BRITISH GEOLOGICAL SURVEY

Lerwick Observatory

Monthly Magnetic Bulletin

September 2015

15/09/LE

SHETLAND ISLANDS

British Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

LERWICK OBSERVATORY MAGNETIC DATA

1. Introduction

Lerwick observatory is one of three geomagnetic observatories in the UK operated and maintained by the British Geological Survey (BGS).

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, reports of rapid variations and geomagnetic activity indices. The operation of the observatory and presentation of data are described in the rest of this section.

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Fax: +44 (0) 131 668 2683
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Internet: www.geomag.bgs.ac.uk

2. Position

The observatory is situated on a ridge of high ground about 2.5 km to the SW of the port of Lerwick in Shetland. The observatory co-ordinates are:

Geographic: 60°08'18.0"N 358°49'02.4"E
Geomagnetic: 61°49'05"N 088°45'25"E
Height above mean sea level: 85 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 2015.5. On-line access to models (including IGRF), charts and navigational data are available at
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 in 2002, and became fully operational in January 2003. 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 Back-up Systems

There are two other fully independent identical systems, GDAS 2 and GDAS 3, operating at the observatory. The data from these are also processed in near real-time and used for quality control purposes. They are also used to fill any gaps or replace any corrupt values in the primary system, GDAS 1.

3.3 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. 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.

Full lists of the UK observatory hourly mean values from 1983 to the present day are available at www.geomag.bgs.ac.uk/data_service/data/obs_data/hourly_means

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.

4.6 Rapid Variations

Charged particles stream from the Sun in the solar wind. The solar wind interacts with the geomagnetic field to create a cavity, the magnetosphere, in which the field is confined. When a region of enhanced velocity and/or density in the solar wind arrives at the dayside boundary of the magnetosphere (at about 10 earth radii) the boundary is pushed towards the Earth. Currents set up on the boundary of the magnetosphere can cause an abrupt change in the geomagnetic field measured on the ground and this is recorded on observatory magnetograms as a sudden impulse (*si*). If, following an *si*, there is a change in the rhythm of activity, the *si* is termed a storm sudden commencement (*ssc*). A classical magnetic storm exhibiting initial, main and recovery phases (shown by, for instance, the *Dst* ring current index) can often occur after a *ssc*, in which case the start of the storm is taken as the time of the *ssc*.

Solar flares, seen at optical wavelengths as a sudden brightening of a small region of the Sun's surface, are also responsible for increased X-ray emissions. These X-rays cause increased ionisation in the ionosphere, which leads to absorption of short-wave radio signals. A solar flare effect (*sfe*), or "crochet", may be observed on a magnetogram during geomagnetically quiet times. It is a relatively short-term change (tens of minutes) to the normal diurnal variation and can vary in size (tens of nT) depending on local time (LT), geomagnetic latitude and solar zenith angle.

4.7 Local geomagnetic activity indices

The Observatory K index. This summarises geomagnetic activity at an observatory by assigning a code, an integer in the range 0 to 9, to each 3-hour Universal Time (UT) interval. The index for each 3-hour UT interval is determined from the maximum range in *H* or *D* (scaled in nT), with allowance made for the regular (undisturbed) diurnal variation. The conversion from range to an index value is made using a quasi-logarithmic scale, with the scale values dependent on the geomagnetic latitude of the observatory. The lower bounds (in nT) for the classification of each period at Lerwick are:

0	1	2	3	4	5	6	7	8	9
0	10	20	40	80	140	240	400	660	1000

The *K* index retains the LT and seasonal dependence of activity associated with the position of the observatory. The 3-hourly *K* indices for the month are tabulated and also plotted as a histogram. All UK observatory *K* indices are available at www.geomag.bgs.ac.uk/data_service/data/magnetic_indices/k_indices

4.8 Global geomagnetic activity indices

The aa index. A number of 3-hour geomagnetic indices are computed by combining *K* indices from networks of observatories to characterise global activity levels and to eliminate LT and seasonal effects. The simplest of these is the *aa* index, computed using the *K* indices from two approximately antipodal observatories: Hartland in the UK and Canberra in Australia. The *aa* index is calculated from linearisations of the Hartland and Canberra *K* indices, and has units of nT. The 3-hourly *aa* indices are tabulated along with the daily mean value of *aa* (denoted *Aa*), the mean values of *aa* for the intervals 00-12UT (Aa_{am}) and 12-24UT (Aa_{pm}) and the monthly mean value. The 3-hourly *aa* indices for the month are also plotted as a histogram.

Although the *aa* index is based on data from only two observatories, provided averages over 12 hours or longer are used, the index is strongly correlated with the *ap* and *am* indices, which are derived using data from more extensive observatory networks.

The *aa* indices listed in this bulletin are available at www.geomag.bgs.ac.uk/data_service/data/magnetic_indices/aaindex as well as the full data set from 1868.

Definitive *aa* are published by the International Service for Geomagnetic Indices, LATMOS, 4 Avenue de Neptune, F-94107 Saint Maur Cedex, France.

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.

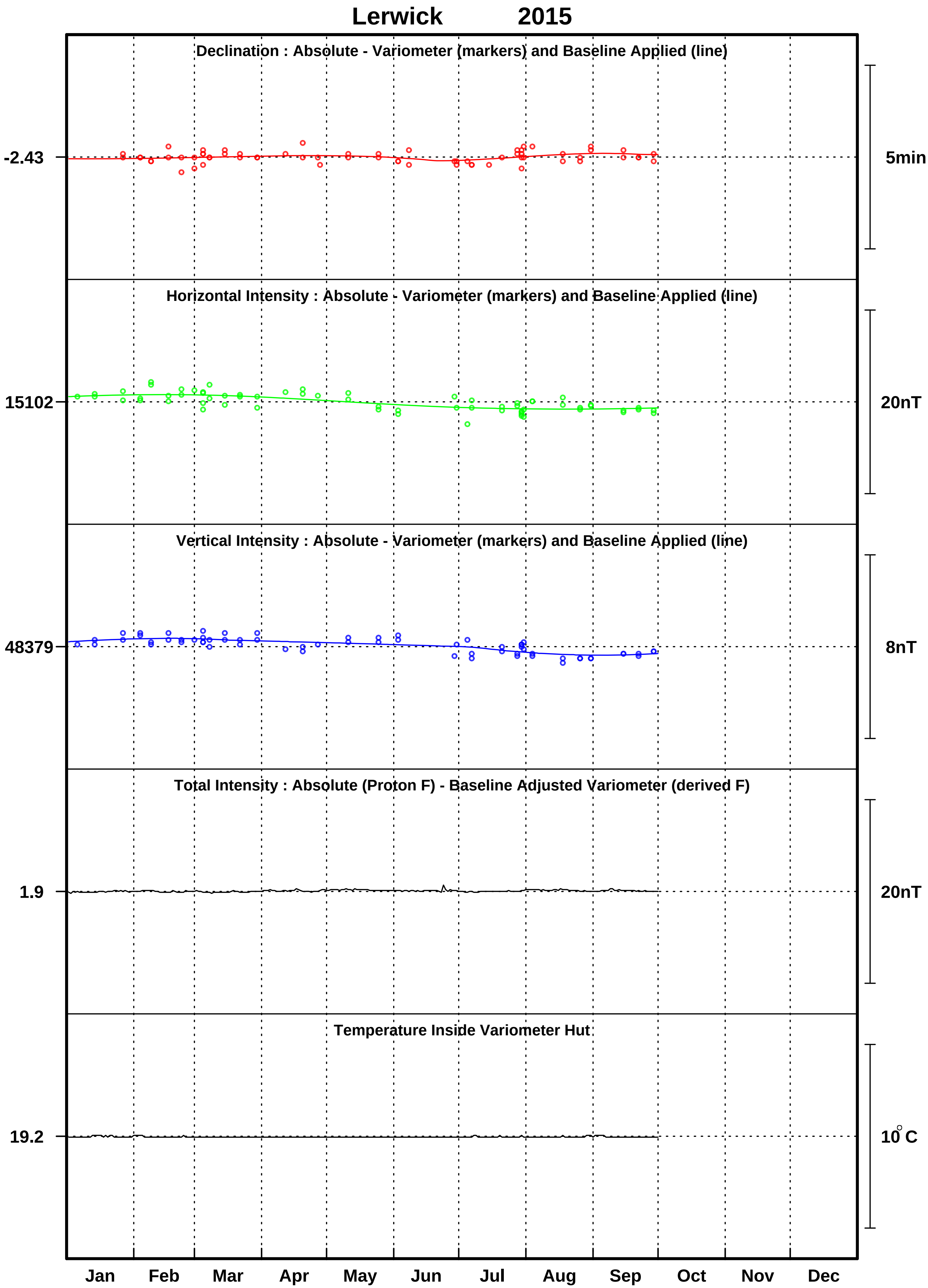
Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: 'The results presented in this paper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

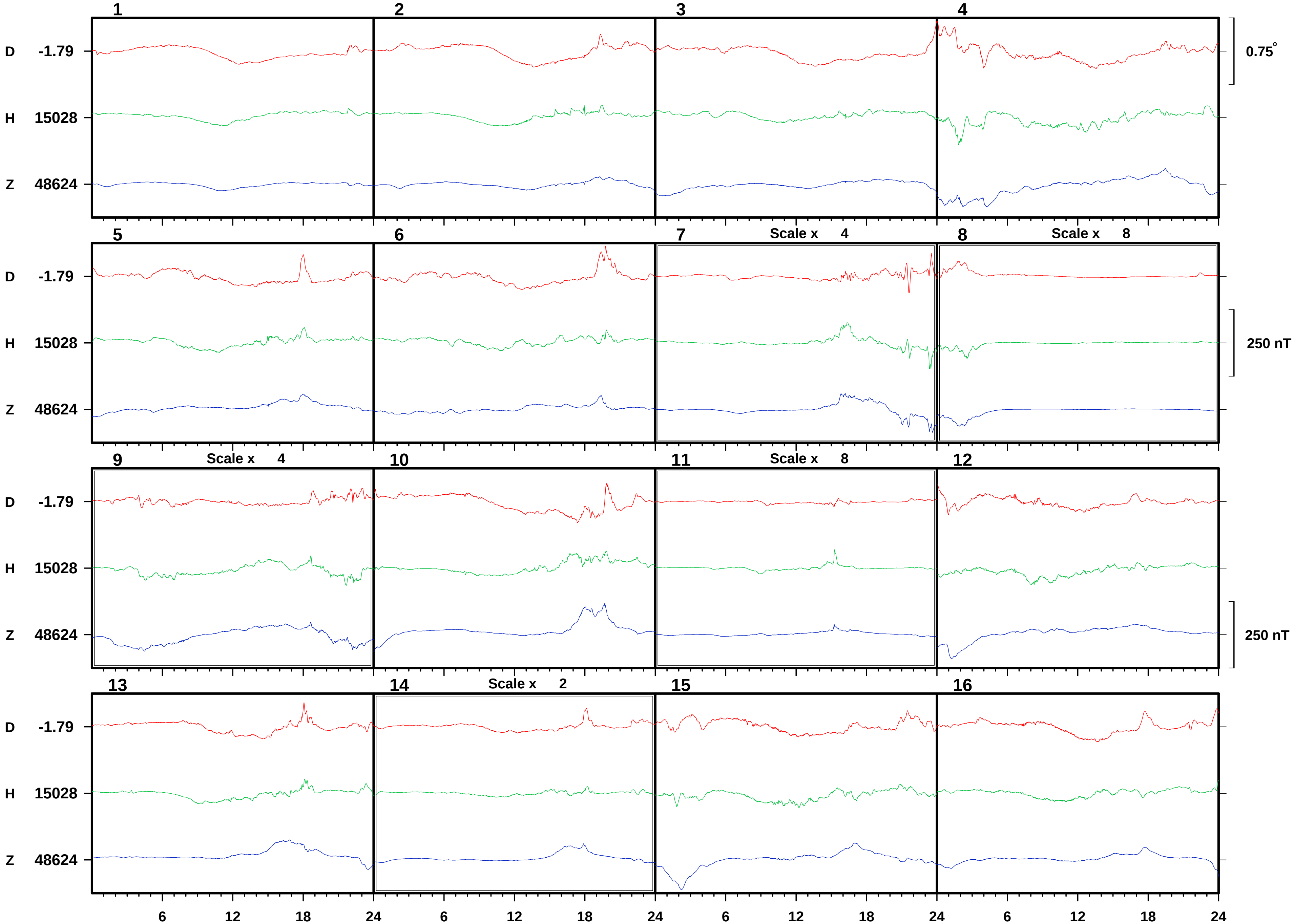
LERWICK OBSERVATORY

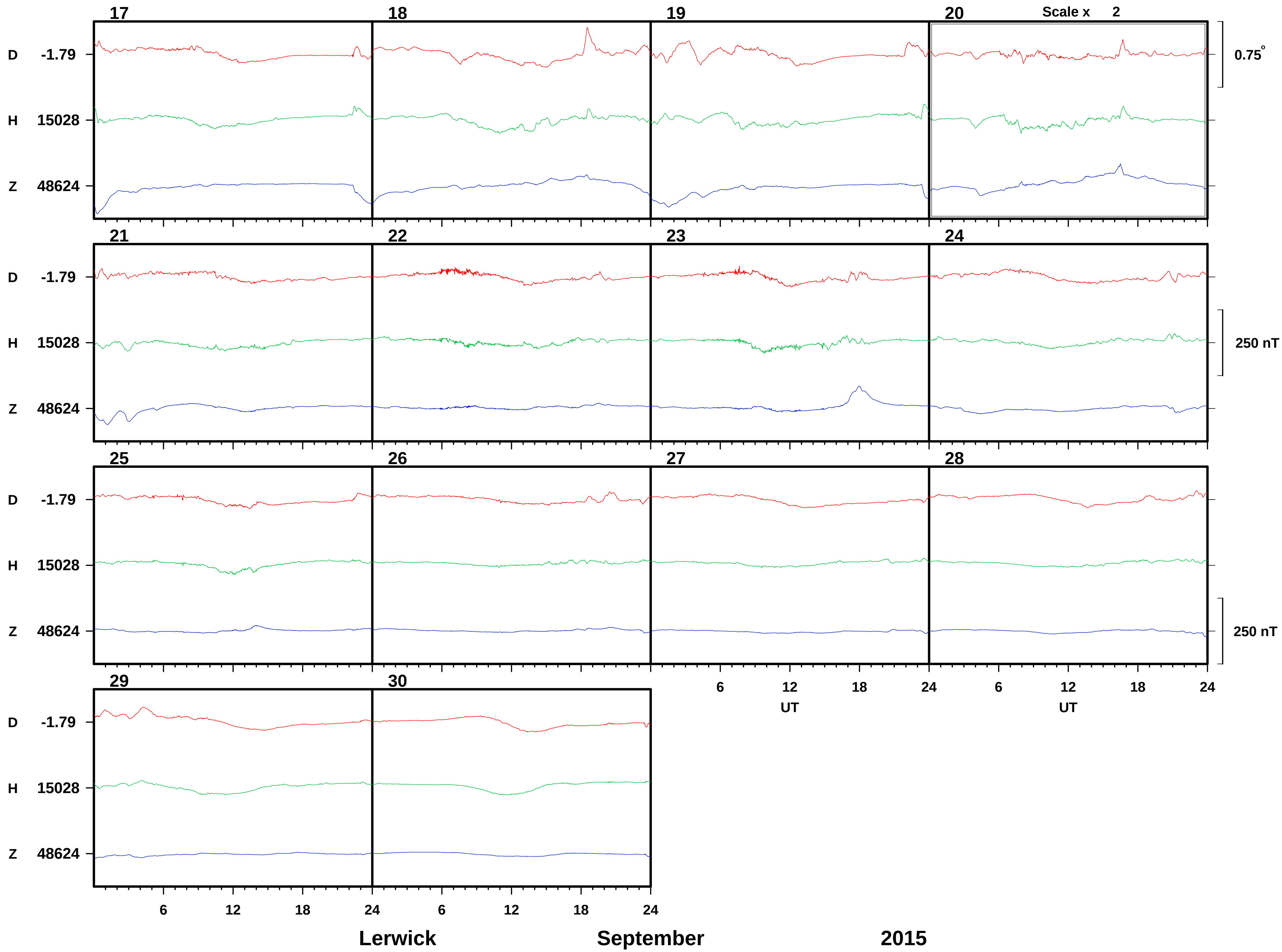
ABSOLUTE OBSERVATIONS

		Declination			Inclination		Total Field		Horizontal Intensity		Vertical Intensity		
Date	**Day Number**	**Time (UT)**	**Absolute (°)**	**Baseline (°)**	**Time (UT)**	**Absolute (°)**	**Site difference (nT)**	**Absolute corrected (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Observer**
10-Sep-15	253	18:15	-2.0029	999.9999	18:29	72.8033	-1.9	50988.9	15075.0	99999.9	48709.5	99999.9	IQ
10-Sep-15	253	18:42	-1.9602	999.9999	19:00	72.8300	-1.9	50980.2	15049.8	99999.9	48708.2	99999.9	IQ
14-Sep-15	257	17:55	-1.4939	-2.4283	18:08	72.8022	-1.9	50988.1	15075.7	15100.7	48708.4	48378.2	OB
14-Sep-15	257	18:19	-1.6180	-2.4317	18:32	72.8347	-1.9	50949.7	15036.8	15100.9	48680.2	48378.2	OB
21-Sep-15	264	17:43	-1.8207	-2.4317	17:55	72.8236	-1.9	50901.6	15032.0	15101.2	48631.4	48378.1	OB
21-Sep-15	264	18:03	-1.8220	-2.4317	18:15	72.8186	-1.9	50902.4	15036.4	15101.0	48630.8	48378.2	OB
28-Sep-15	271	16:25	-1.8263	-2.4300	16:44	72.8122	-1.9	50900.7	15041.4	15100.9	48627.5	48378.3	OB
28-Sep-15	271	16:56	-1.8270	-2.4333	17:12	72.8103	-1.9	50901.5	15043.3	15100.6	48627.8	48378.3	OB


Lerwick 2015
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
-2.43
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
15102
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
48379
8nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
1.9
20nT
Temperature Inside Variometer Hut
19.2
10°C
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

