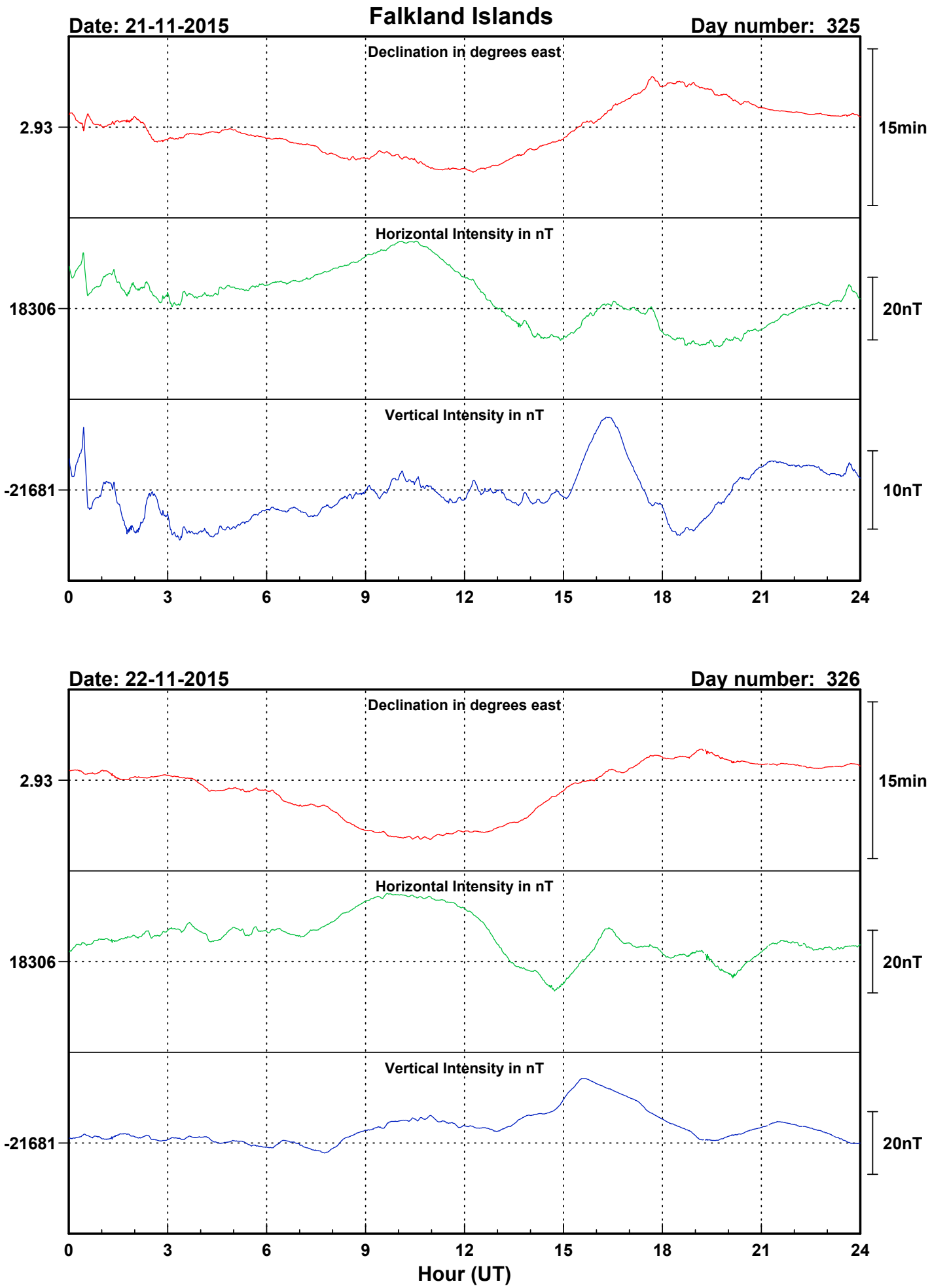
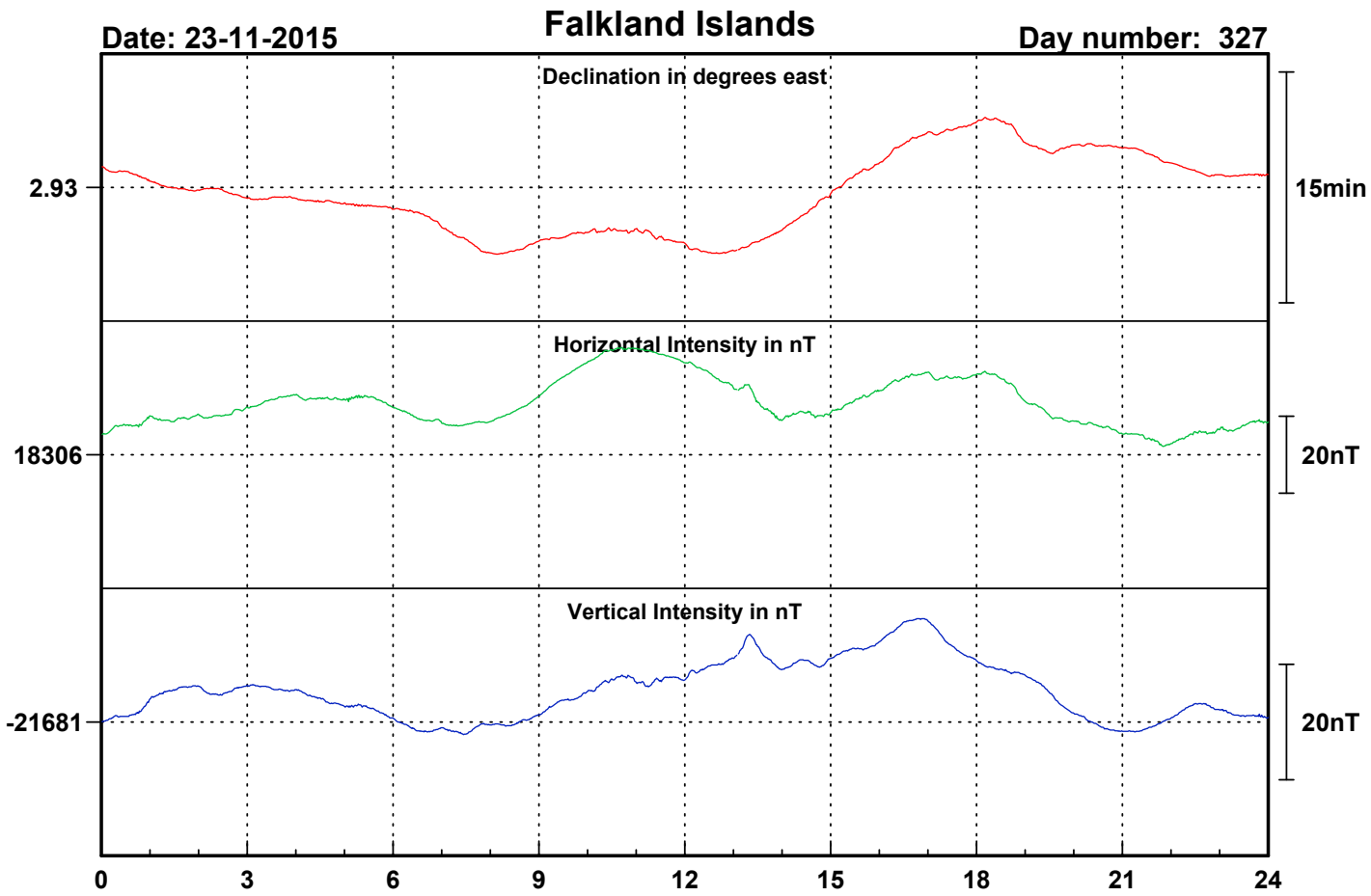
