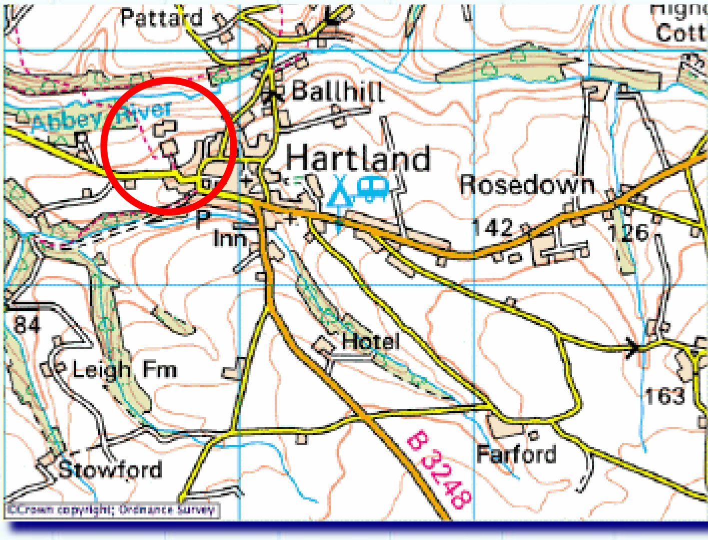
BRITISH GEOLOGICAL SURVEY

Hartland Observatory

Monthly Magnetic Bulletin

July 2009



09/07/HA

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

HARTLAND OBSERVATORY MAGNETIC DATA

1. Introduction

This bulletin is published to meet the needs of both commercial and academic users of geomagnetic data. Magnetic observatory data is presented as a series of plots of one-minute, hourly and daily values, followed by tabulations of monthly values, geomagnetic activity indices and reports of rapid variations. 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:

National Geomagnetic Service
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

Hartland Observatory, one of the three geomagnetic observatories operated and maintained in the UK by BGS, is situated on the NW boundary of the village of Hartland in North Devon. The observatory co-ordinates are:

Geographic: 50°59.7′N 355°30.96′E
Geomagnetic: 53°54.42 ′N 080°06.54′E
Height above mean sea level: 95 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), which was developed by BGS staff, installed in 2002, and became fully operational in January 2003. 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 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 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. These one-minute values are used to update the Geomagnetism Information and Forecast Service (GIFS), an on-line information system accessed via the World Wide Web at the address given in Section 1.1. GIFS also provides information on geomagnetic and solar activity.

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 can also be 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. 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. Provisional and definitive values are indicated in the table as **P** or **D** respectively. It is anticipated that provisional values will not be altered by more than a few nT or tenths of arcminutes before being made definitive.

4.6 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 ranges in *H* and in *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 *K* index retains the local time (LT) and seasonal dependence of activity associated with the position of the observatory.

The provisional 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 daily mean value of *aa* (denoted *Aa*), the mean values of *aa* for the intervals 00-12UT and 12-24UT and the daily mean values for Hartland alone (Aa_n) and Canberra alone (Aa_s) are tabulated.

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 publication are provisional only; the definitive values are published by the International Service for Geomagnetic Indices, CRPE/CNET - CNRS, 4 Avenue de Neptune, F-94107 Saint Maur Cedex, France.