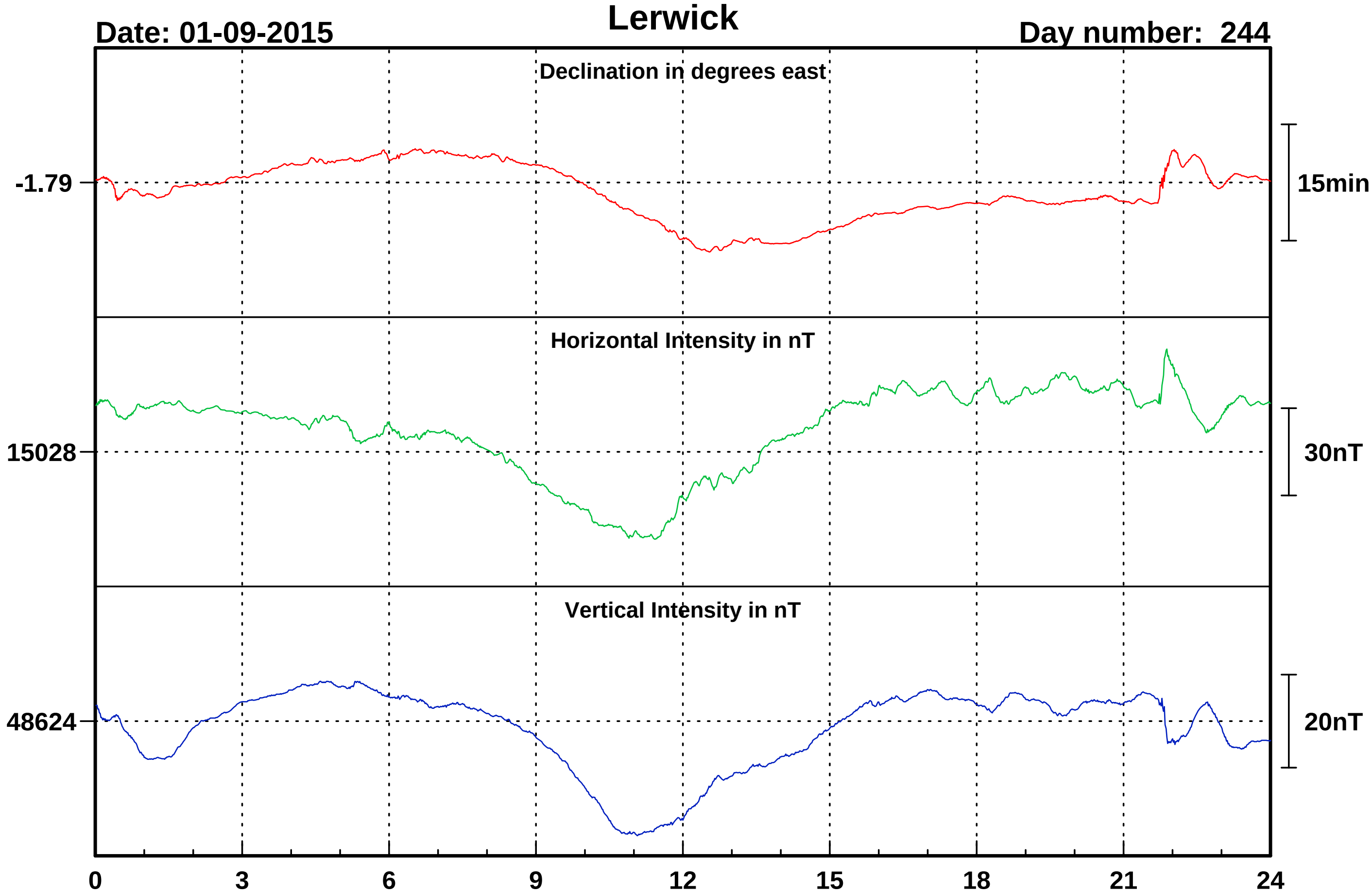
Lerwick September 2015

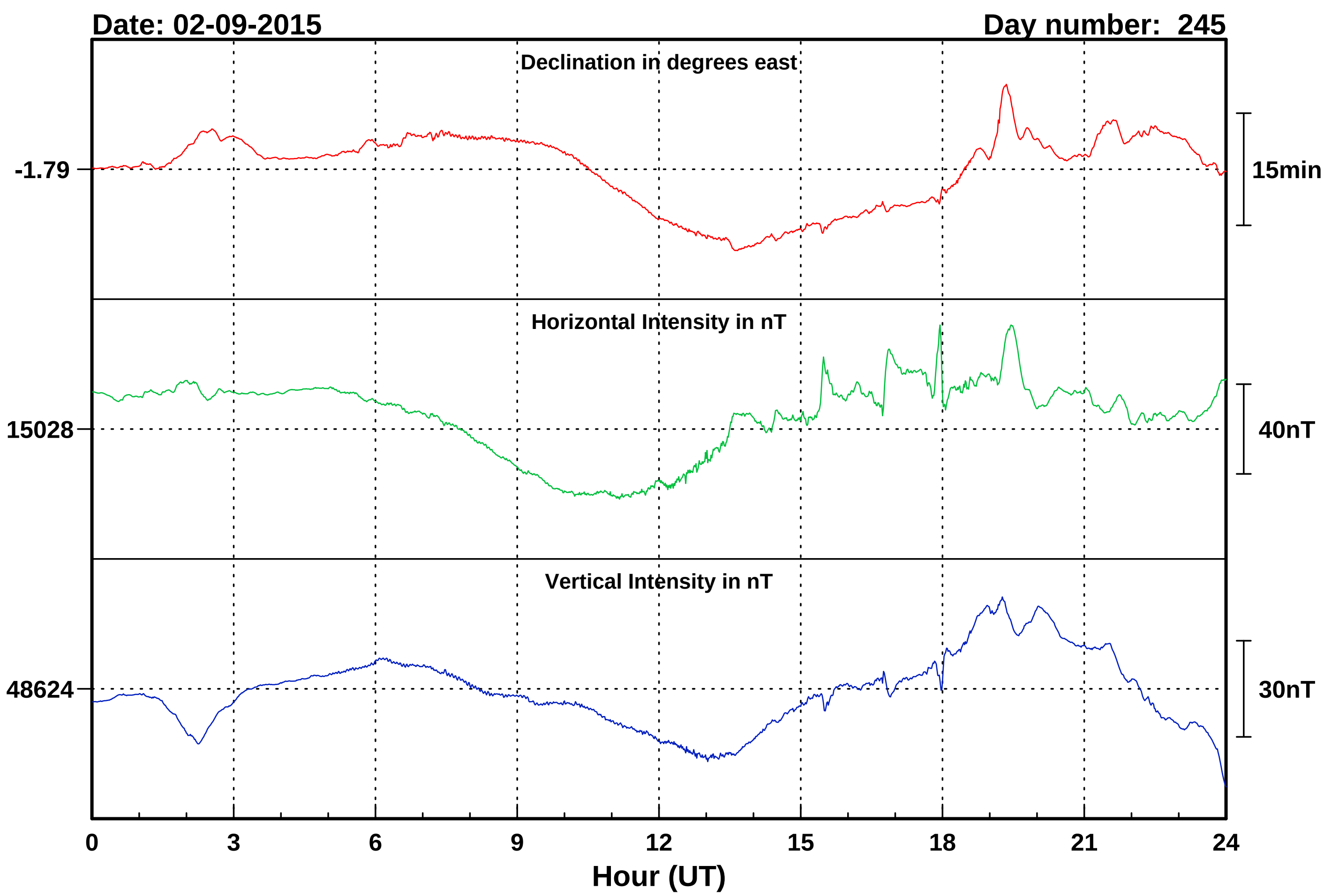


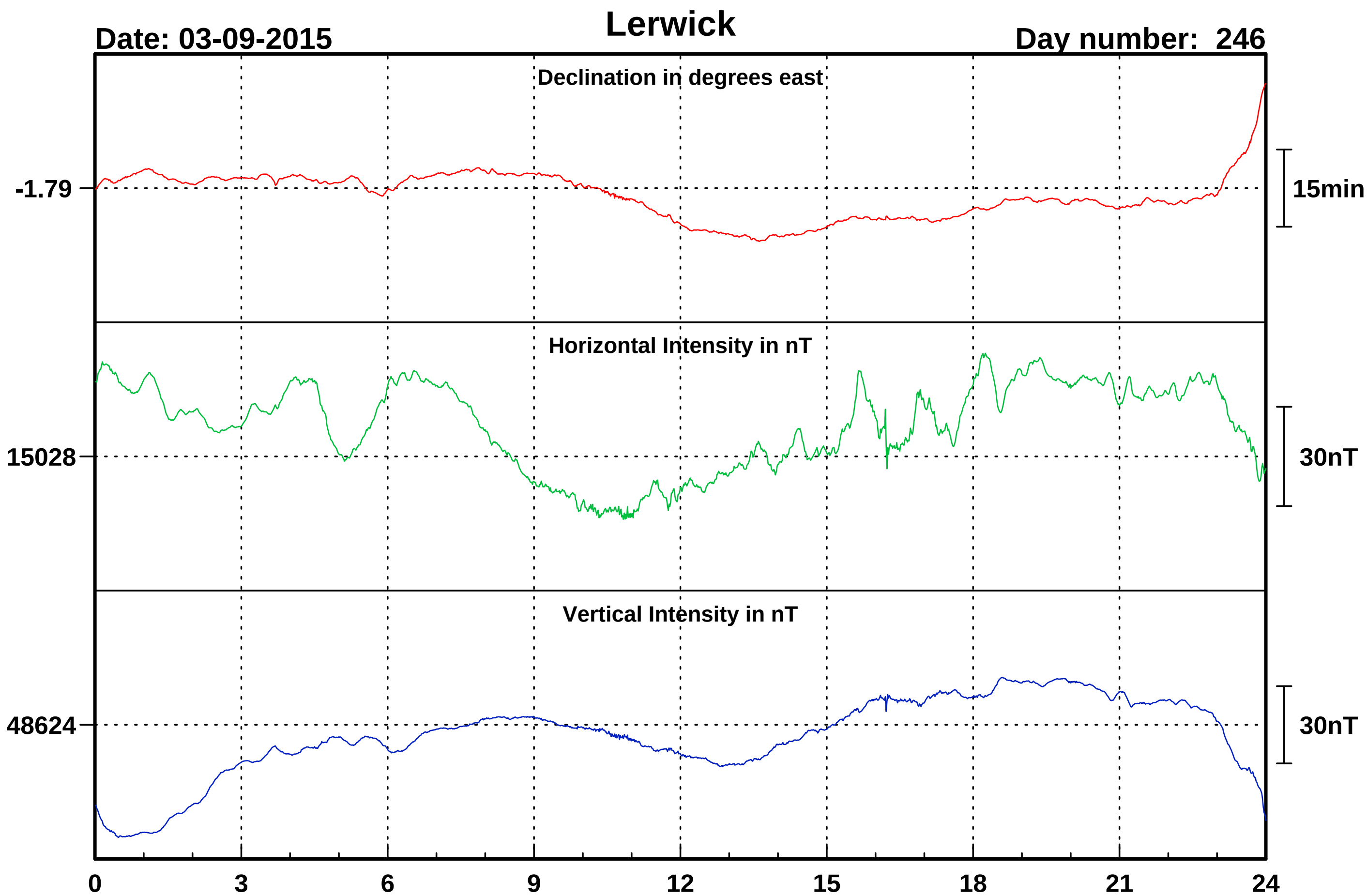


17
18
19
20
Scale x 2
0.75°
D -1.79
H 15028
Z 48624
21
22
23
24
250 nT
25
26
27
28
250 nT
29
30
6
12
18
24
UT
Lerwick
September
2015

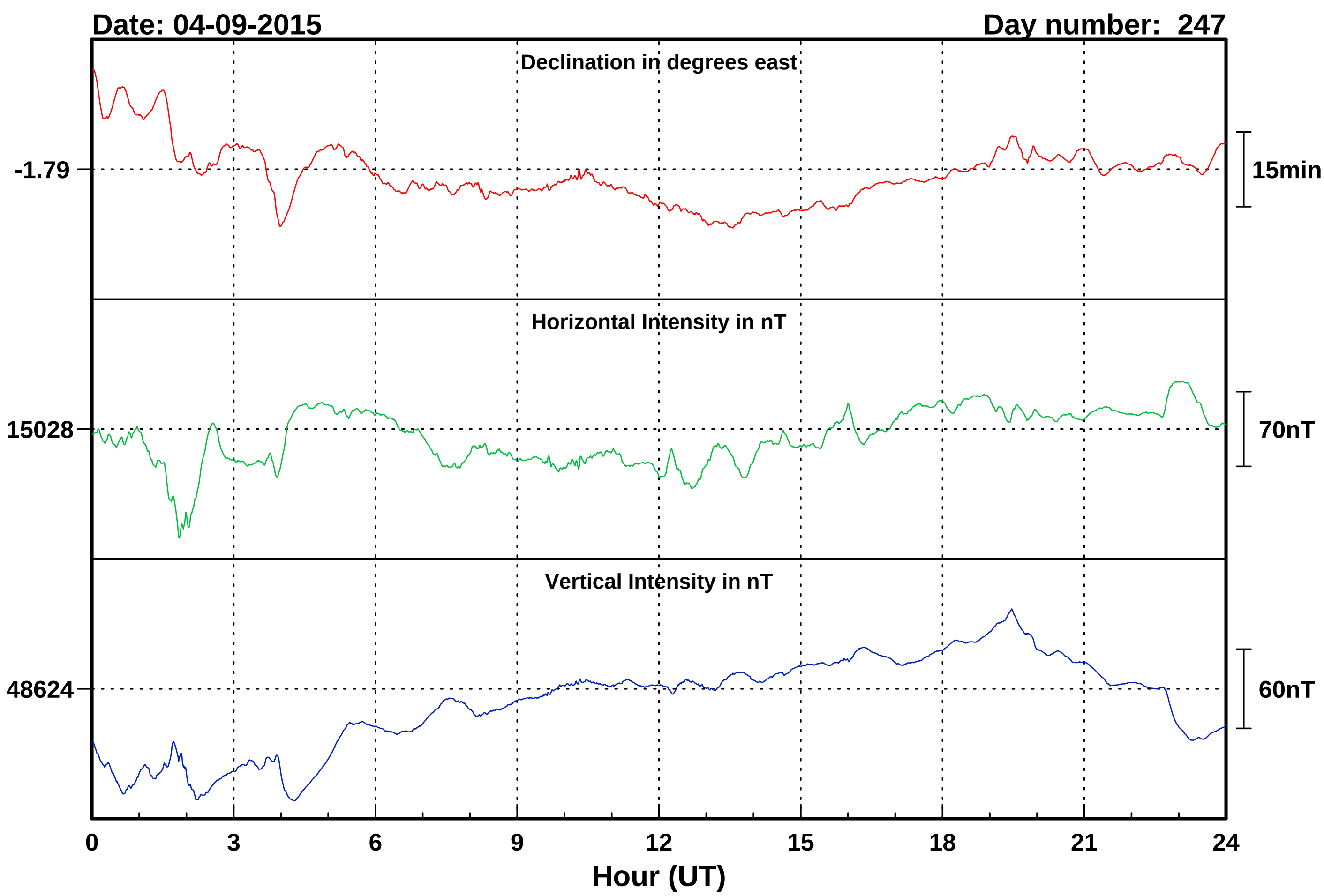
Lerwick


Date: 01-09-2015
Day number: 244
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
30nT
Vertical Intensity in nT
48624
20nT
0
3
6
9
12
15
18
21
24

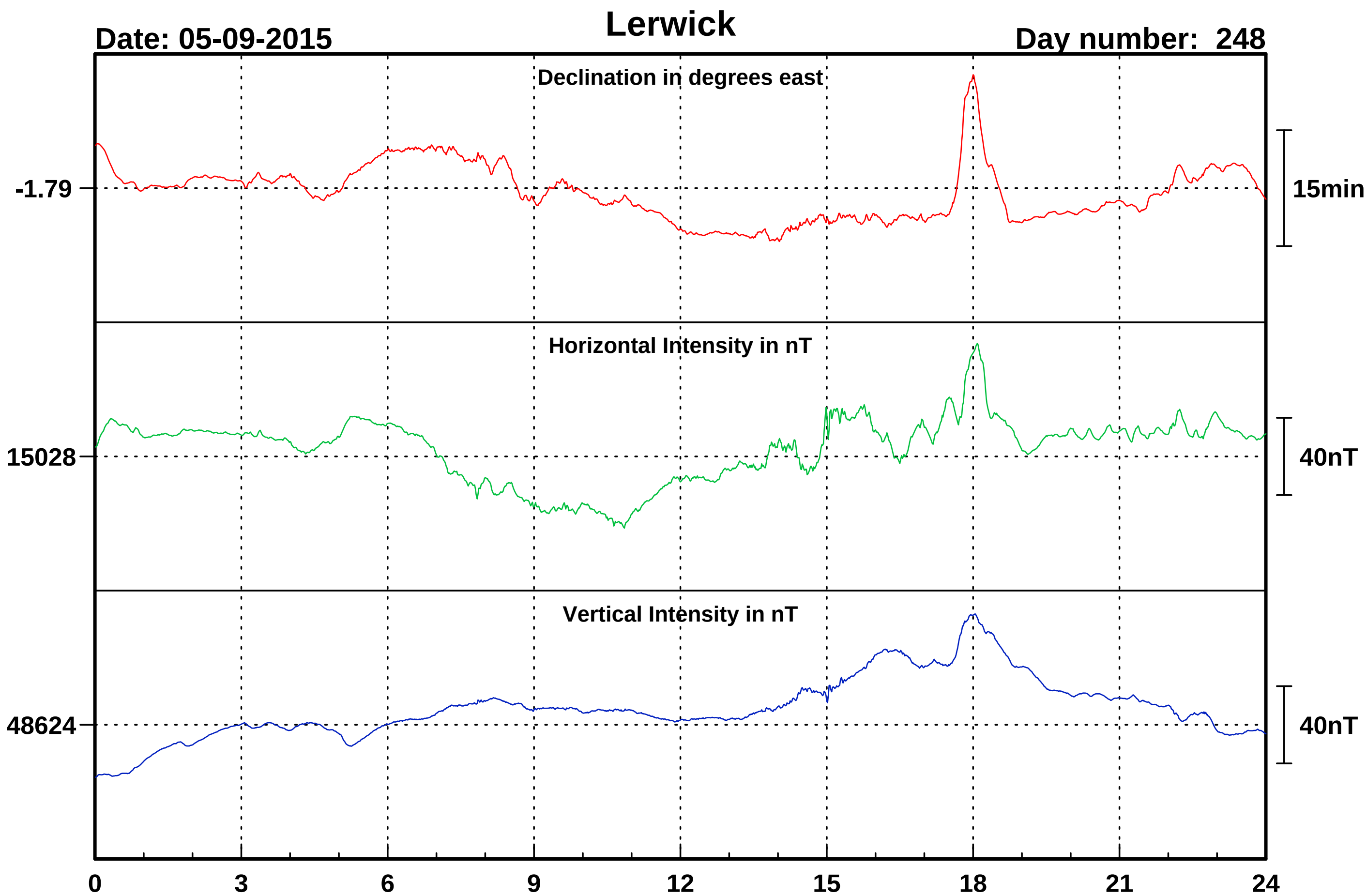

Date: 02-09-2015
Day number: 245
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
40nT
Vertical Intensity in nT
48624
30nT
0
3
6
9
12
15
18
21
24
Hour (UT)

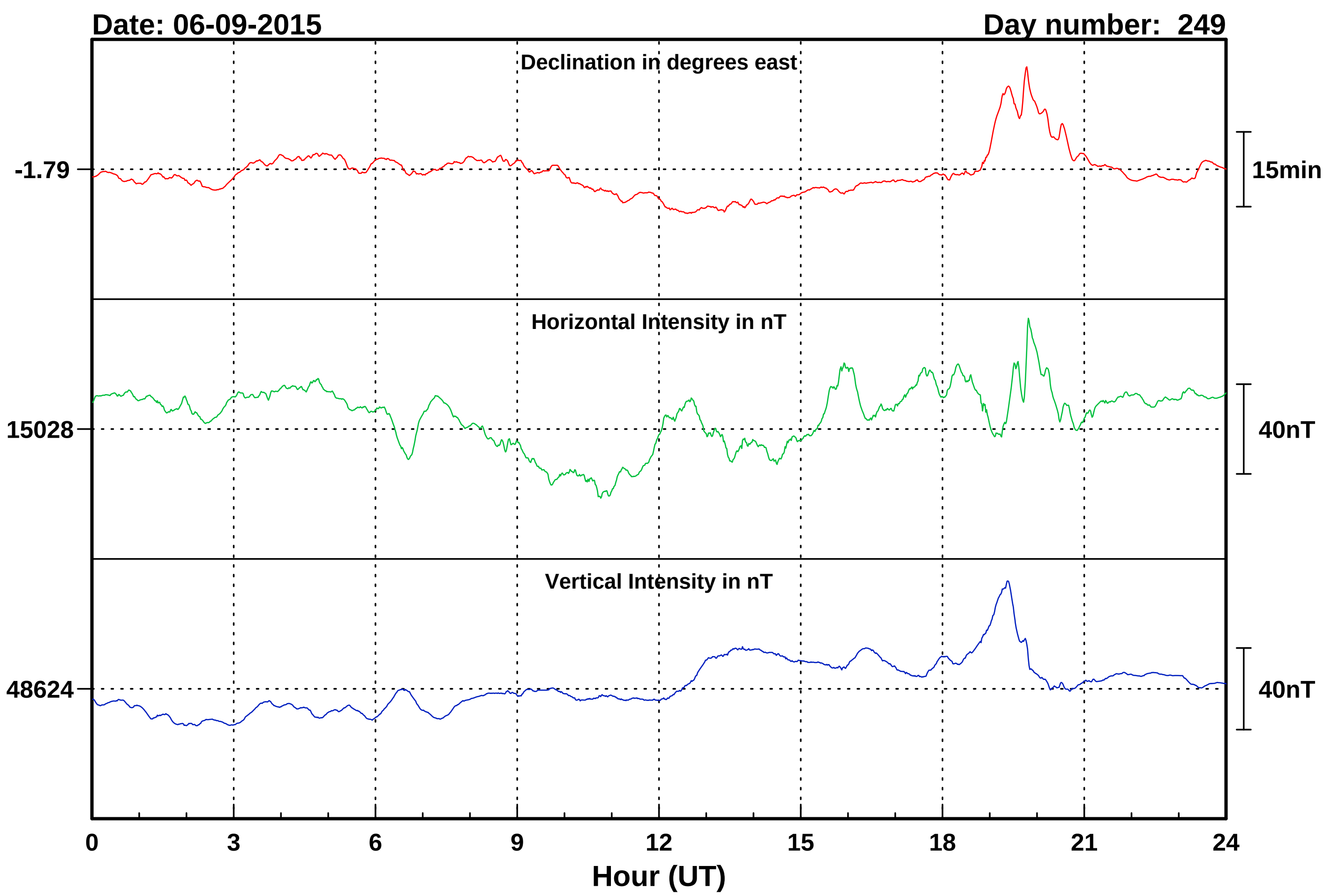


Lerwick
Date: 03-09-2015
Day number: 246
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
30nT
Vertical Intensity in nT
48624
30nT
0 3 6 9 12 15 18 21 24