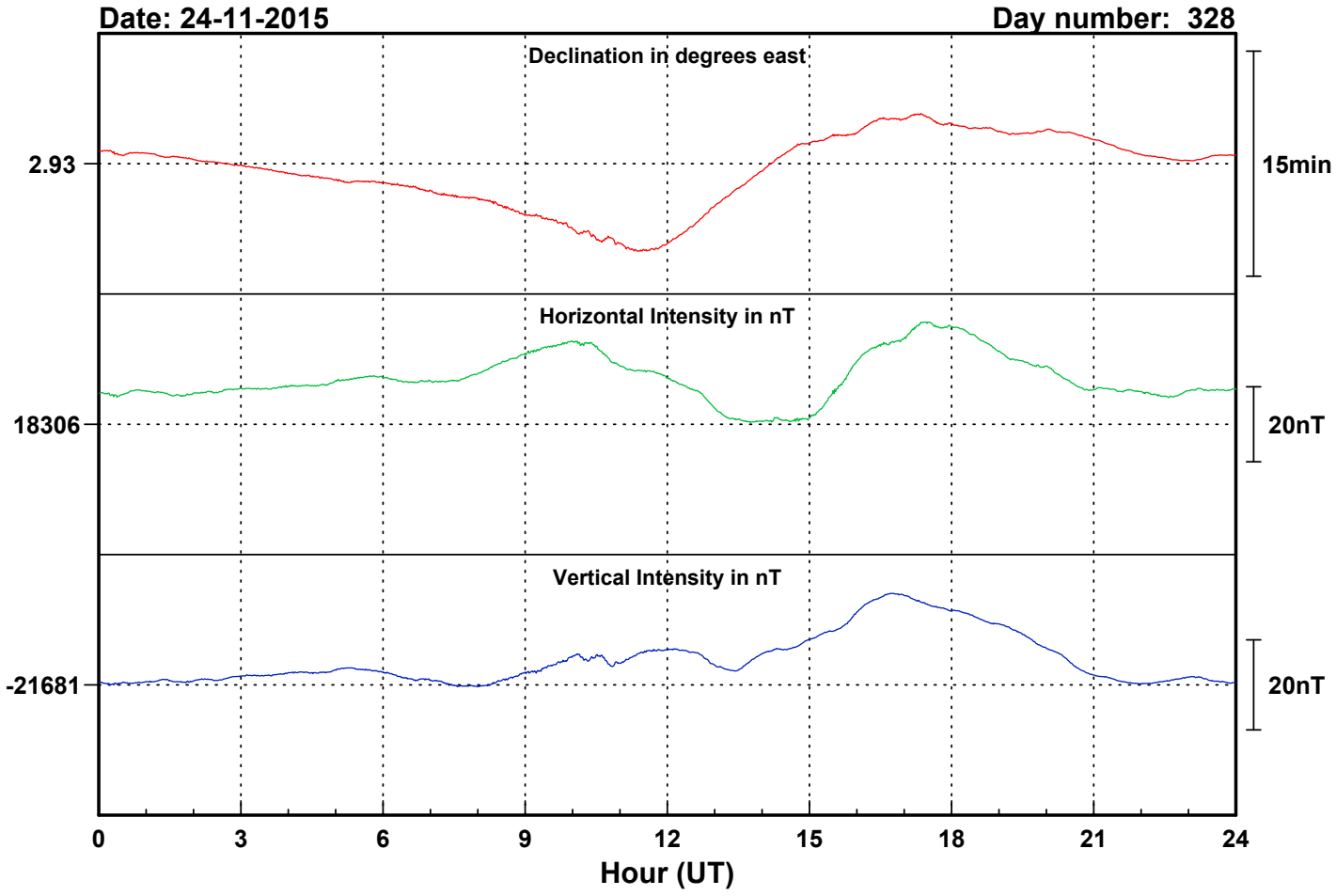
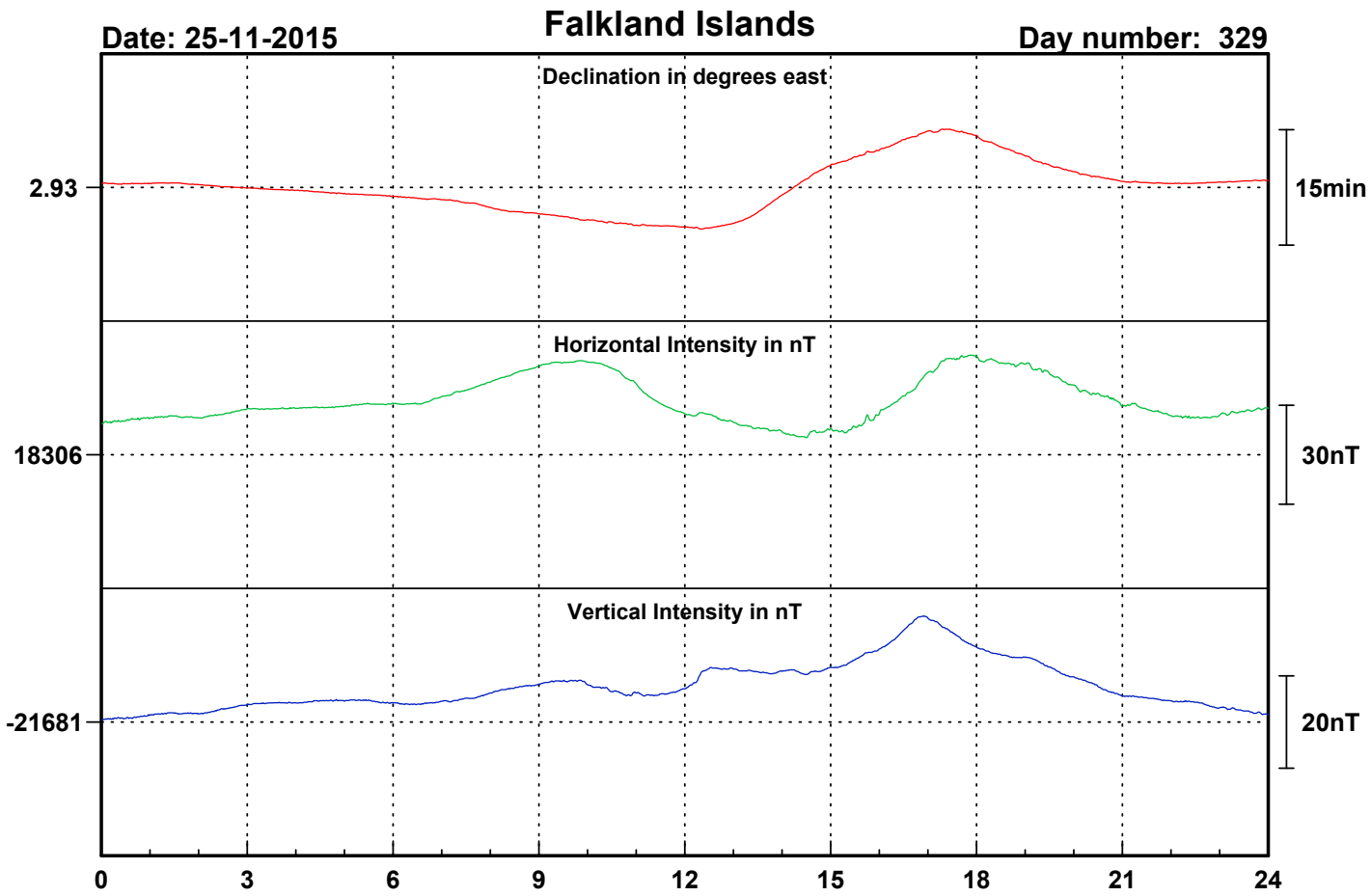