4.7 Rapid Variations

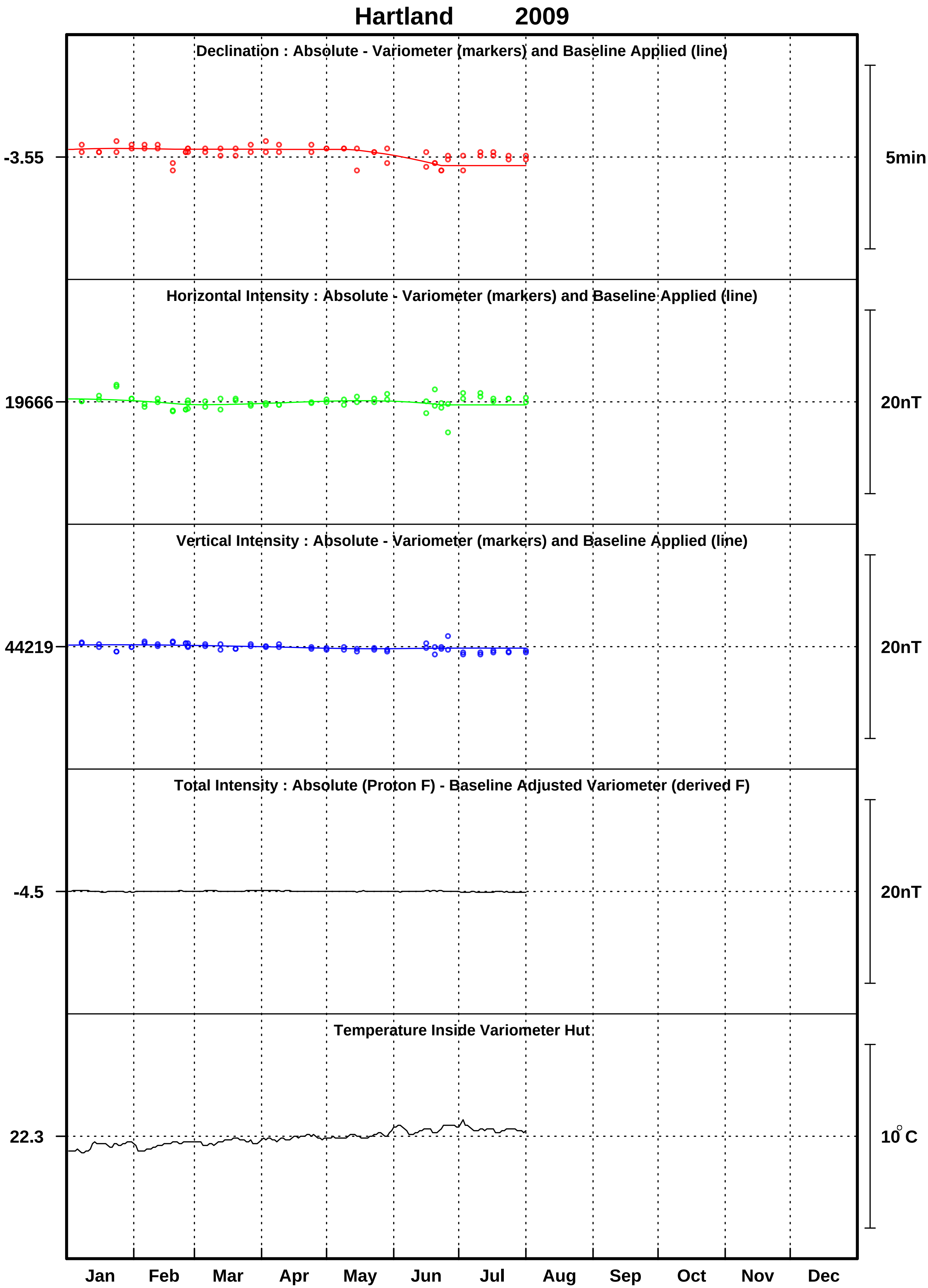
Charged particles stream from the Sun in the solar wind. The solar wind interacts with the geomagnetic field to create a cavity, the magnetosphere, in which the field is confined. When a region of enhanced velocity and/or density in the solar wind arrives at the day-side boundary of the magnetosphere (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. The X-rays cause increased ionisation in the ionosphere, which leads to absorption of short-wave radio signals. On an observatory magnetogram a Solar Flare Effect (SFE), or "crochet" may be observed. This is an enhancement to the diurnal variation of the order of 10 nT, lasting about an hour.