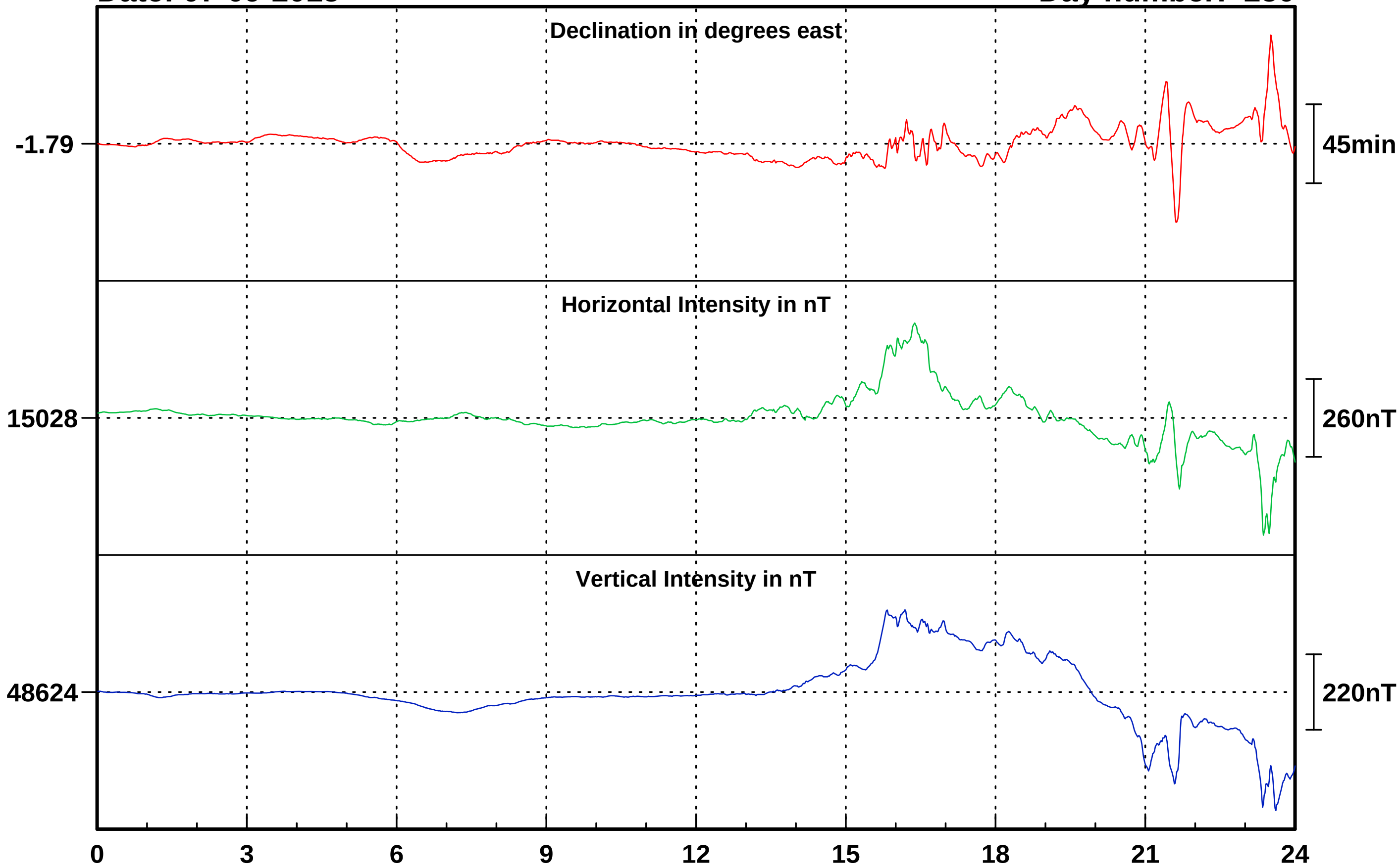
Date: 04-09-2015
Day number: 247
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
70nT
Vertical Intensity in nT
48624
60nT
0 3 6 9 12 15 18 21 24
Hour (UT)


Lerwick
Date: 05-09-2015
Day number: 248
Declination in degrees east
Horizontal Intensity in nT
Vertical Intensity in nT
-1.79
15028
48624
15min
40nT
40nT
0
3
6
9
12
15
18
21
24

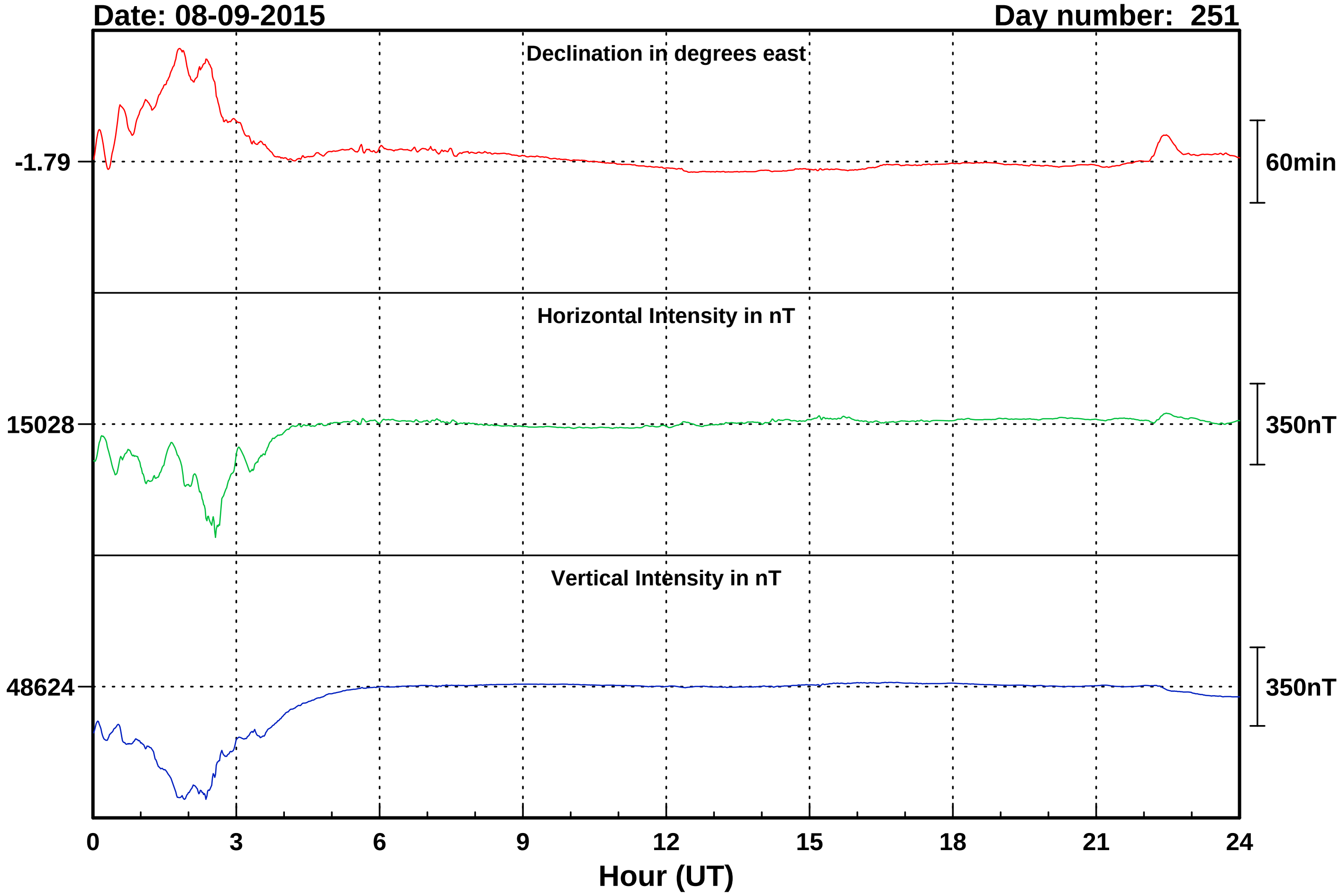

Date: 06-09-2015
Day number: 249
Declination in degrees east
Horizontal Intensity in nT
Vertical Intensity in nT
-1.79
15028
48624
15min
40nT
40nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Lerwick