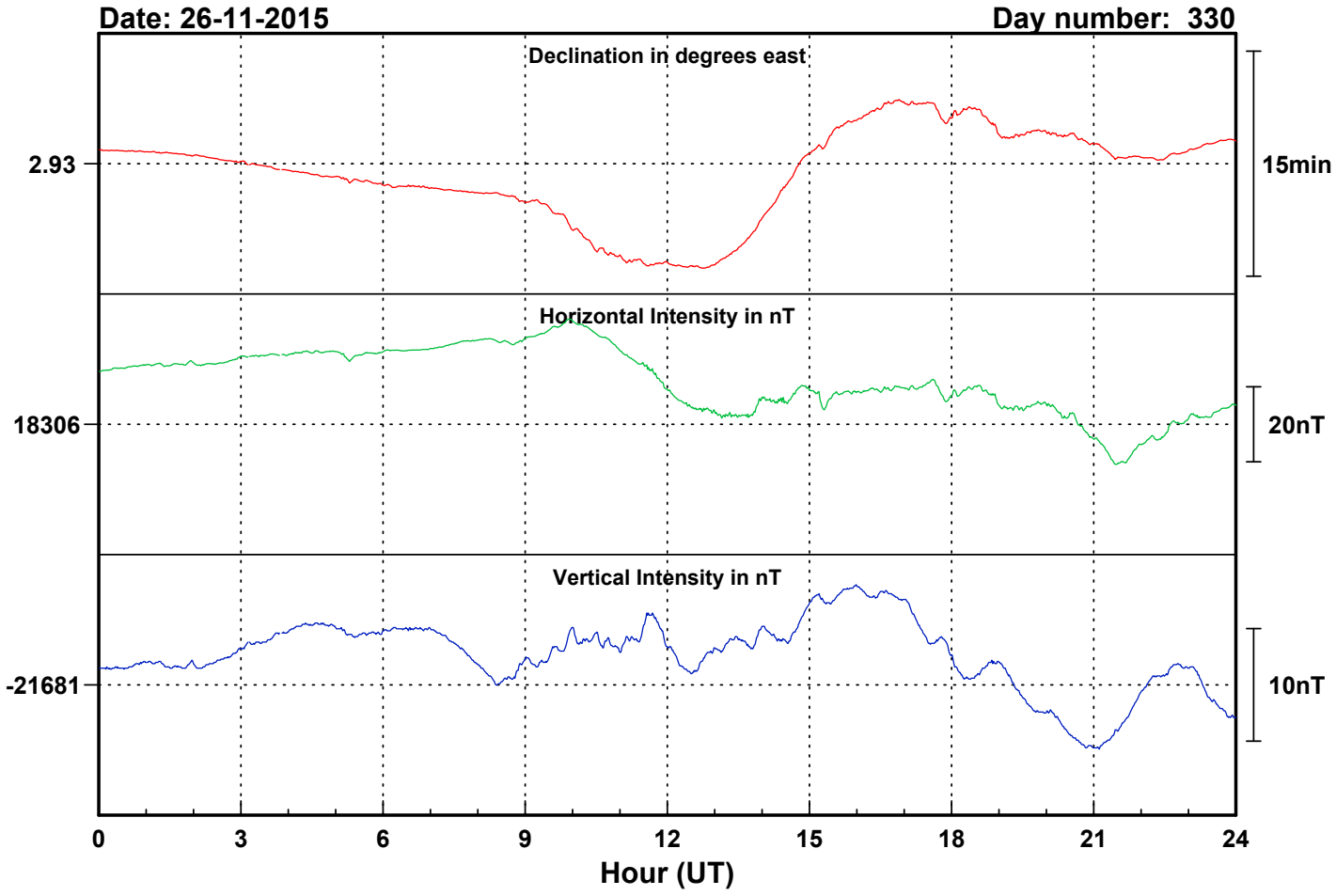
24
Hour (UT)