Date: 07-09-2015 **Day number: 250**

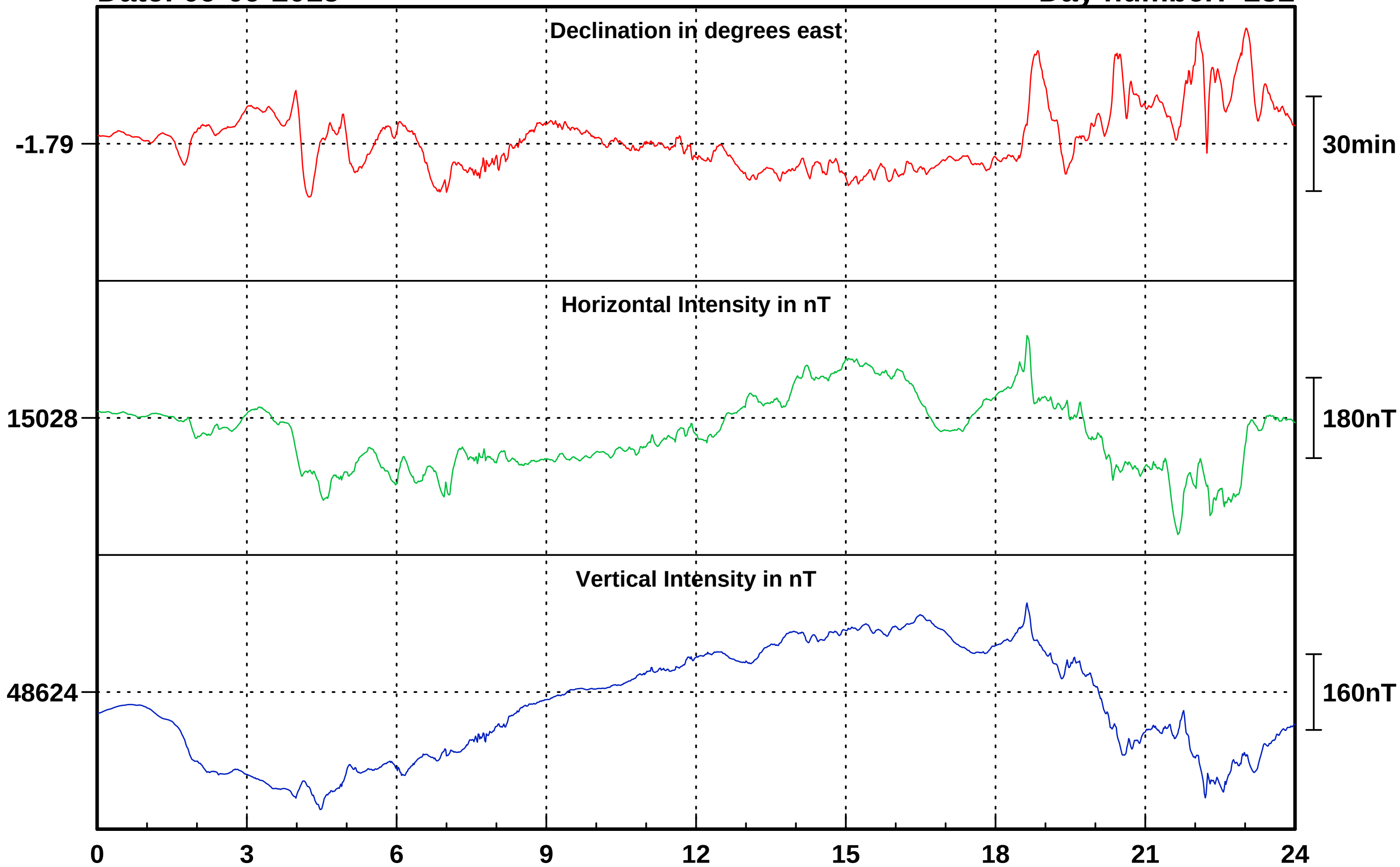


Date: 08-09-2015 **Day number: 251**

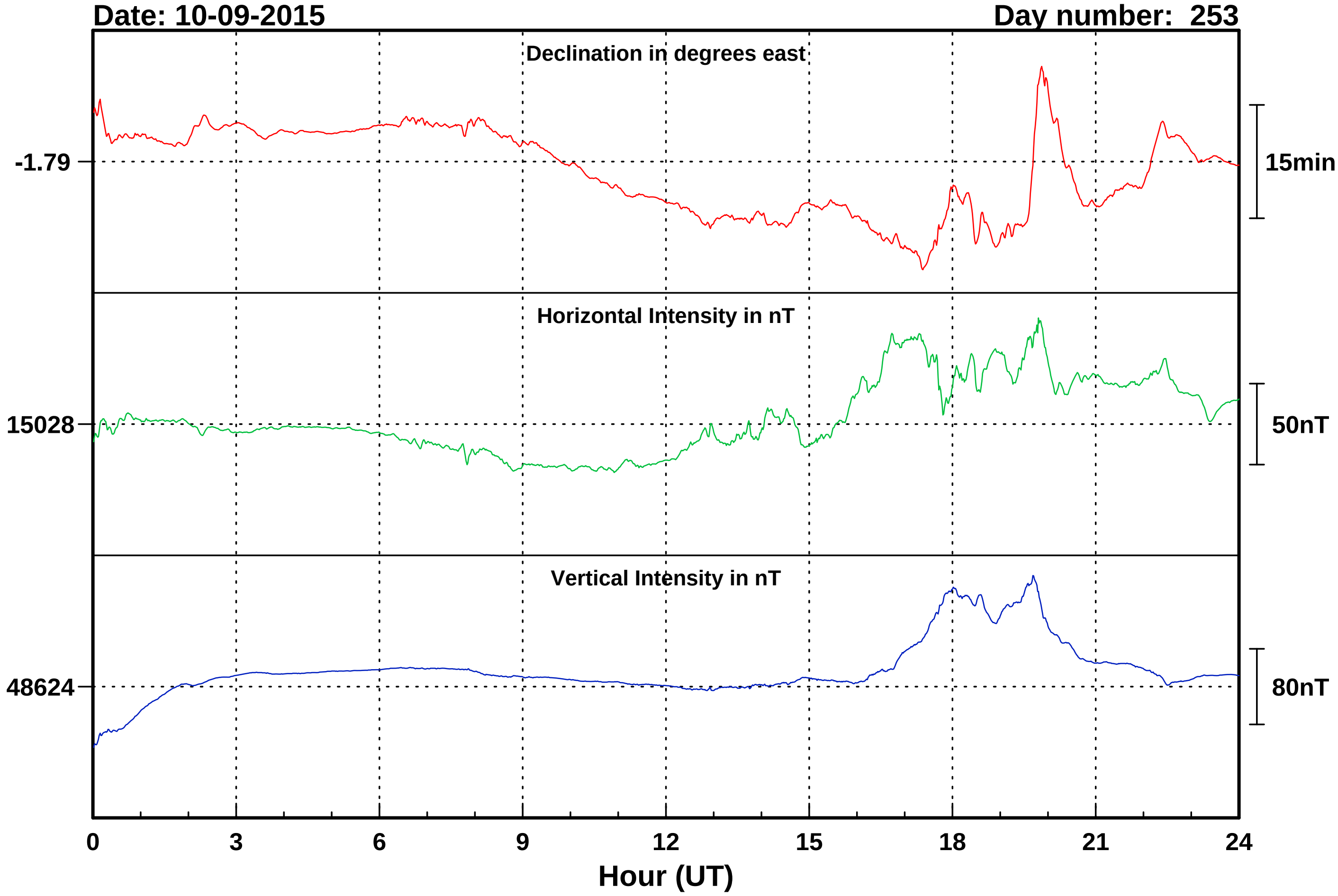


Lerwick

Date: 09-09-2015 Day number: 252

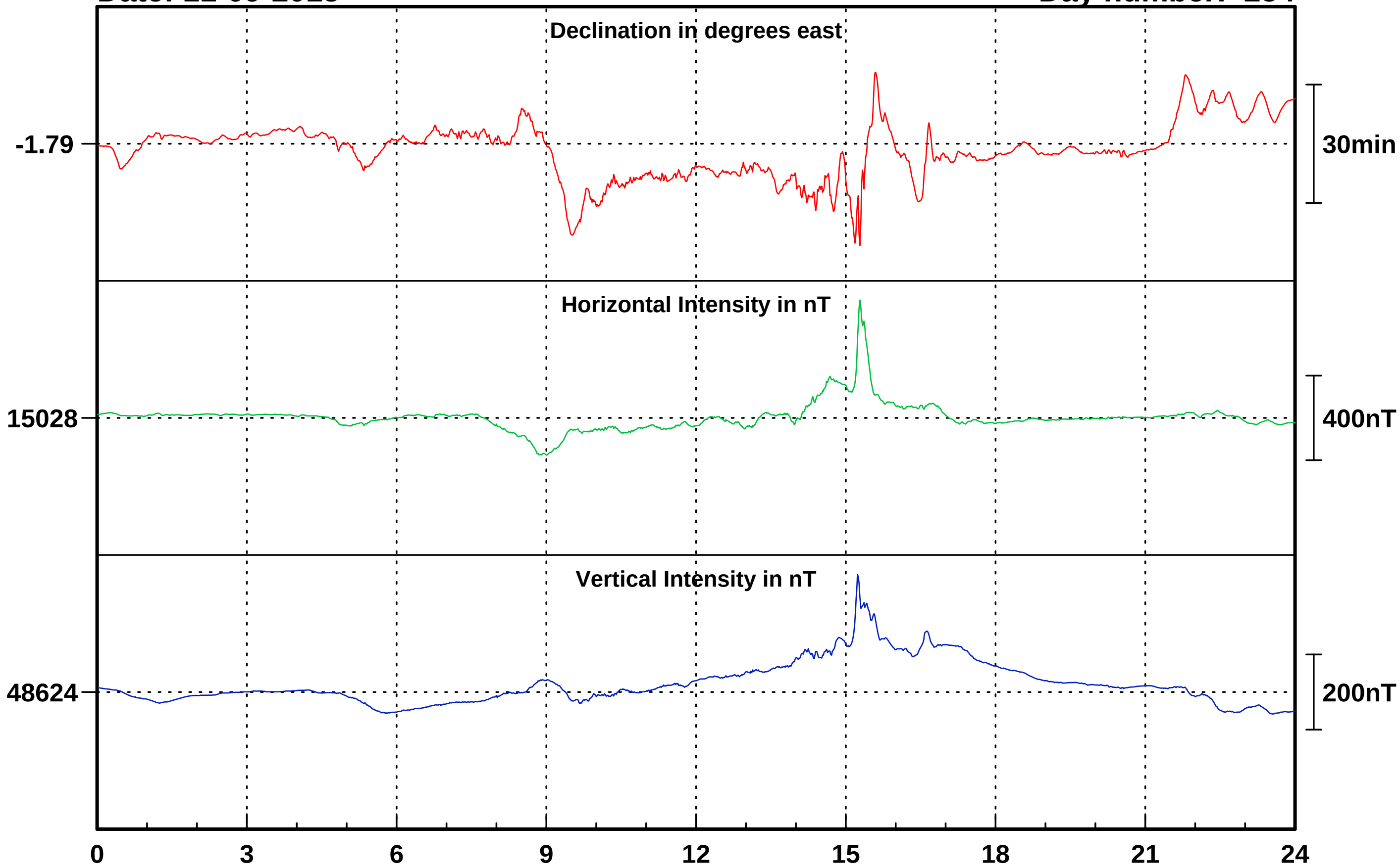


Date: 10-09-2015 Day number: 253

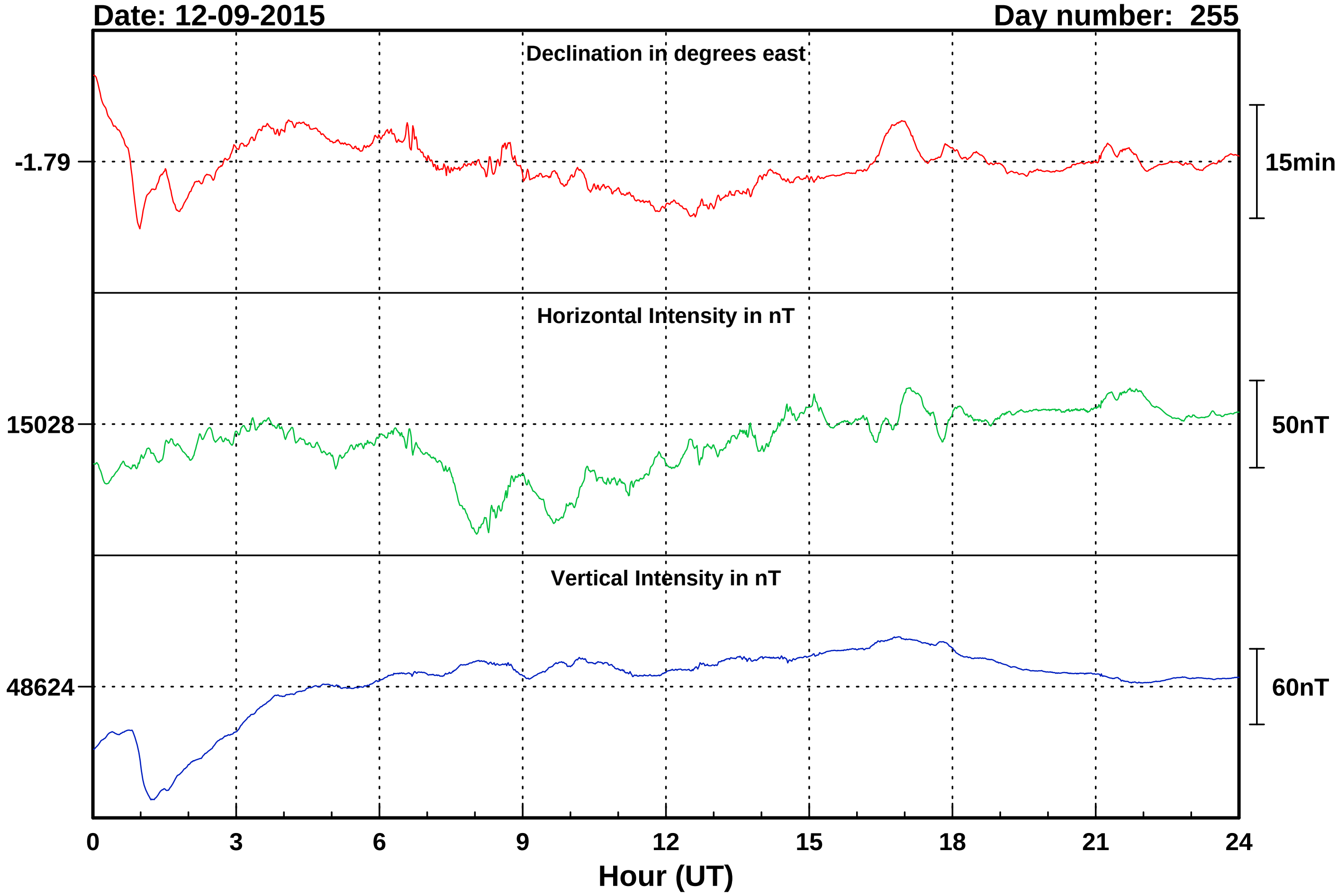


Lerwick

Date: 11-09-2015 Day number: 254

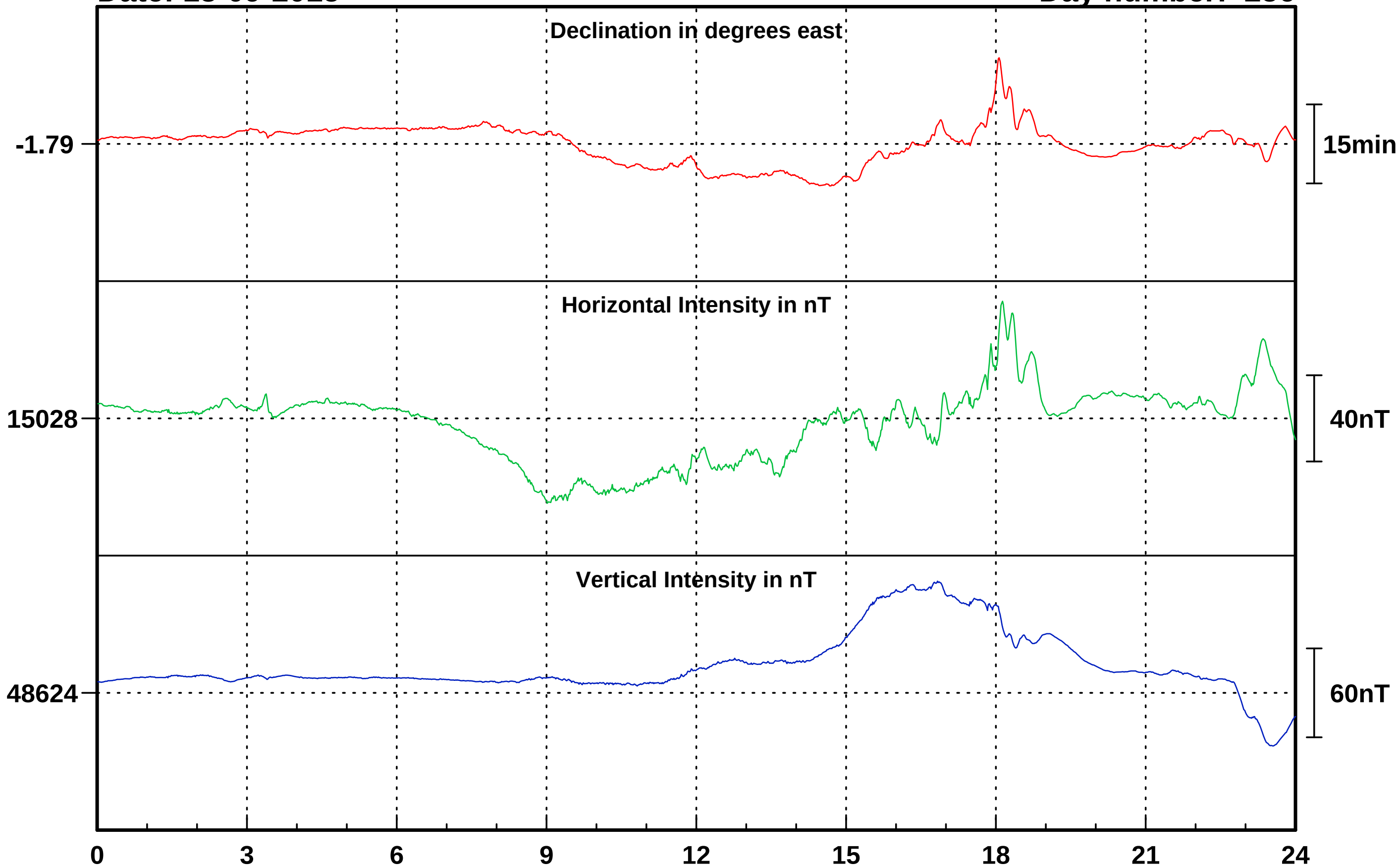


Date: 12-09-2015 Day number: 255

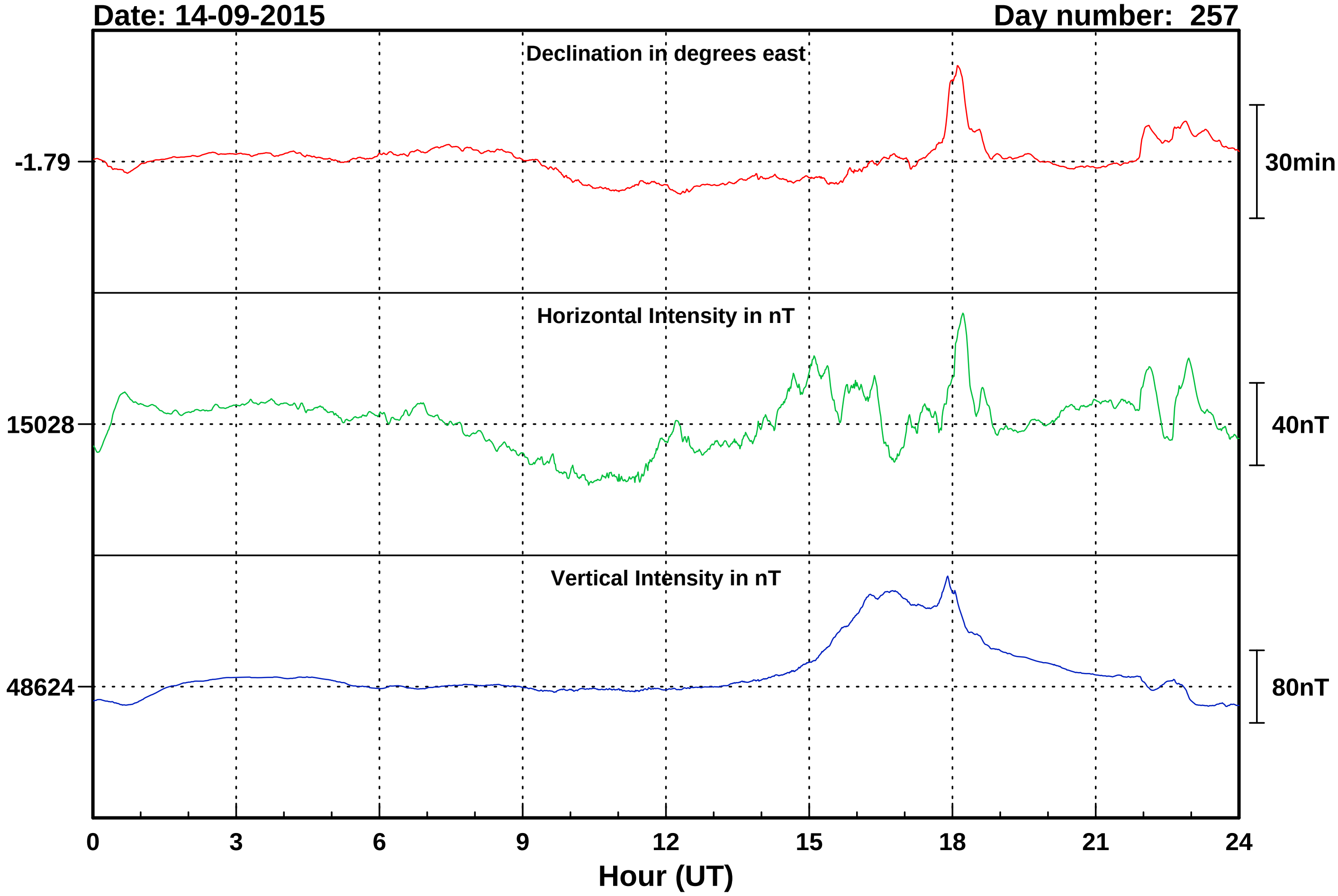


Lerwick

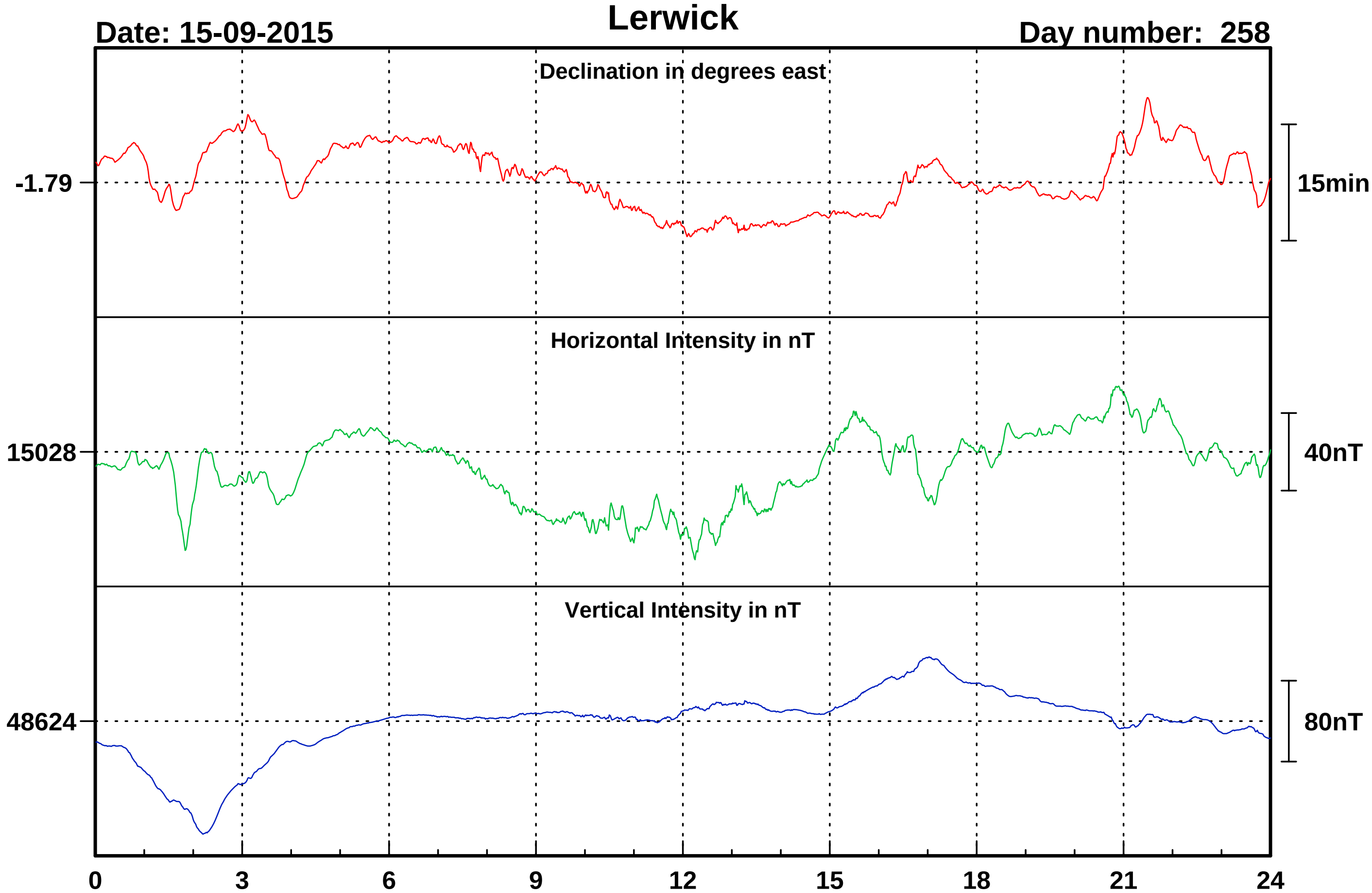
Date: 13-09-2015 Day number: 256



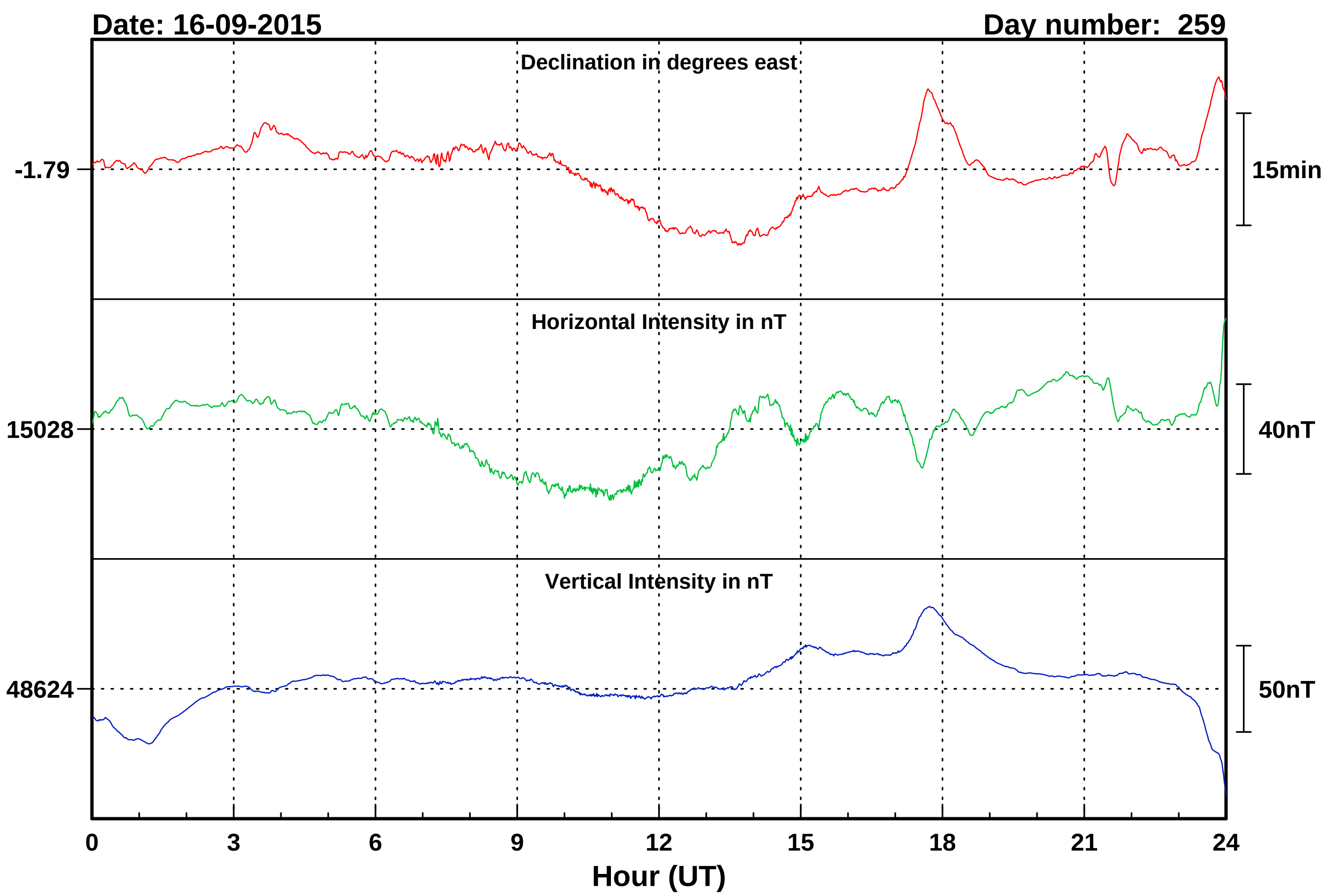
Date: 14-09-2015 Day number: 257



Lerwick



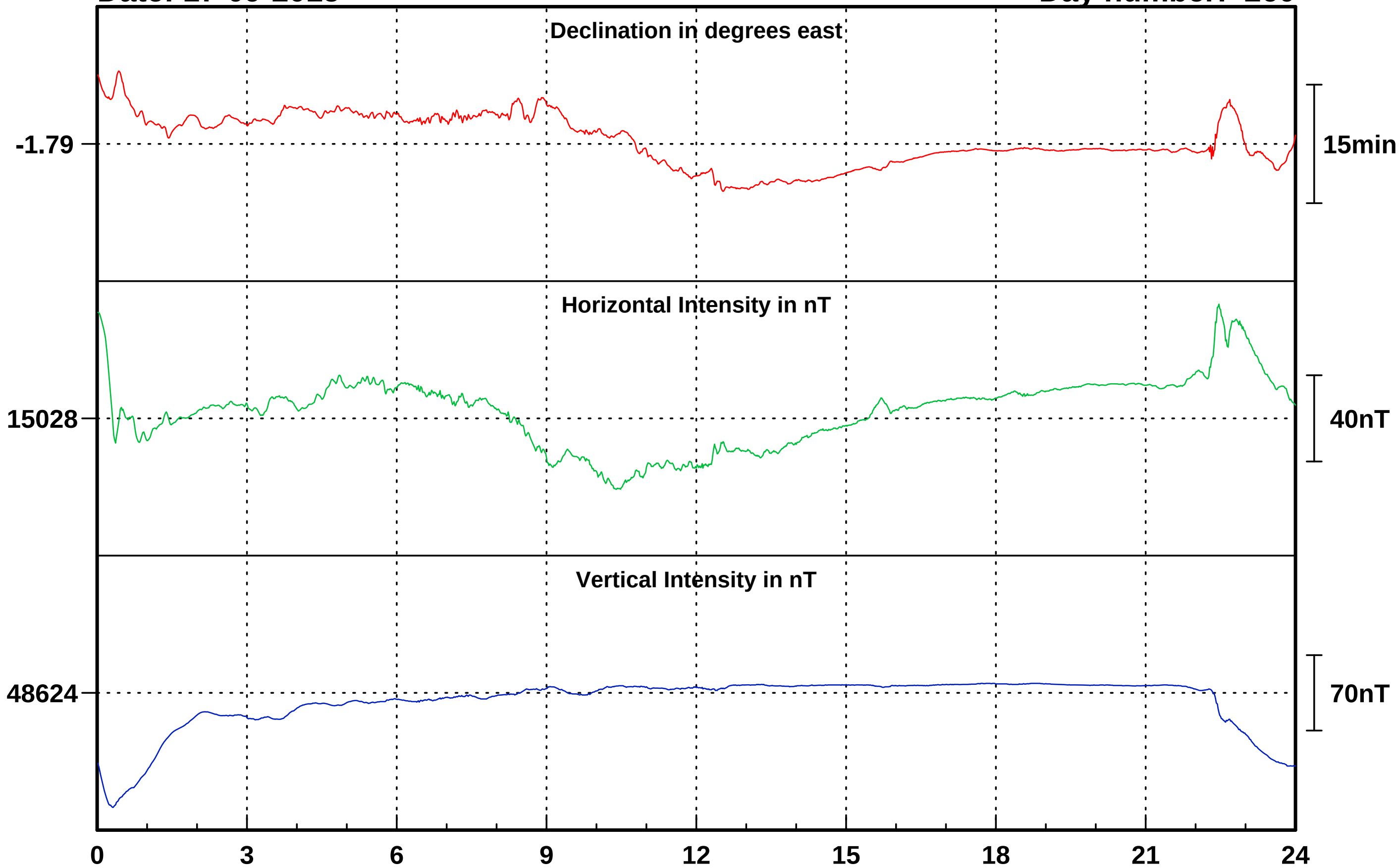
Date: 15-09-2015
Day number: 258
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
40nT
Vertical Intensity in nT
48624
80nT
0
3
6
9
12
15
18
21
24



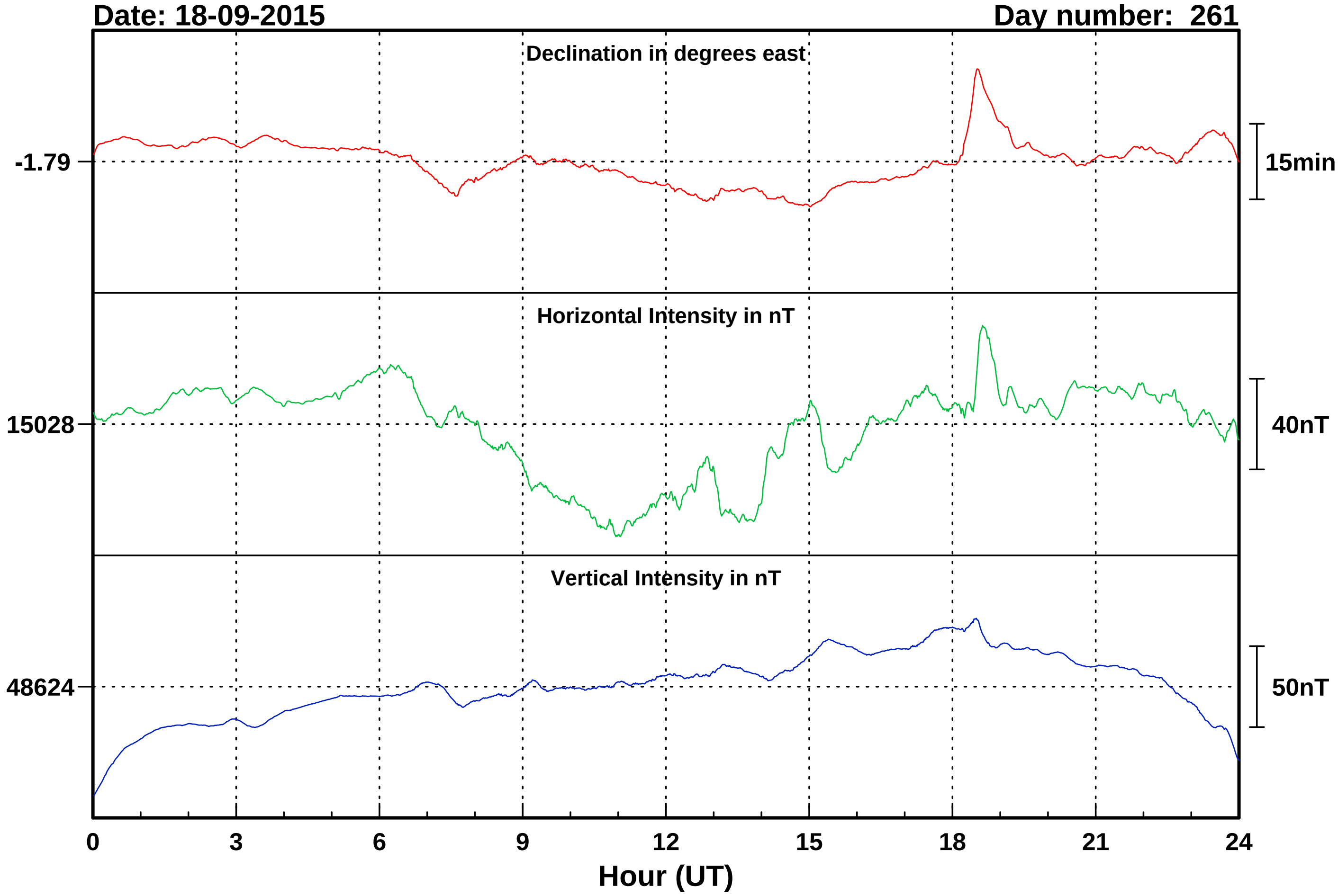
Date: 16-09-2015
Day number: 259
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
40nT
Vertical Intensity in nT
48624
50nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Lerwick