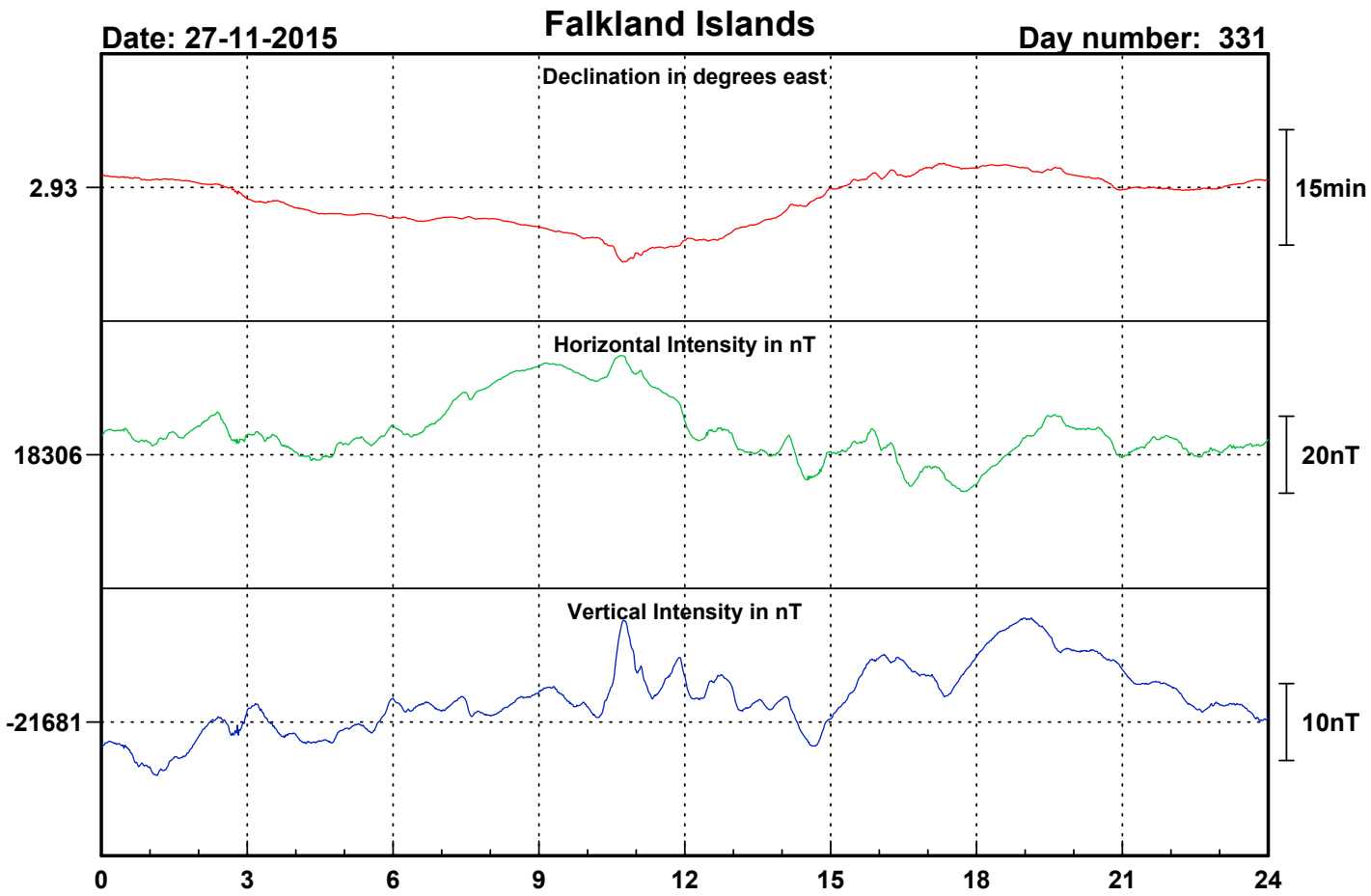

Falkland Islands
Date: 21-11-2015
Day number: 325
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
10nT
0
3
6
9
12
15
18
21
24
Date: 22-11-2015
Day number: 326
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

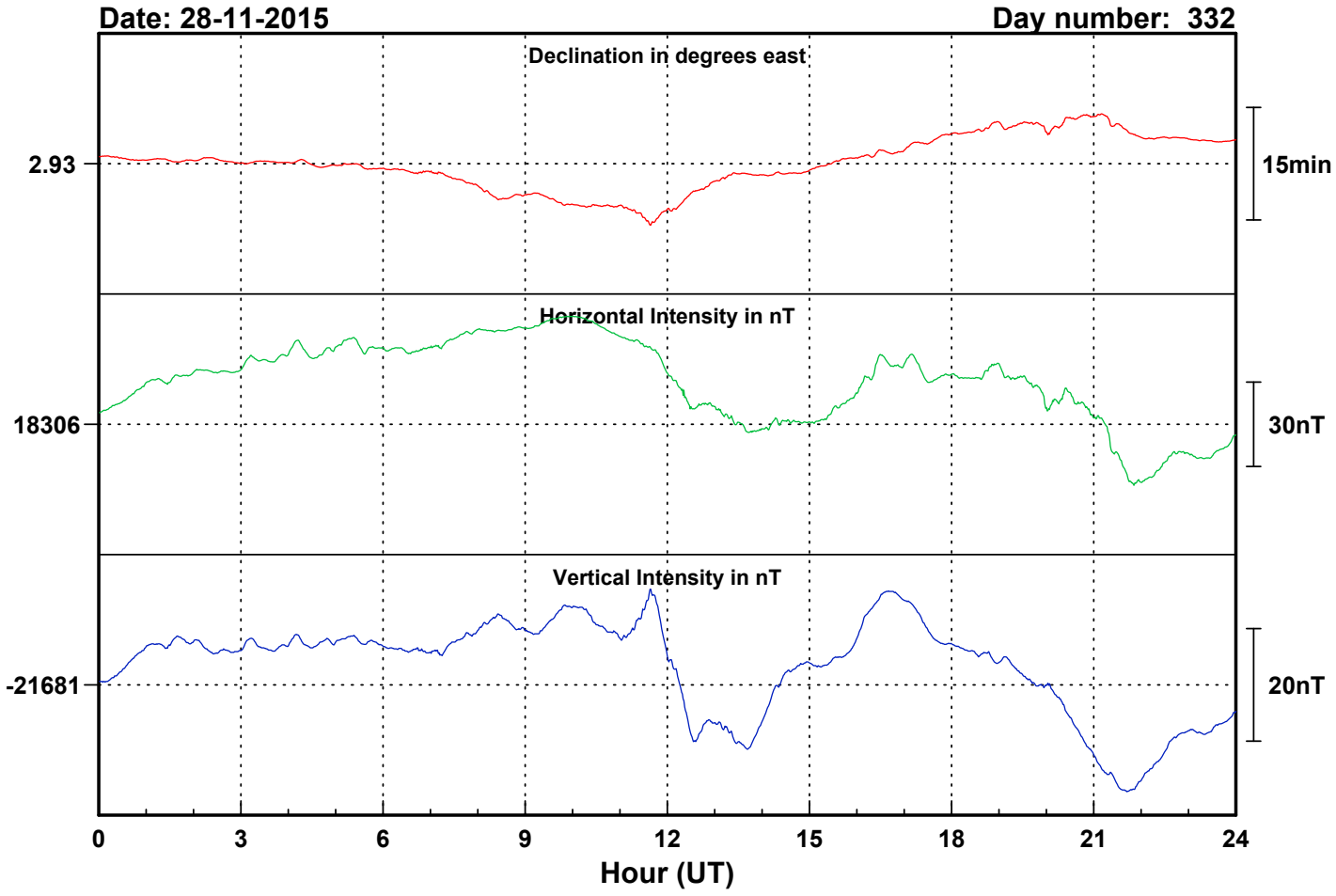

Falkland Islands
Date: 23-11-2015
Day number: 327
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24