Date: 17-09-2015 Day number: 260

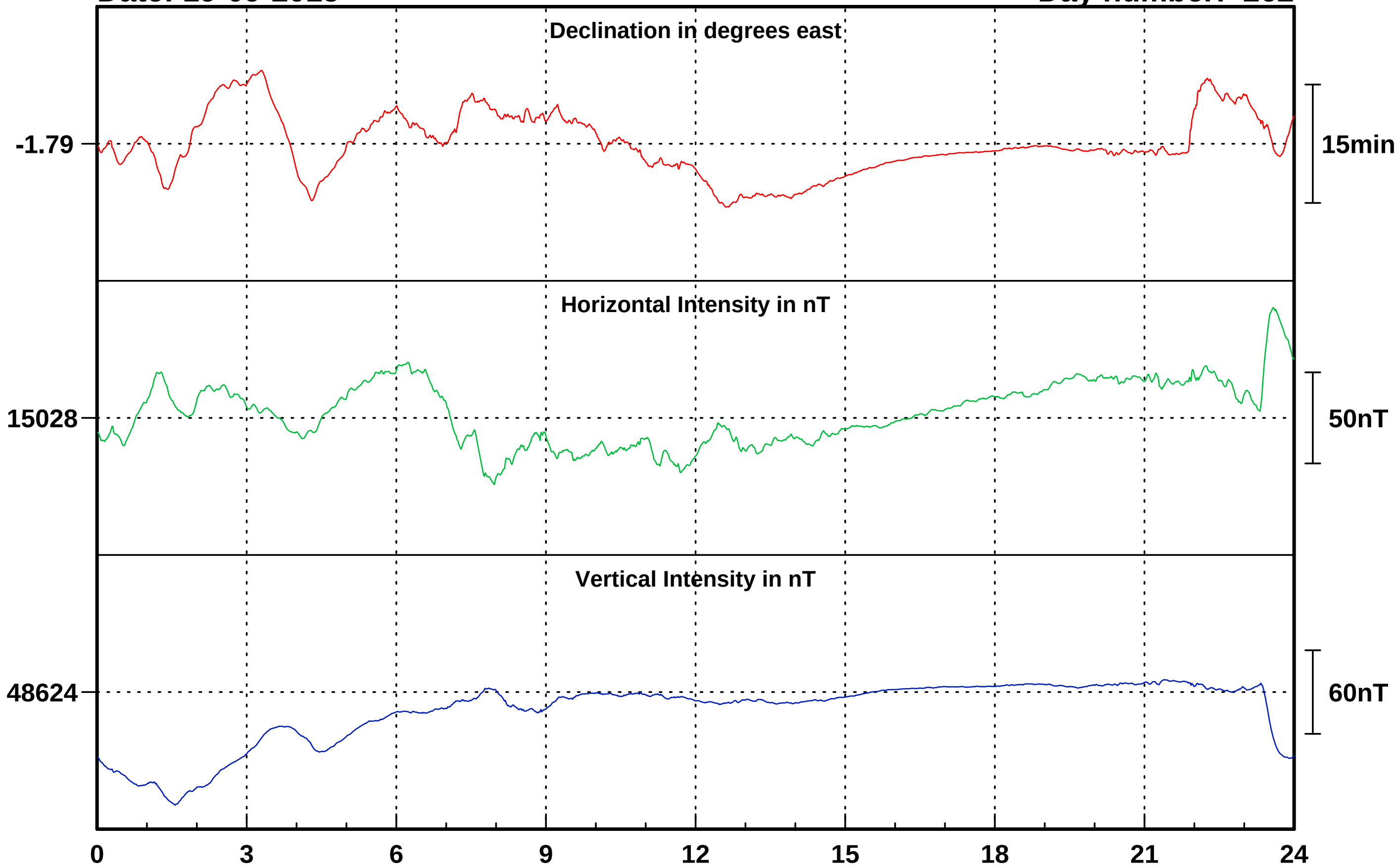


Date: 18-09-2015 Day number: 261

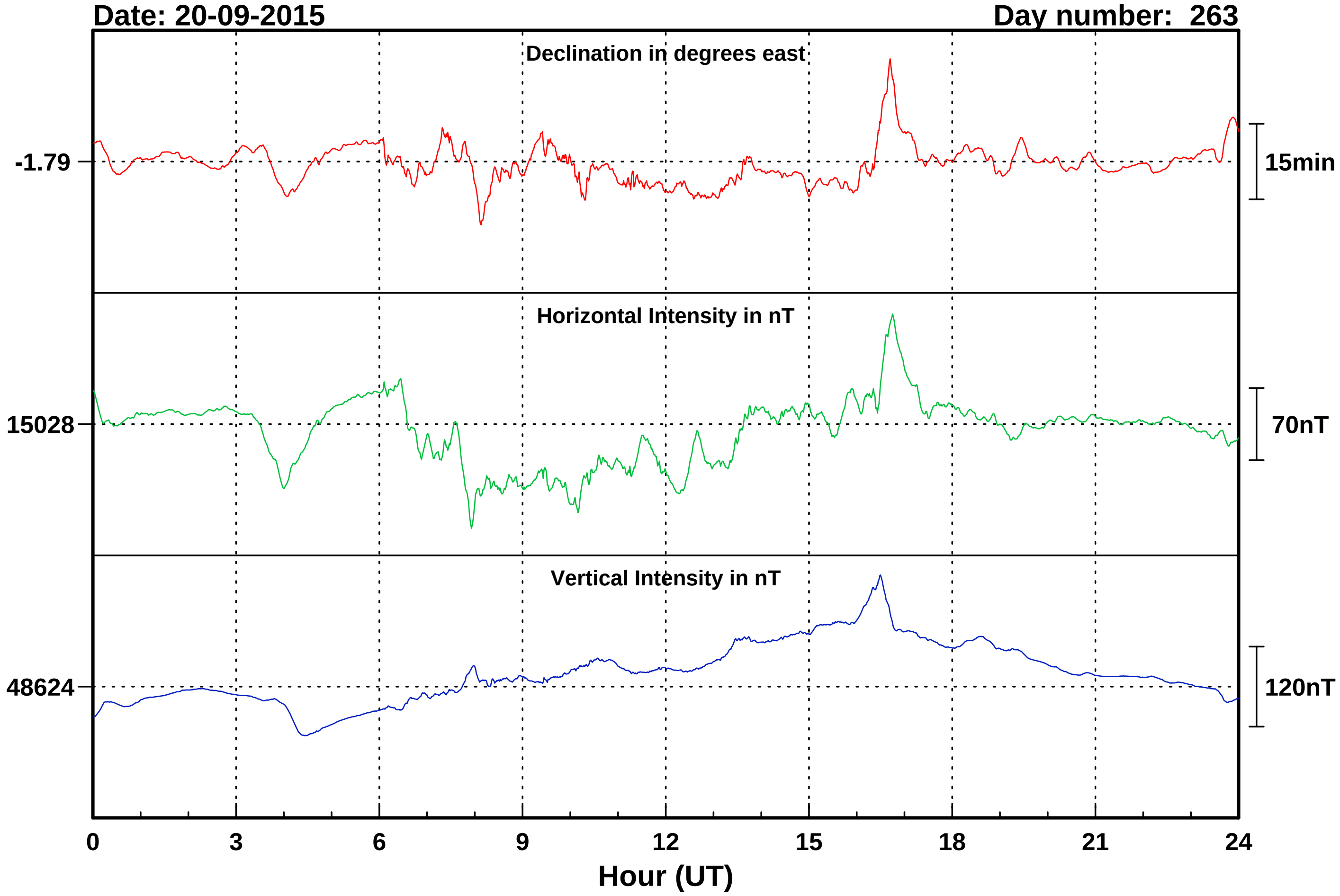


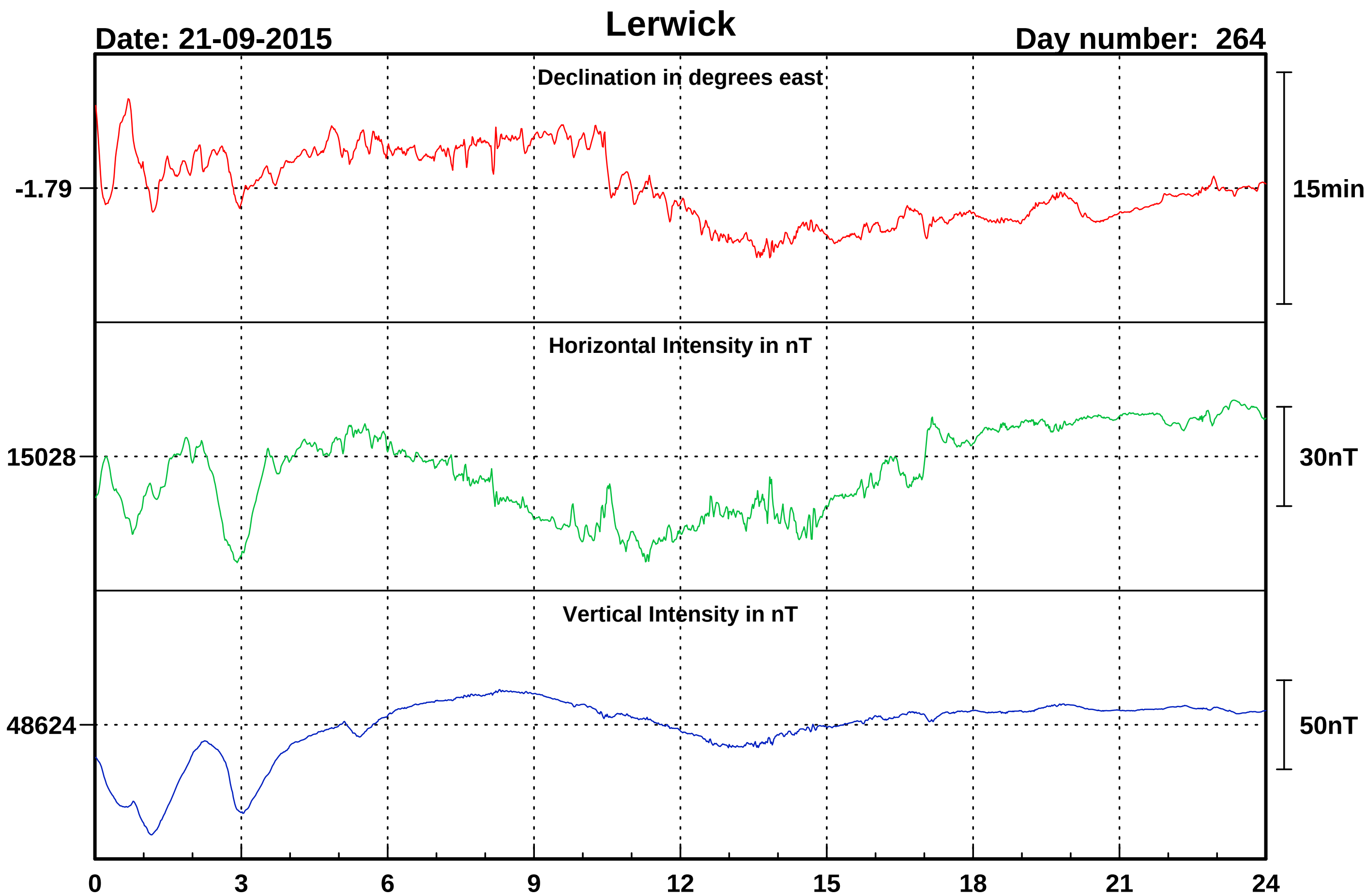
Lerwick

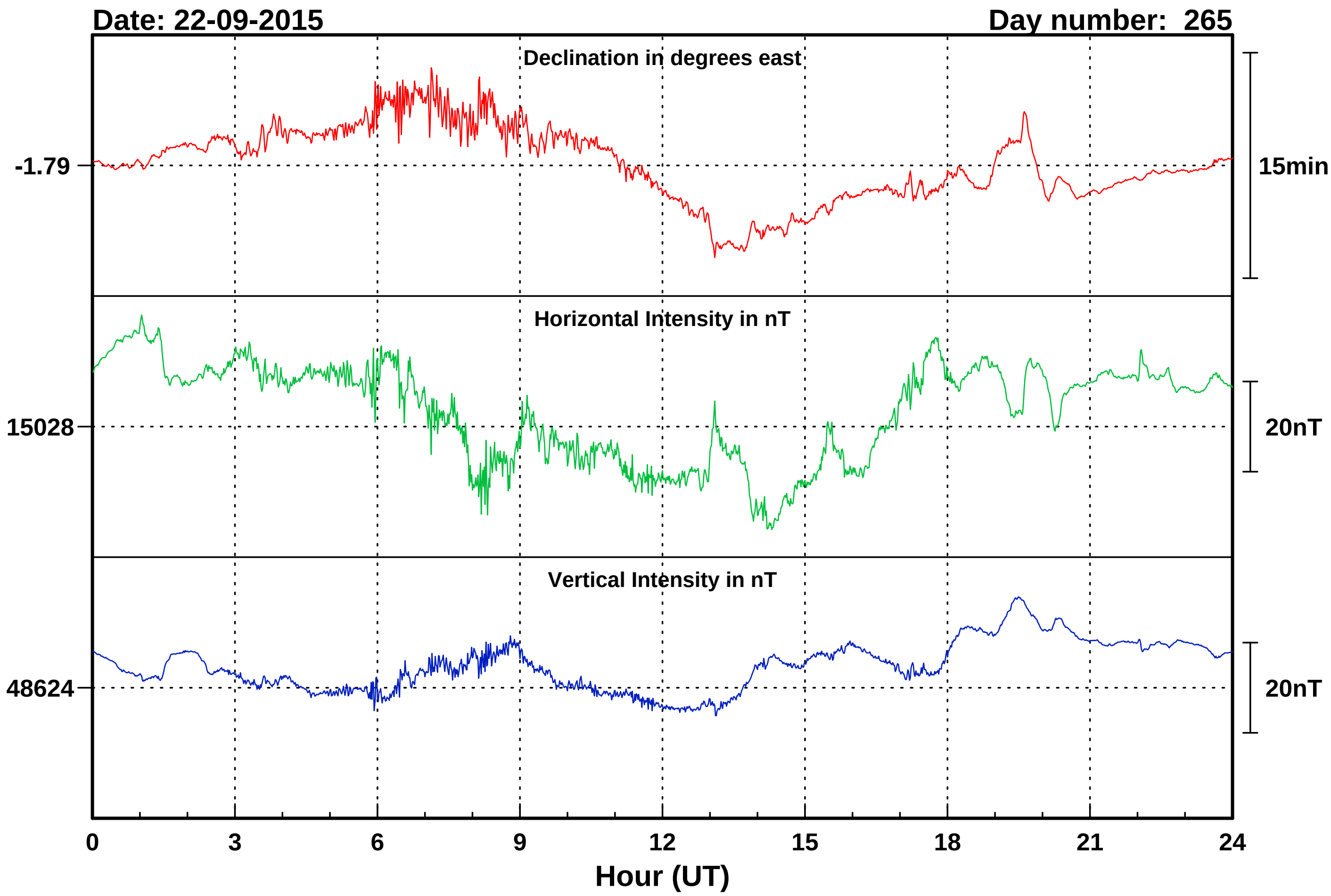
Date: 19-09-2015 **Day number: 262**



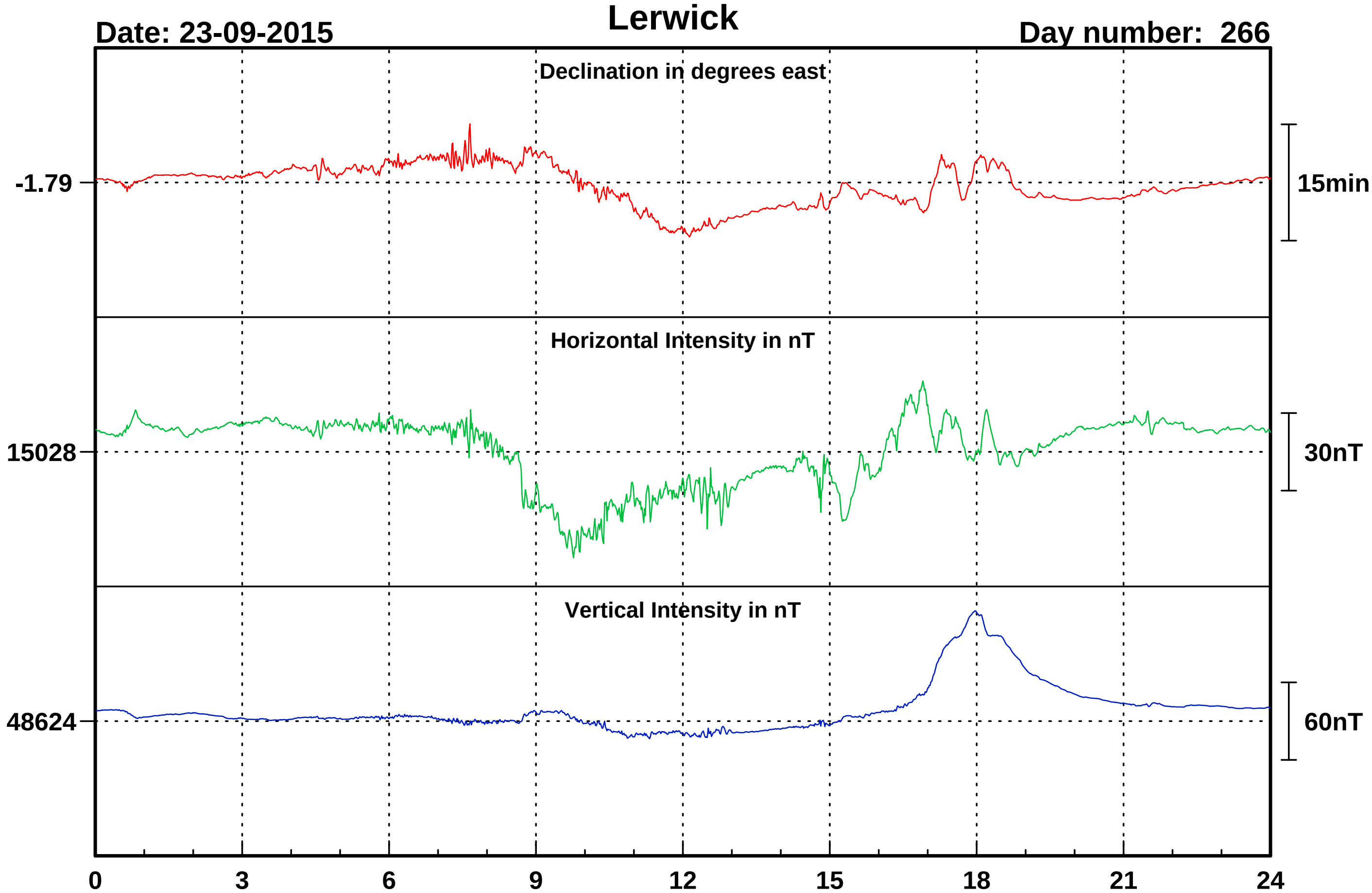
Date: 20-09-2015 **Day number: 263**

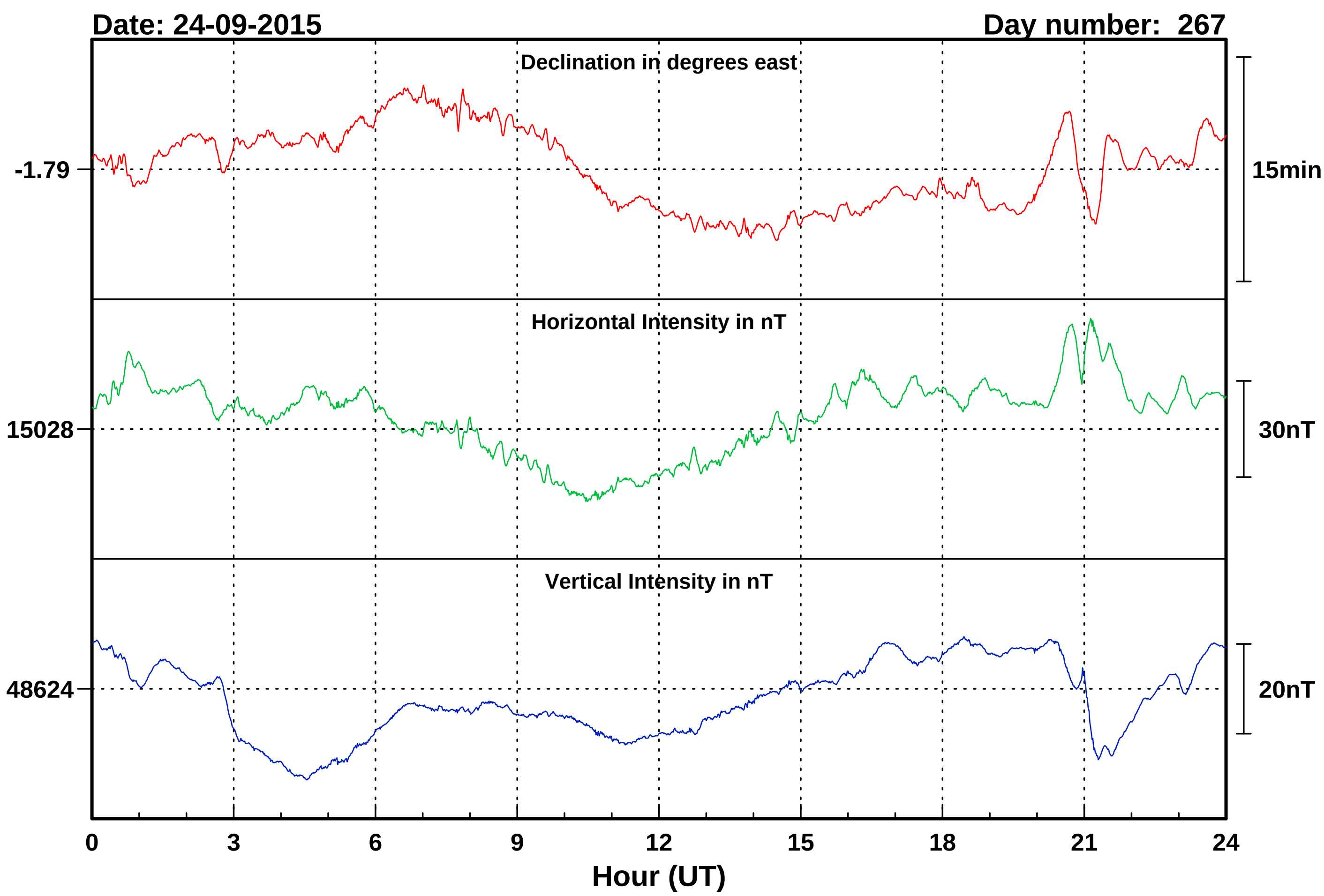


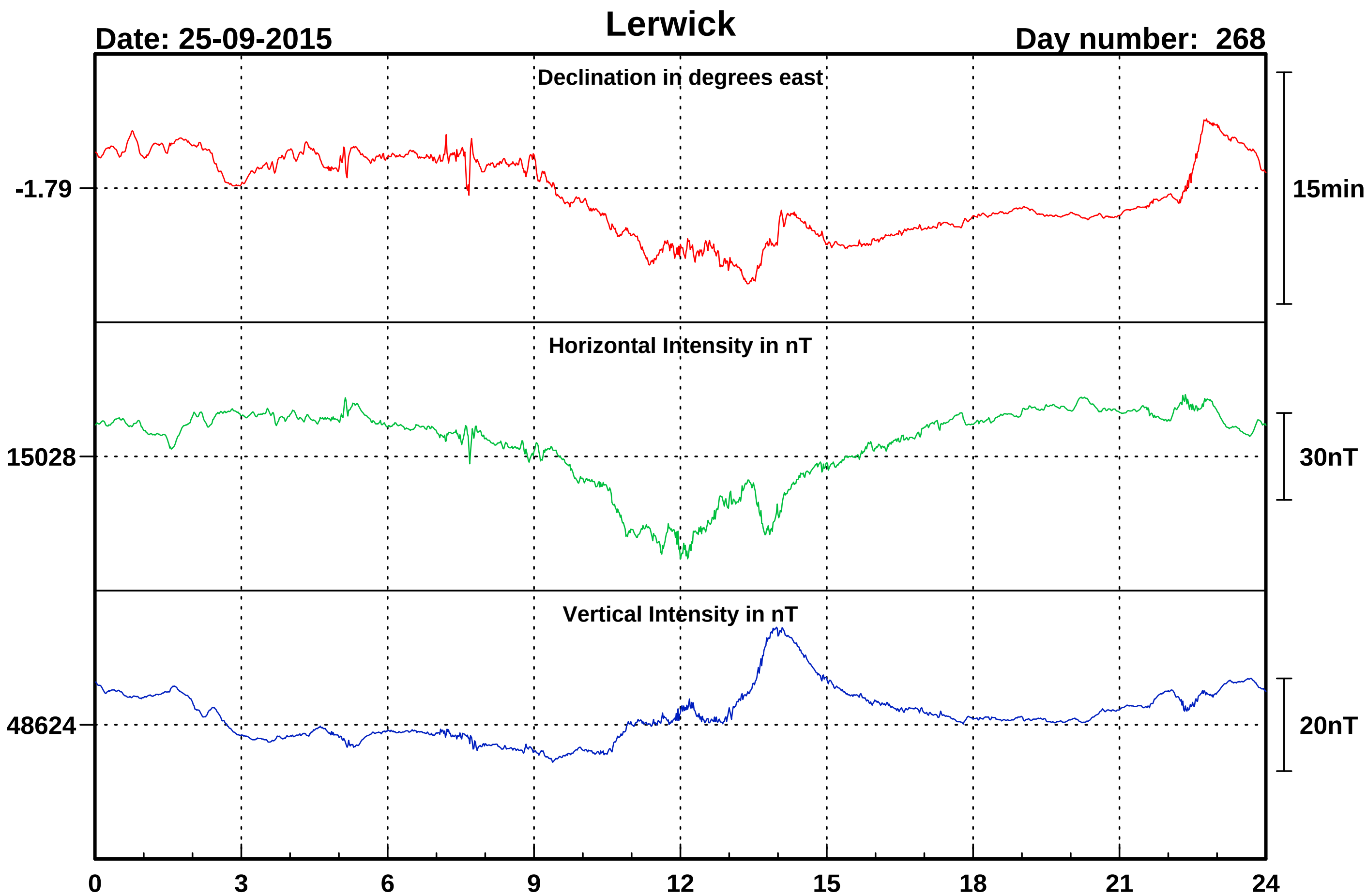

Lerwick
Date: 21-09-2015
Day number: 264
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
30nT
Vertical Intensity in nT
48624
50nT
0
3
6
9
12
15
18
21
24

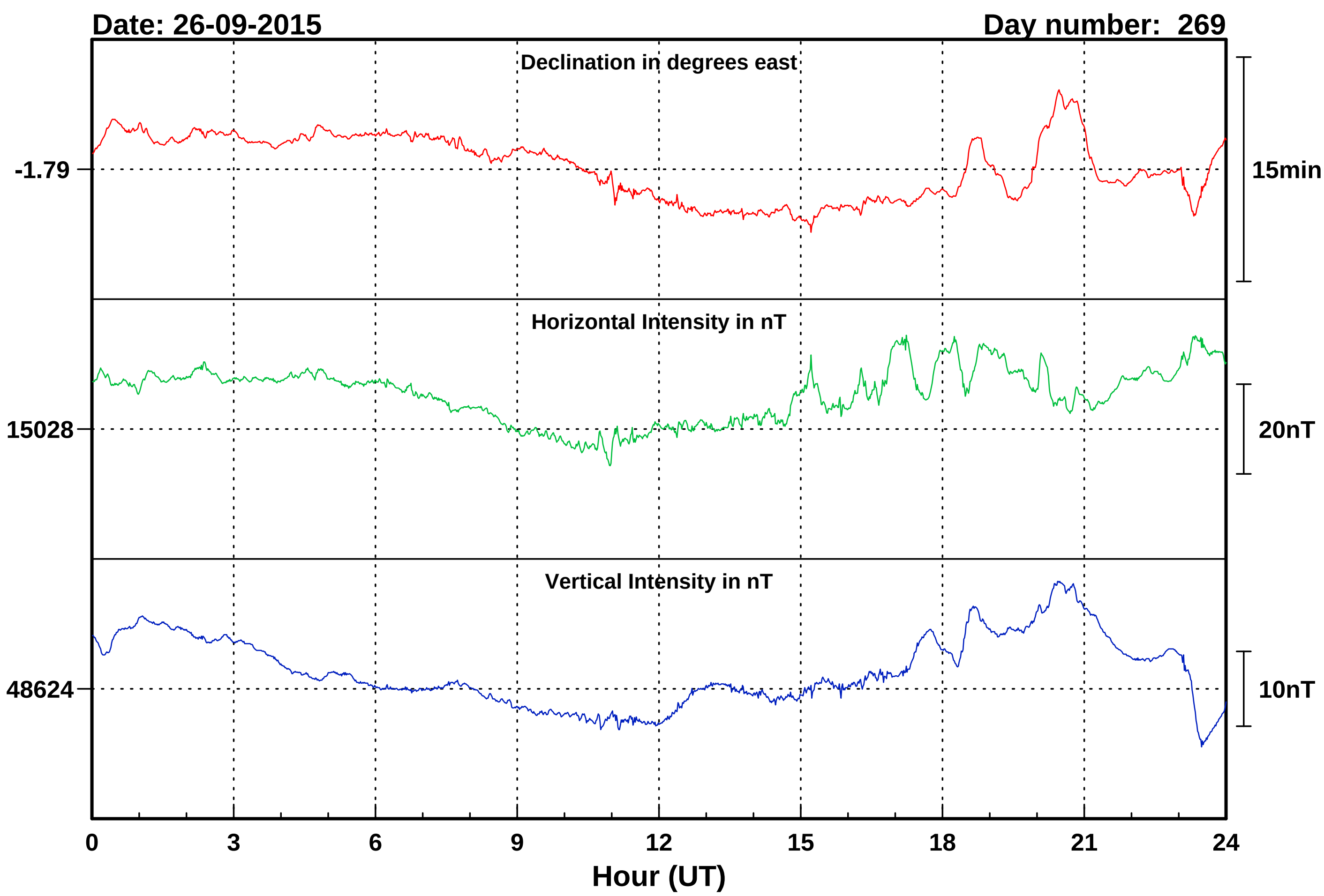

Date: 22-09-2015
Day number: 265
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
20nT
Vertical Intensity in nT
48624
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