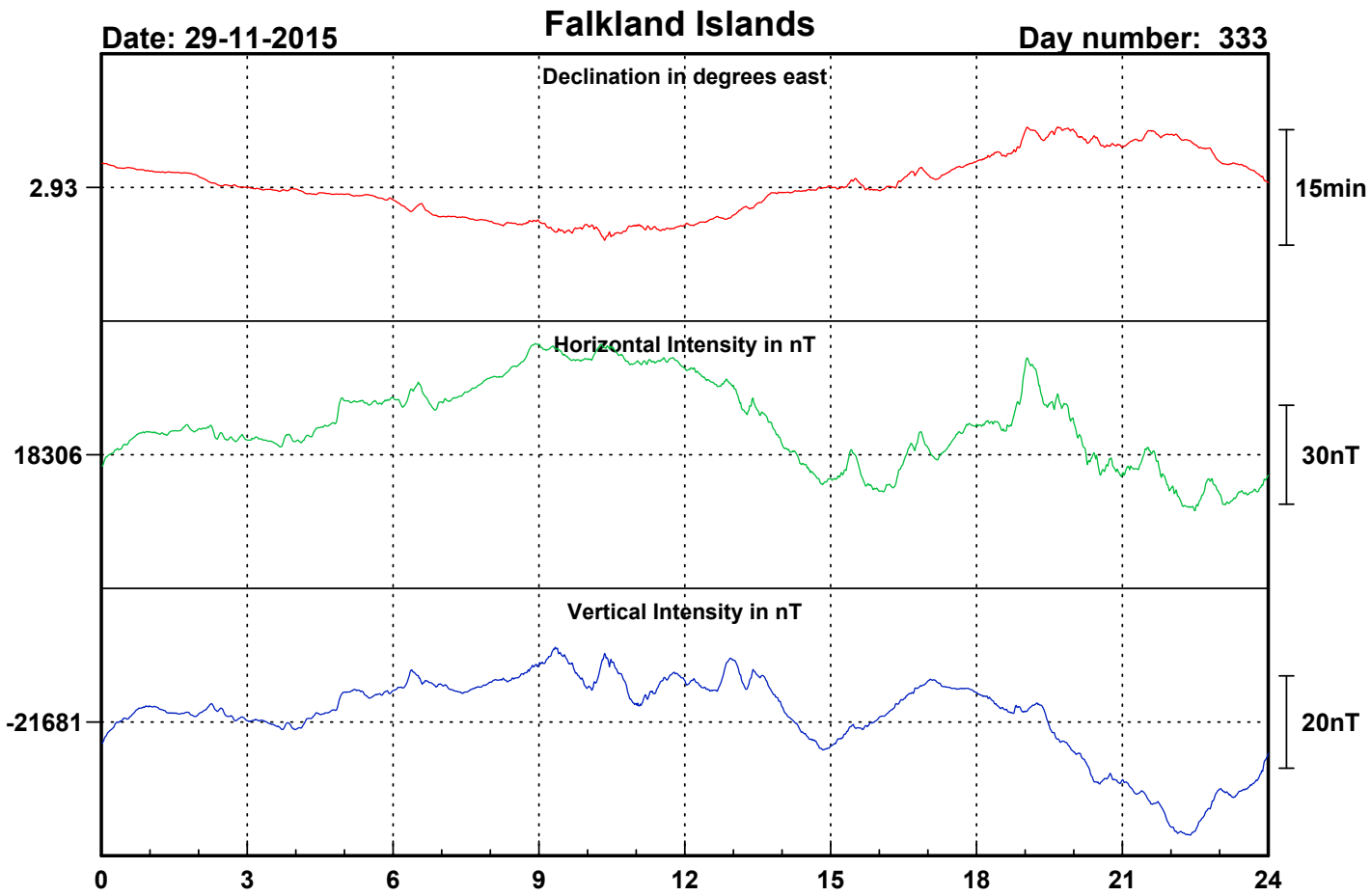

Date: 24-11-2015
Day number: 328
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

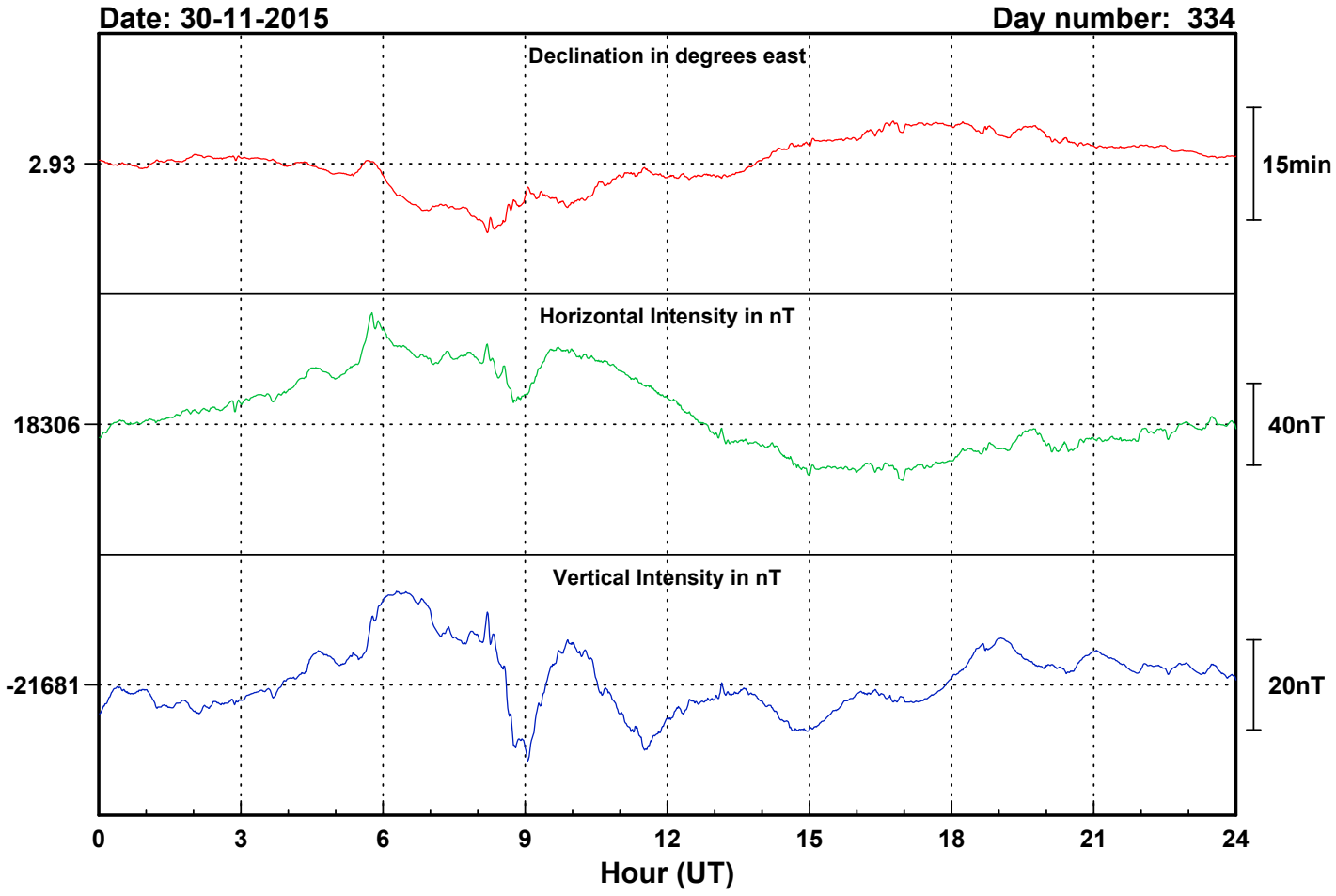

Falkland Islands
Date: 25-11-2015
Day number: 329
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24


Date: 26-11-2015
Day number: 330
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

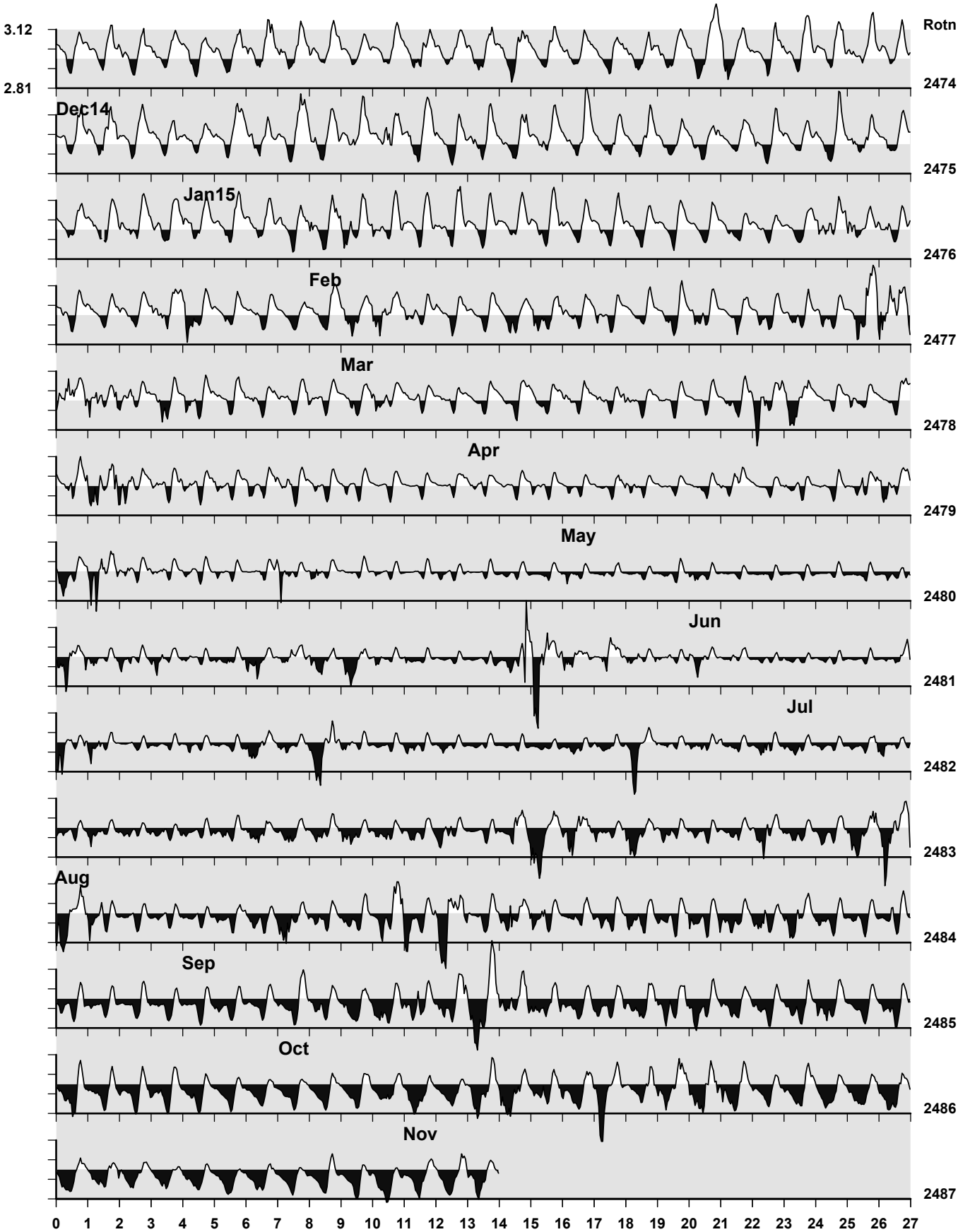

Falkland Islands
Date: 27-11-2015
Day number: 331
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
20nT
Vertical Intensity in nT
-21681
10nT
0
3
6
9
12
15
18
21
24


Date: 28-11-2015
Day number: 332
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)


Falkland Islands
Date: 29-11-2015
Day number: 333
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
30nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24