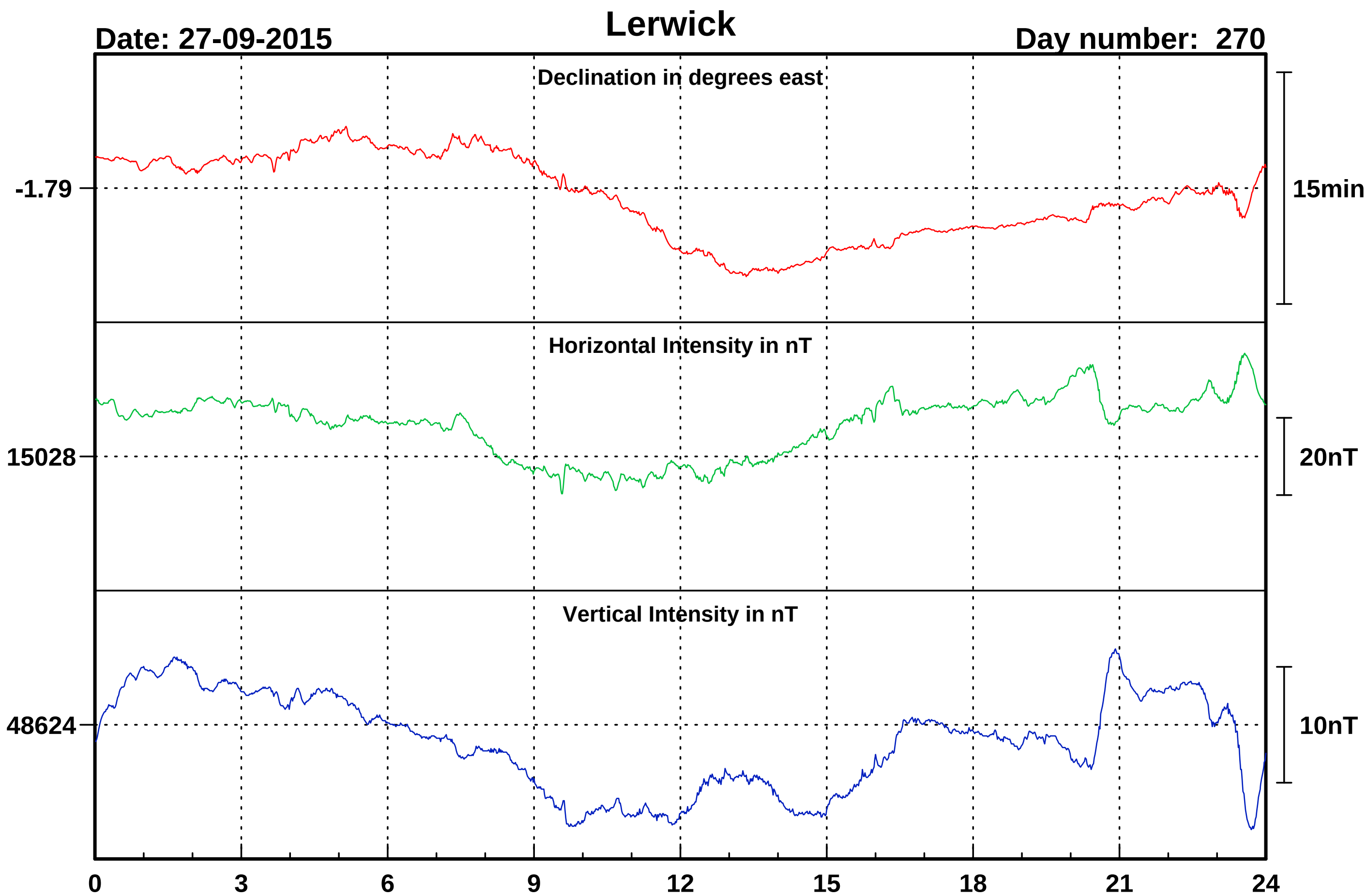
Lerwick

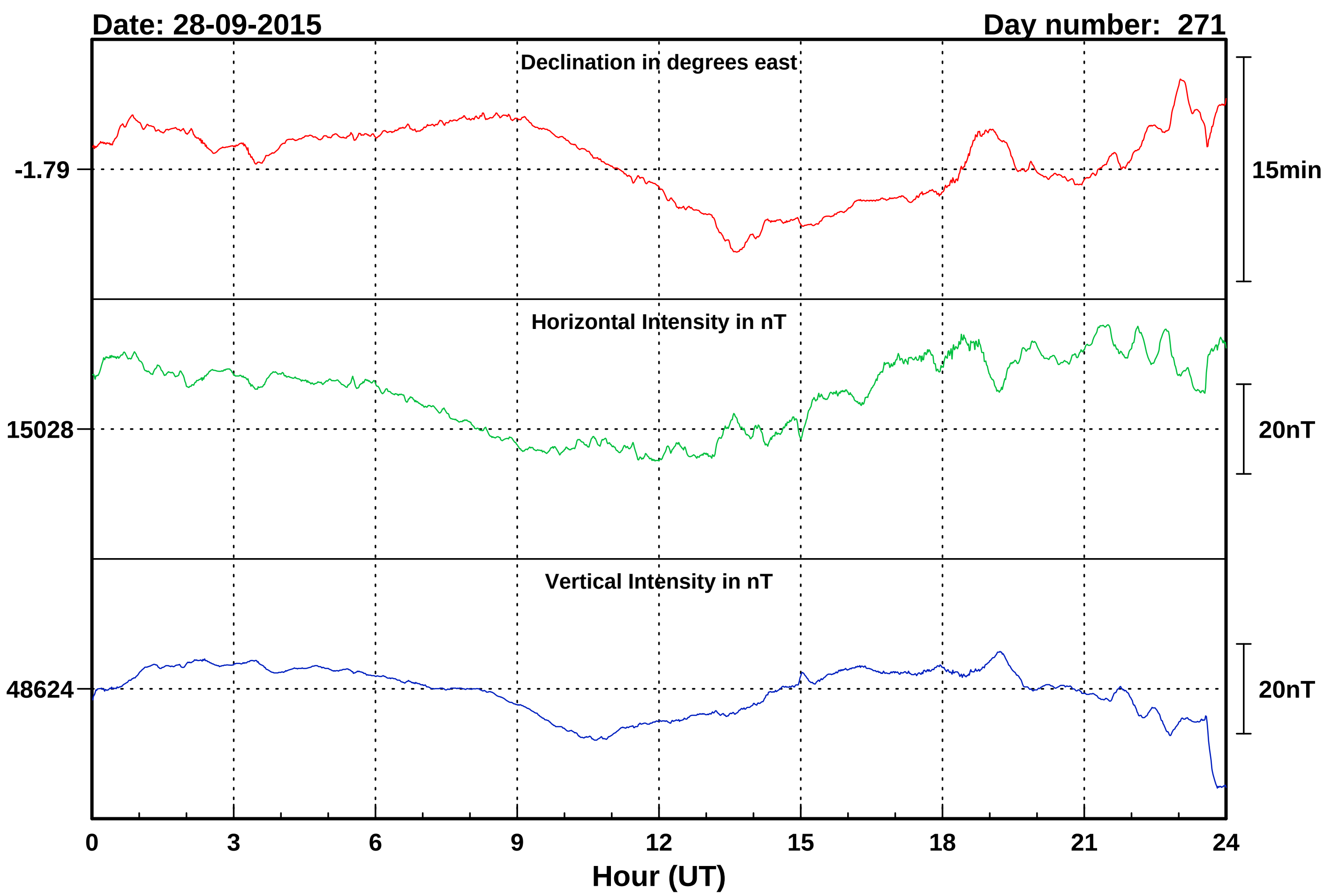

Date: 23-09-2015
Day number: 266
Declination in degrees east
Horizontal Intensity in nT
Vertical Intensity in nT
-1.79
15028
48624
15min
30nT
60nT
0
3
6
9
12
15
18
21
24


Date: 24-09-2015
Day number: 267
Declination in degrees east
Horizontal Intensity in nT
Vertical Intensity in nT
-1.79
15028
48624
15min
30nT
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

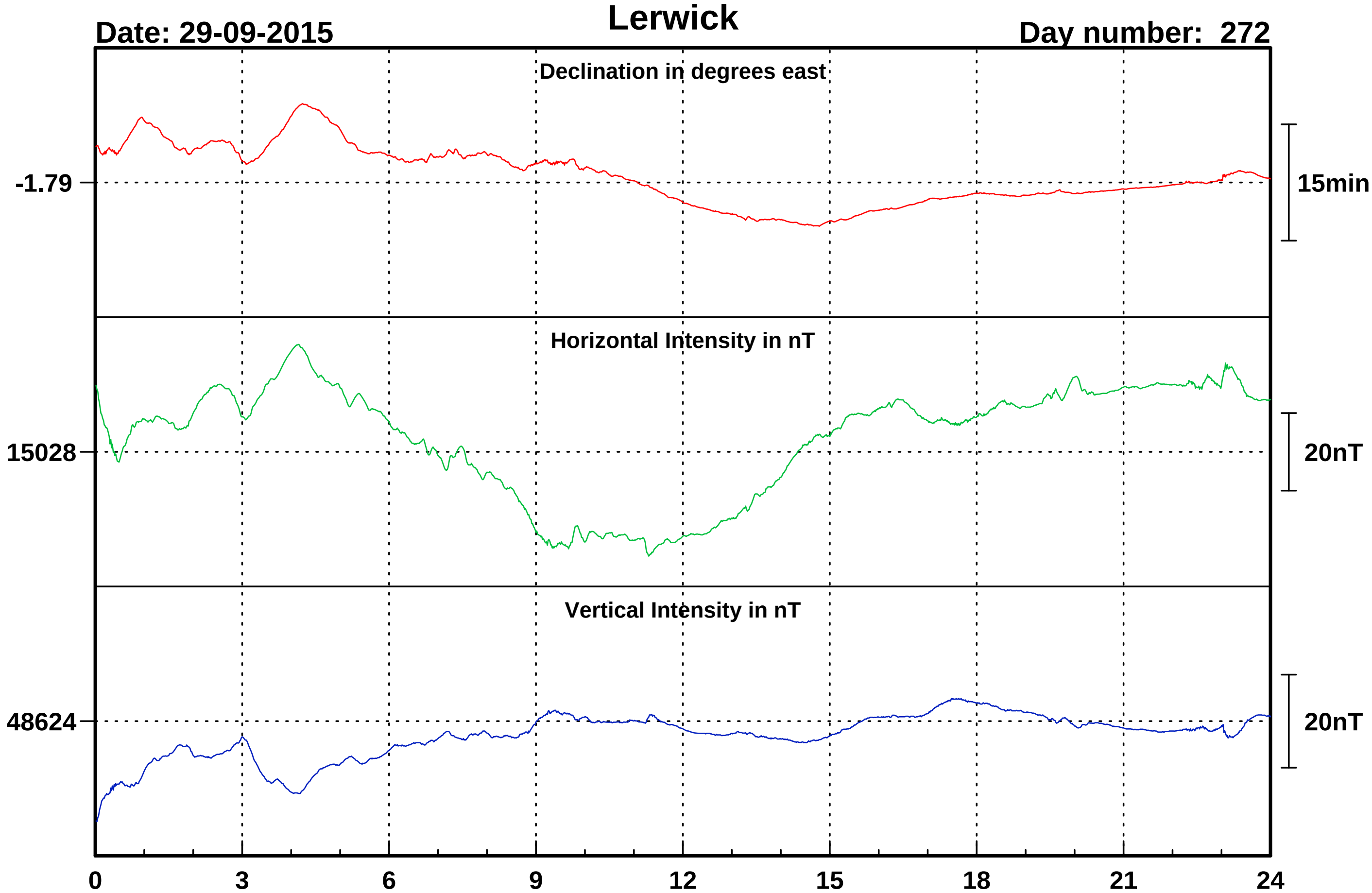

Lerwick
Date: 25-09-2015
Day number: 268
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
30nT
Vertical Intensity in nT
48624
20nT
0
3
6
9
12
15
18
21
24


Date: 26-09-2015
Day number: 269
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
20nT
Vertical Intensity in nT
48624
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

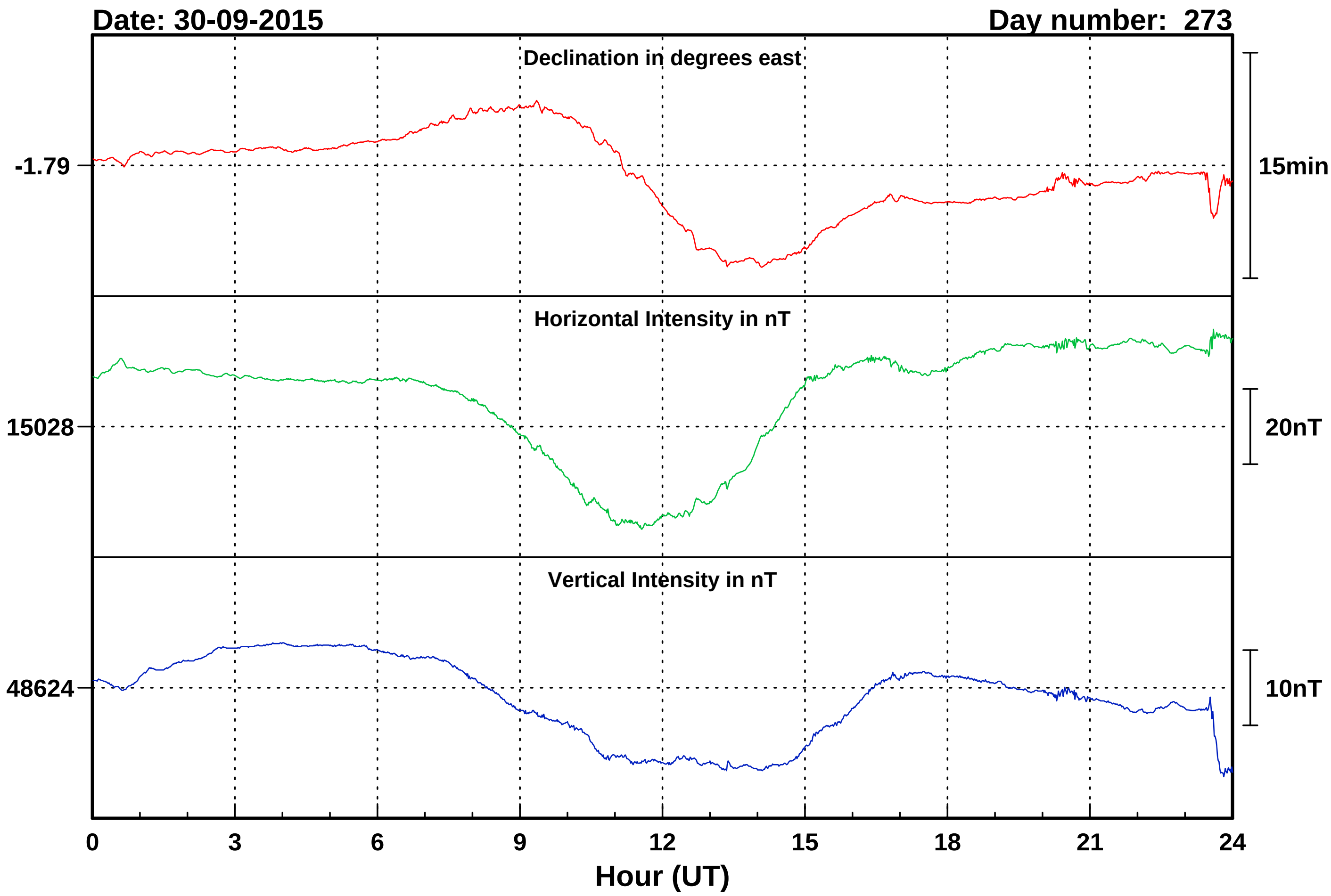

Lerwick
Date: 27-09-2015
Day number: 270
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
20nT
Vertical Intensity in nT
48624
10nT
0
3
6
9
12
15
18
21
24


Date: 28-09-2015
Day number: 271
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
20nT
Vertical Intensity in nT
48624
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Lerwick

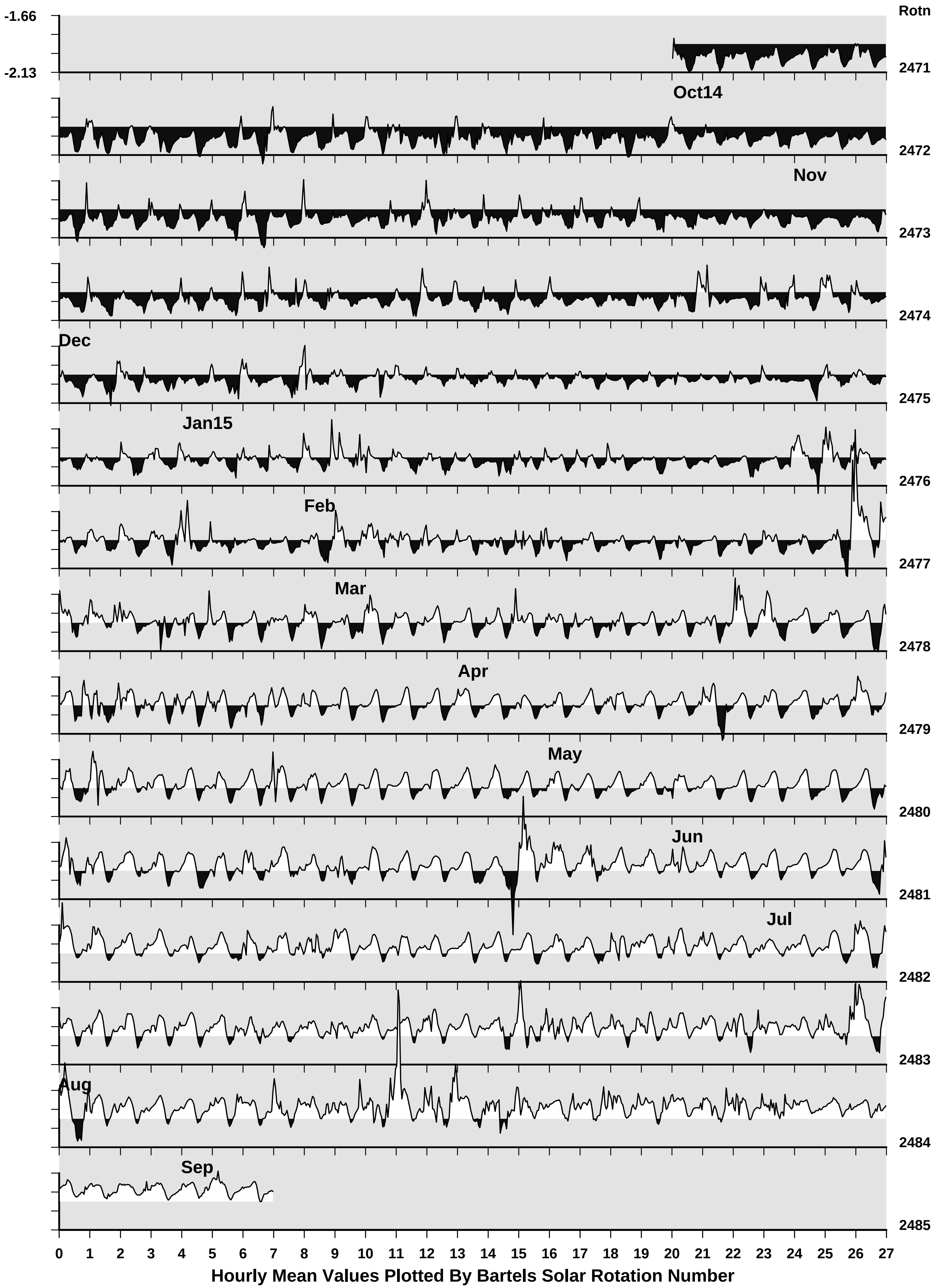


Date: 29-09-2015
Day number: 272
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
20nT
Vertical Intensity in nT
48624
20nT
0
3
6
9
12
15
18
21
24