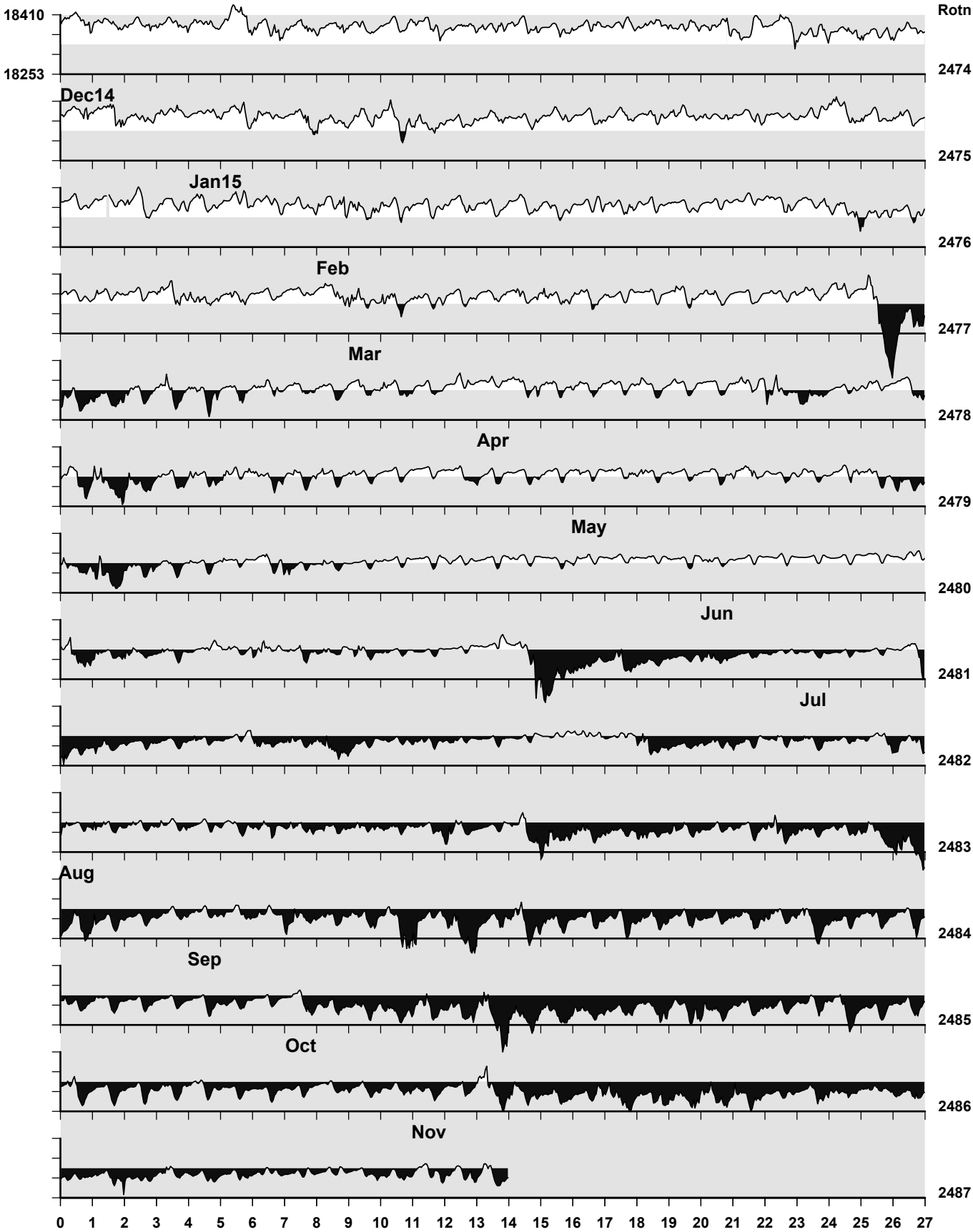

Date: 30-11-2015
Day number: 334
Declination in degrees east
2.93
15min
Horizontal Intensity in nT
18306
40nT
Vertical Intensity in nT
-21681
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Falkland Islands Observatory: Declination (degrees)

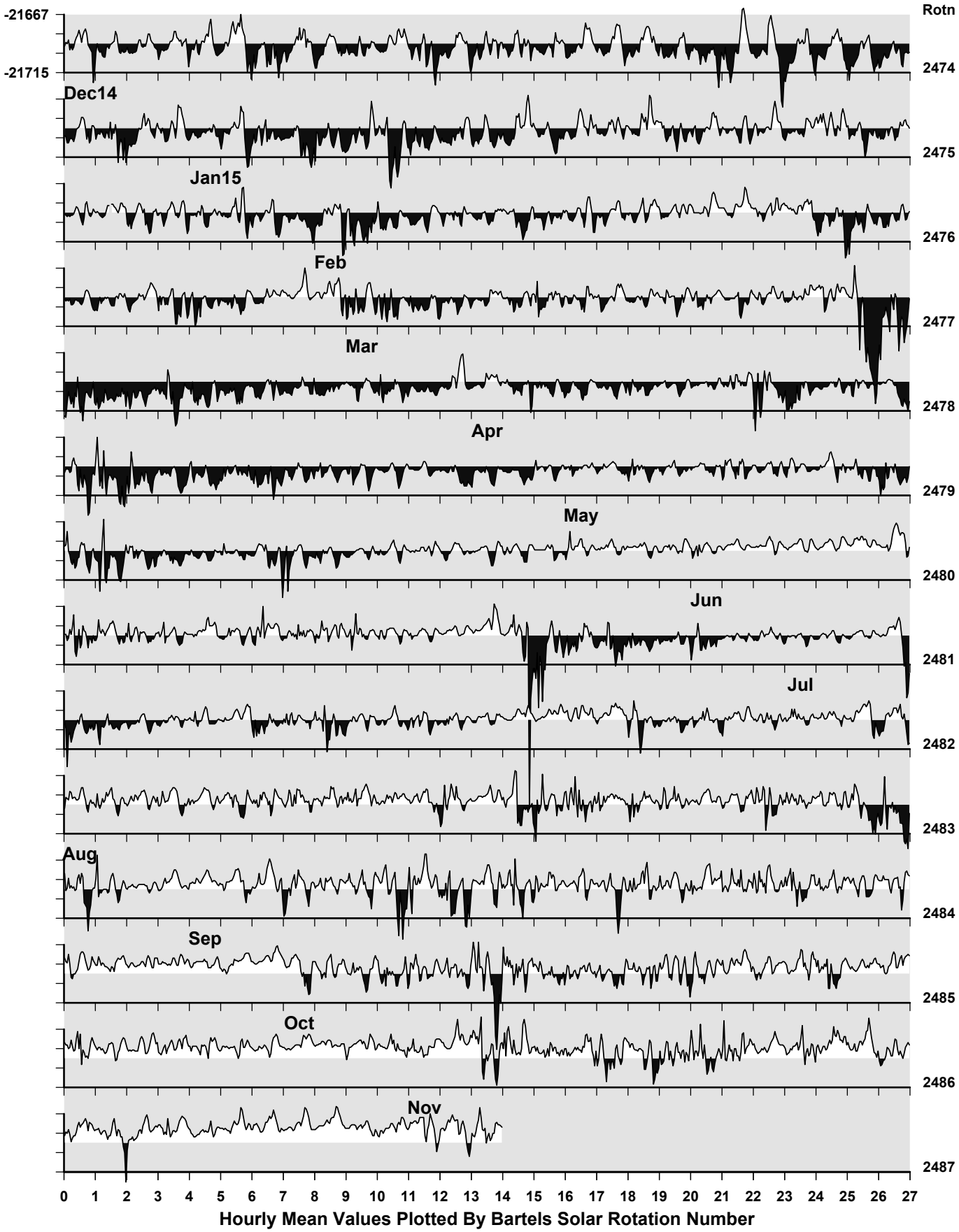


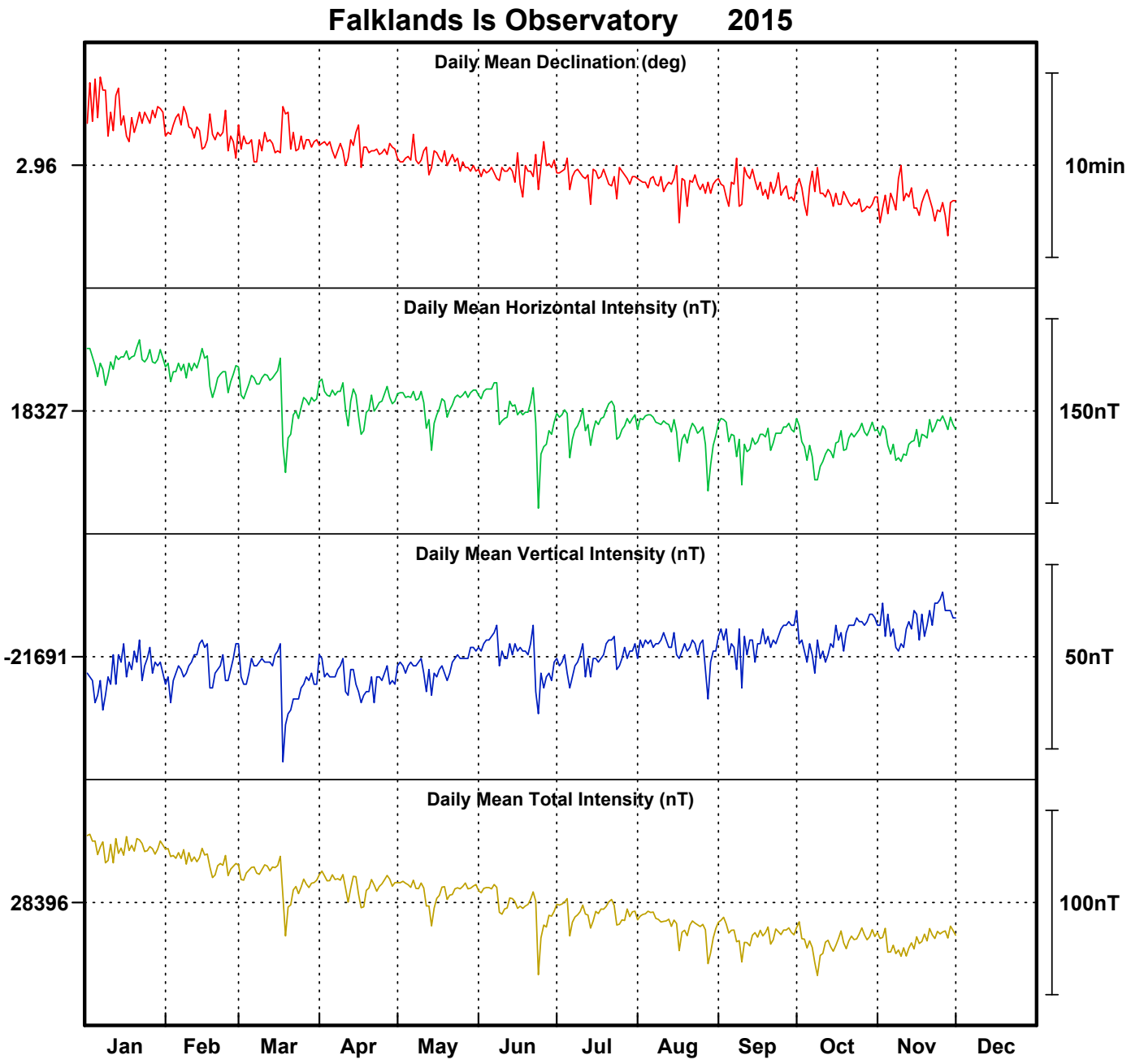
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Falkland Islands Observatory: Horizontal Intensity (nT)



Falkland Islands Observatory: Vertical Intensity (nT)




Falklands Is Observatory 2015
Daily Mean Declination (deg)
2.96
10min
Daily Mean Horizontal Intensity (nT)
18327
150nT
Daily Mean Vertical Intensity (nT)
-21691
50nT
Daily Mean Total Intensity (nT)
28396
100nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Port Stanley Observatory 2015

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	3° 0.6′	18369 nT	-49° 44.7′	18344 nT	965 nT	-21695 nT	28427 nT
February	2° 59.7′	18359 nT	-49° 45.5′	18334 nT	959 nT	-21693 nT	28419 nT
March	2° 59.1′	18338 nT	-49° 47.7′	18314 nT	955 nT	-21697 nT	28409 nT
April	2° 58.7′	18335 nT	-49° 48.0′	18310 nT	953 nT	-21697 nT	28406 nT
May	2° 58.1′	18334 nT	-49° 47.8′	18309 nT	949 nT	-21693 nT	28403 nT
June	2° 57.5′	18324 nT	-49° 48.5′	18299 nT	946 nT	-21690 nT	28394 nT
July	2° 57.2′	18318 nT	-49° 49.2′	18293 nT	944 nT	-21691 nT	28391 nT
August	2° 56.8′	18310 nT	-49° 49.6′	18286 nT	941 nT	-21688 nT	28384 nT
September	2° 56.6′	18306 nT	-49° 49.9′	18282 nT	940 nT	-21686 nT	28379 nT
October	2° 56.1′	18300 nT	-49° 50.3′	18276 nT	937 nT	-21685 nT	28375 nT
November	2° 55.8′	18306 nT	-49° 49.4′	18282 nT	936 nT	-21681 nT	28376 nT

Note

i. The values shown here are provisional.