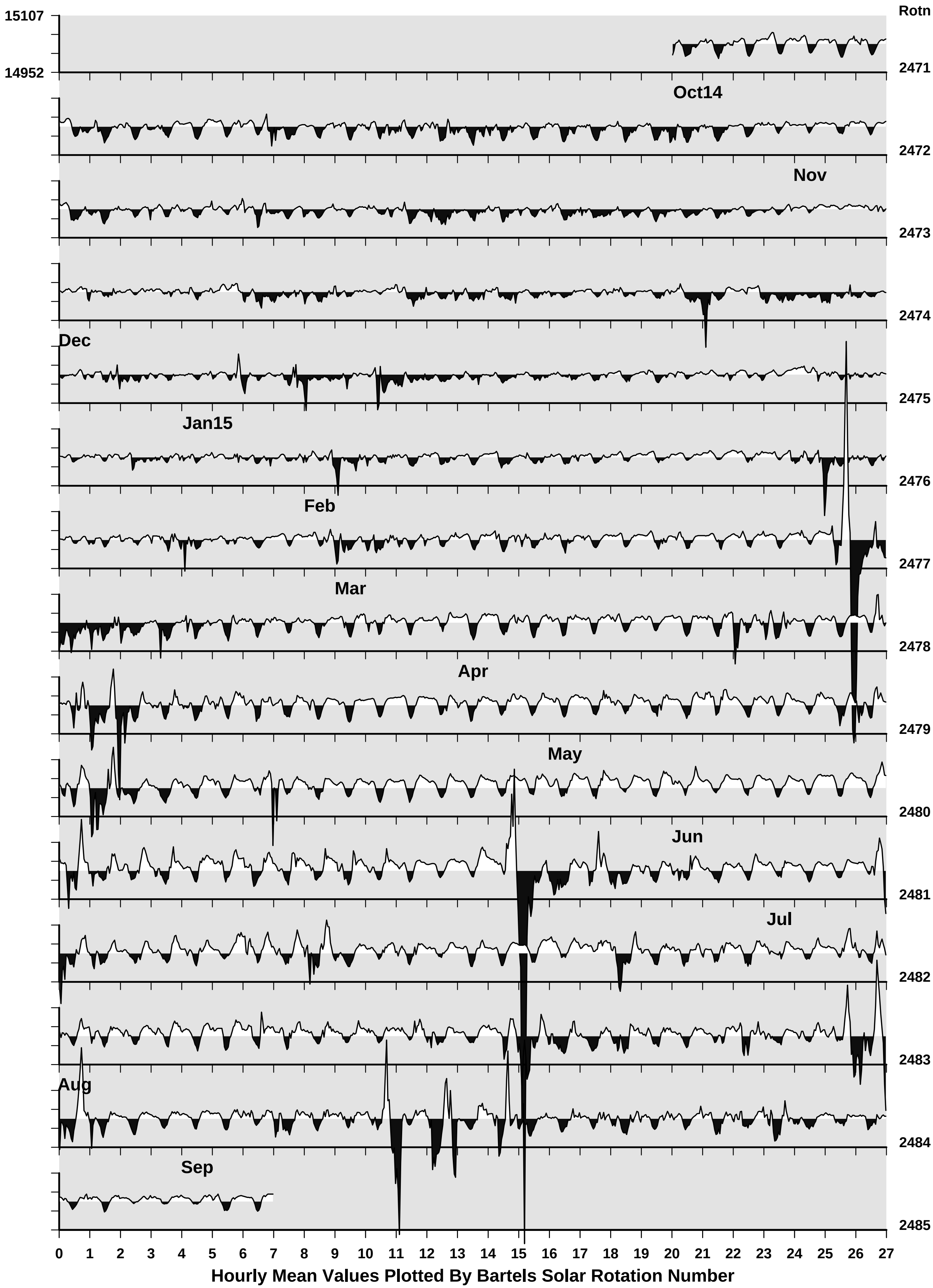


Date: 30-09-2015
Day number: 273
Declination in degrees east
-1.79
15min
Horizontal Intensity in nT
15028
20nT
Vertical Intensity in nT
48624
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

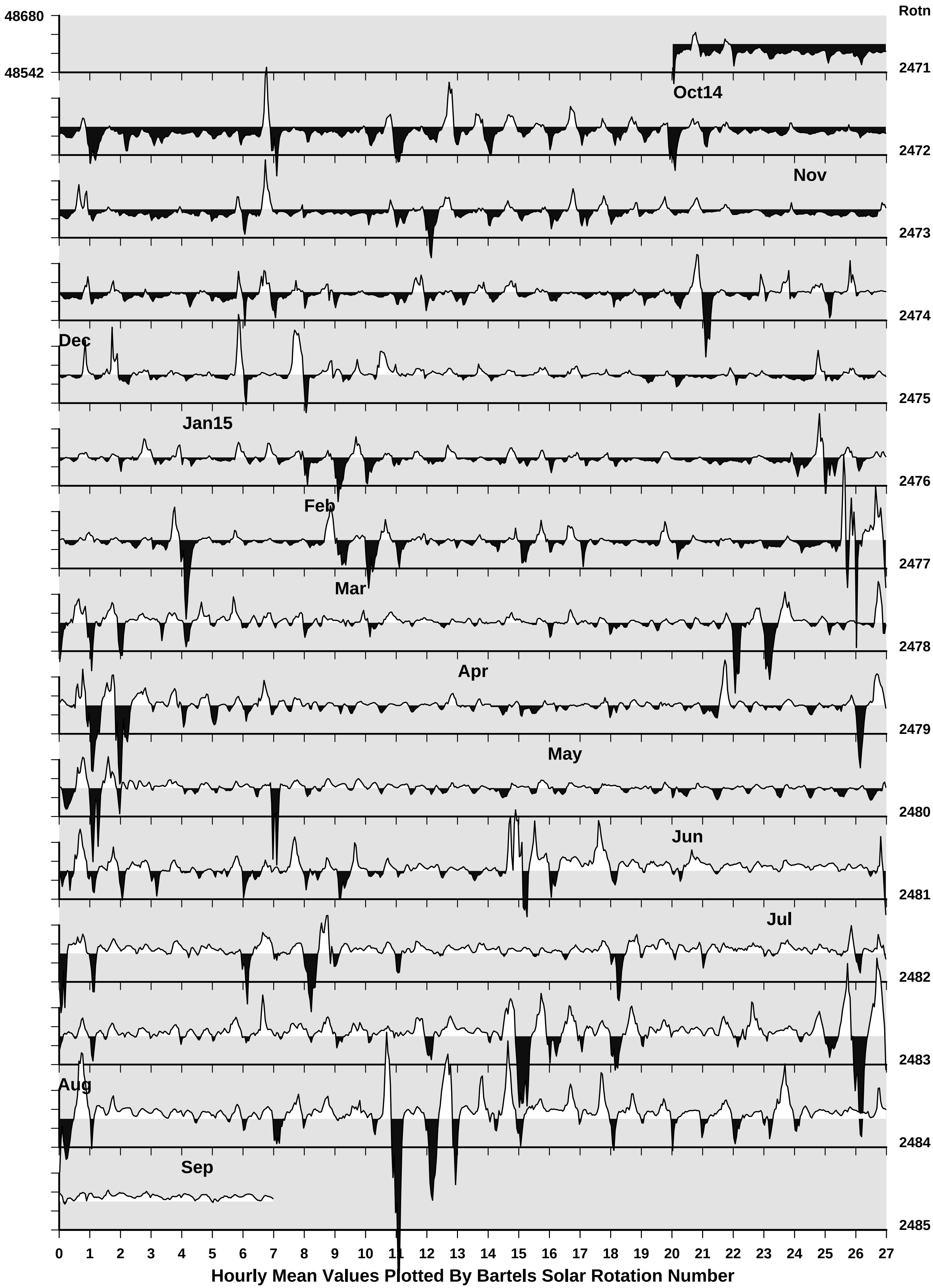
Lerwick Observatory: Declination (degrees)

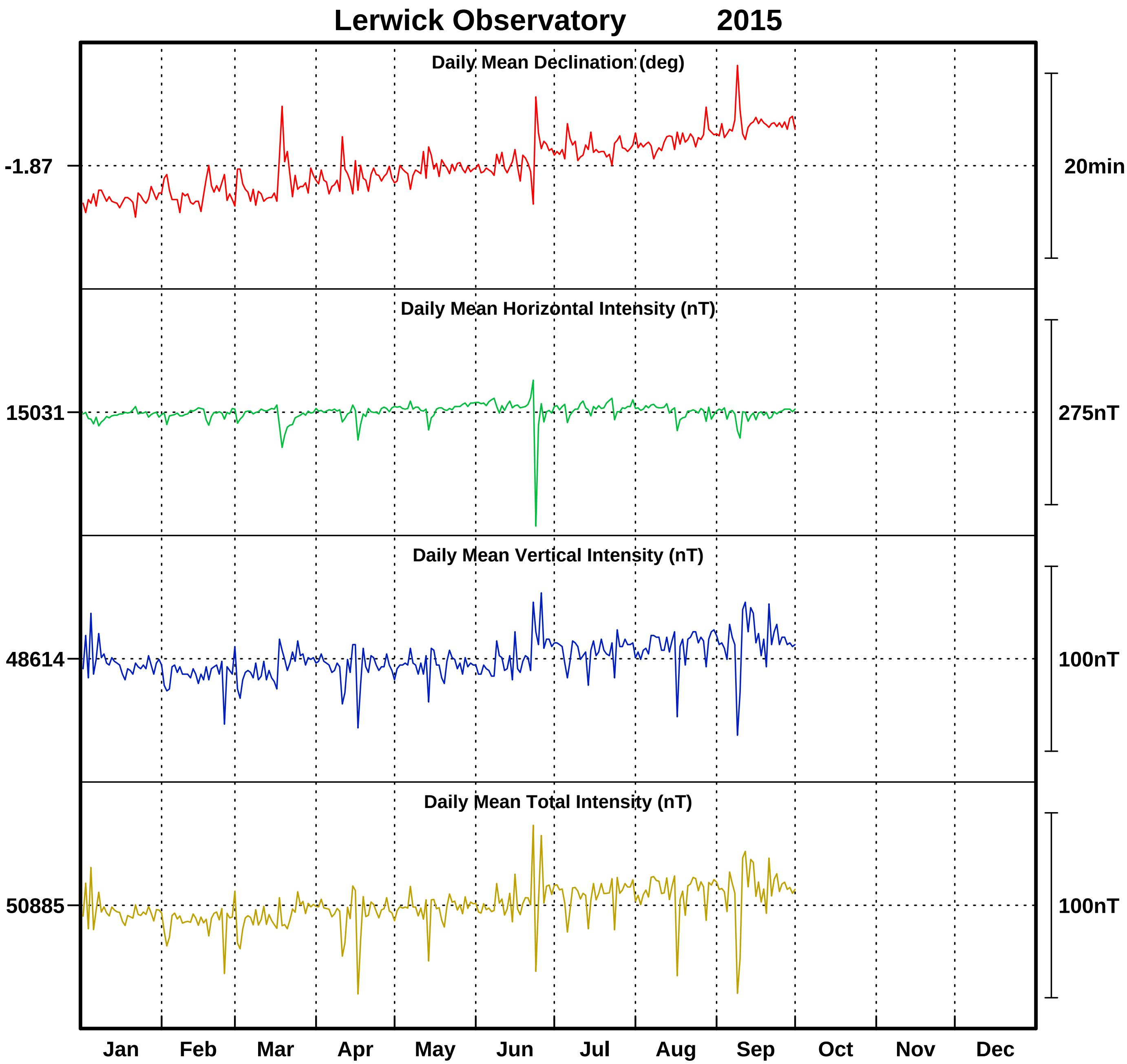


Lerwick Observatory: Horizontal Intensity (nT)



Lerwick Observatory: Vertical Intensity (nT)




Lerwick Observatory 2015
Daily Mean Declination (deg)
-1.87
20min
Daily Mean Horizontal Intensity (nT)
15031
275nT
Daily Mean Vertical Intensity (nT)
48614
100nT
Daily Mean Total Intensity (nT)
50885
100nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Lerwick Observatory 2015

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	-1° 55.7´	15027 nT	72° 49.4´	15018 nT	-506 nT	48612 nT	50882 nT
February	-1° 55.0´	15029 nT	72° 49.1´	15020 nT	-503 nT	48606 nT	50876 nT
March	-1° 53.9´	15025 nT	72° 49.4´	15017 nT	-498 nT	48610 nT	50879 nT
April	-1° 53.3´	15031 nT	72° 49.1´	15023 nT	-495 nT	48609 nT	50880 nT
May	-1° 52.4´	15037 nT	72° 48.7´	15029 nT	-491 nT	48611 nT	50884 nT
June	-1° 51.4´	15035 nT	72° 48.9´	15027 nT	-487 nT	48617 nT	50888 nT
July	-1° 50.1´	15037 nT	72° 48.8´	15030 nT	-482 nT	48618 nT	50891 nT
August	-1° 49.3´	15033 nT	72° 49.2´	15025 nT	-478 nT	48622 nT	50893 nT
September	-1° 47.5´	15028 nT	72° 49.5´	15021 nT	-470 nT	48624 nT	50893 nT

Note

i. The values shown here are provisional.

LERWICK RAPID VARIATIONS

SIs and SSCs

Date	Time (UT)	Type	Quality	H (nT)	D (min)	Z (nT)
10-09-15	07 44	SSC	C	-13.1	1.94	-
20-09-15	06 03	SSC*	B	-14.3	-5.45	-

Notes:
An asterisk (*) indicates that the principal impulse was preceded by a smaller reversed impulse.
The quality of the event is classified as follows:

A = very distinct
B = fair, ordinary, but unmistakable
C = doubtful

The amplitudes given are for the first chief movement of the event.

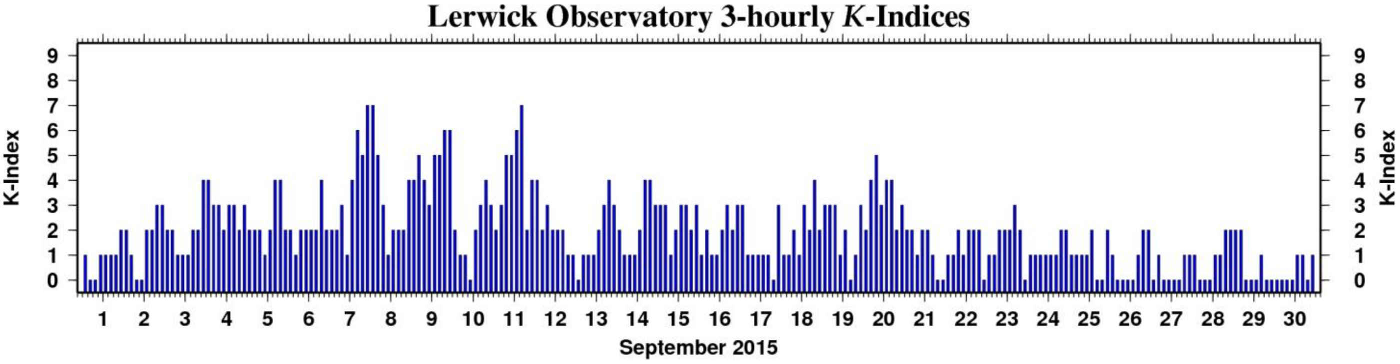
SFEs

Date	Universal Time			H (nT)	D (min)	Z (nT)
	Start	Maximum	End			
28-09-15	14 53	14 59	15 16	-4.5	-0.57	2.8
29-09-15	11 10	11 17	11 30	-4.7	-	1.9
30-09-15	13 19	13 21	13 25	-1.9	-0.48	1.3

Note:
The amplitudes given are for the first chief movement of the event.

INDICES OF GEOMAGNETIC ACTIVITY

Day	*K* - INDICES FOR THREE-HOUR INTERVAL							
	00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24
1	1	0	0	1	1	1	1	2
2	2	1	0	0	2	2	3	3
3	2	2	1	1	1	2	2	4
4	4	3	3	2	3	3	2	3
5	2	2	2	1	2	4	4	2
6	2	1	2	2	2	2	4	2
7	2	2	3	1	4	6	5	7
8	7	5	3	1	2	2	2	4
9	4	5	4	3	5	5	6	6
10	2	1	1	0	2	3	4	3
11	2	3	5	5	6	7	2	4
12	4	2	3	2	2	2	1	1
13	0	1	1	1	2	3	4	3
14	2	1	1	1	2	4	4	3
15	3	3	1	2	3	3	2	3
16	1	2	1	1	2	3	2	3
17	3	1	1	1	1	1	0	3
18	1	1	2	1	3	2	4	2
19	3	3	3	1	2	0	1	3
20	2	4	5	3	4	4	2	3
21	2	2	1	2	2	1	0	0
22	1	1	2	1	2	2	2	0
23	1	1	2	2	2	3	2	0
24	1	1	1	1	1	1	2	2
25	1	1	1	1	2	0	0	2
26	1	0	0	0	0	1	2	2
27	0	1	0	0	0	0	1	1
28	1	0	0	0	1	1	2	2
29	2	2	0	0	0	1	0	0
30	0	0	0	0	1	1	0	1



The *aa* Index

Date	Day	3-hourly *aa*-indices								Aa_{am}	Aa_{pm}	Aa
01-09-15	244	12	5	8	9	12	2	5	12	8.6	7.9	8.2
02-09-15	245	12	9	8	2	12	24	37	24	7.8	24.3	16.1
03-09-15	246	20	16	8	8	12	16	16	45	12.9	22.4	17.6
04-09-15	247	45	37	45	46	46	24	24	24	43.4	29.5	36.5
05-09-15	248	9	24	16	24	24	45	45	16	18.4	32.7	25.6
06-09-15	249	12	24	32	24	32	16	45	16	23.1	27.4	25.3
07-09-15	250	16	16	45	24	81	102	102	115	25.4	99.7	62.6
08-09-15	251	115	45	24	8	24	16	16	45	48.0	25.4	36.7
09-09-15	252	45	67	80	116	59	46	102	80	77.0	71.6	74.3
10-09-15	253	16	8	20	12	16	45	59	24	14.0	36.1	25.1
11-09-15	254	24	46	171	137	81	137	32	45	94.5	73.8	84.2
12-09-15	255	37	24	59	46	32	24	8	12	41.5	19.0	30.2
13-09-15	256	8	8	8	38	38	59	45	24	15.3	41.5	28.4
14-09-15	257	12	12	8	24	16	80	58	24	14.0	44.7	29.3
15-09-15	258	37	24	16	46	59	32	24	24	30.8	34.8	32.8
16-09-15	259	16	16	16	8	32	45	24	37	14.0	34.7	24.4
17-09-15	260	45	24	16	24	8	8	5	20	27.5	10.1	18.8
18-09-15	261	20	12	32	38	24	16	37	16	25.4	23.4	24.4
19-09-15	262	24	37	45	38	16	5	8	37	36.1	16.6	26.3
20-09-15	263	24	59	137	59	46	80	32	24	69.7	45.5	57.6
21-09-15	264	32	24	8	16	16	16	5	8	20.1	11.3	15.7
22-09-15	265	24	24	46	8	32	16	12	12	25.5	18.0	21.8
23-09-15	266	8	12	32	16	24	32	45	12	17.0	28.4	22.7
24-09-15	267	16	12	12	5	8	8	12	24	11.3	12.9	12.1
25-09-15	268	16	12	8	24	46	8	5	12	15.0	17.6	16.3
26-09-15	269	12	8	2	5	5	12	16	12	6.8	11.3	9.1
27-09-15	270	5	8	8	5	2	5	12	12	6.5	7.8	7.2
28-09-15	271	5	5	2	2	8	8	12	12	3.8	9.9	6.8
29-09-15	272	12	20	8	8	5	5	5	5	11.8	5.1	8.5
30-09-15	273	2	2	2	2	2	5	5	5	2.5	4.5	3.5
											Monthly Mean Value	26.9

<u>Notes</u>

i. The units of the *aa* index are nT.
ii. The 3-hour *aa* values are rounded to the nearest integer. Where *aa* = *.5, *aa* is rounded down.
iii. Daily values (Aa_{am}, Aa_{pm} and *Aa*) are computed from *aa* values of original resolution.
iv. The monthly mean value is computed from the daily mean values, *Aa*.
v. Definitive *aa* indices are derived and published by the International Service for Geomagnetic Indices.