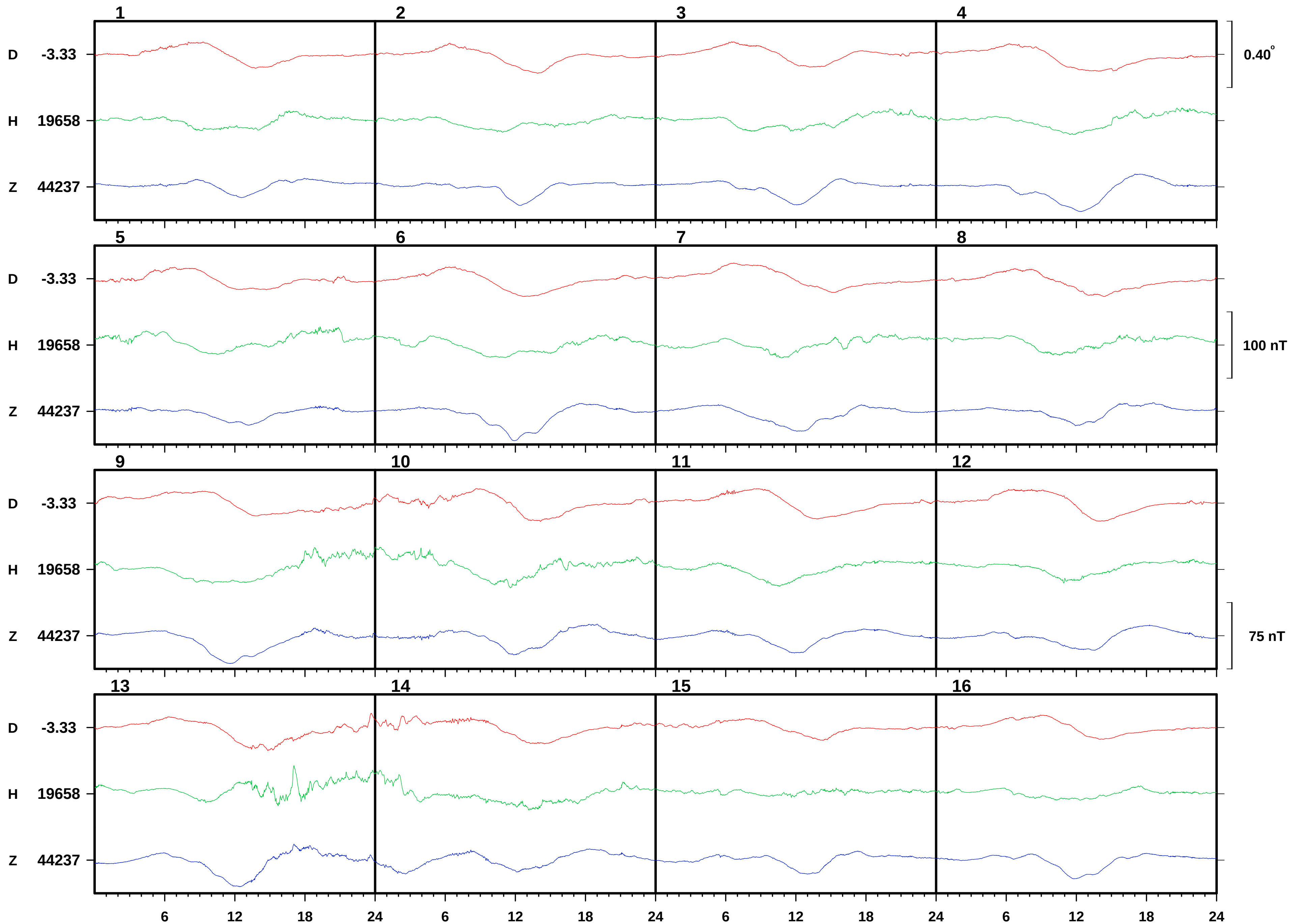
HARTLAND OBSERVATORY

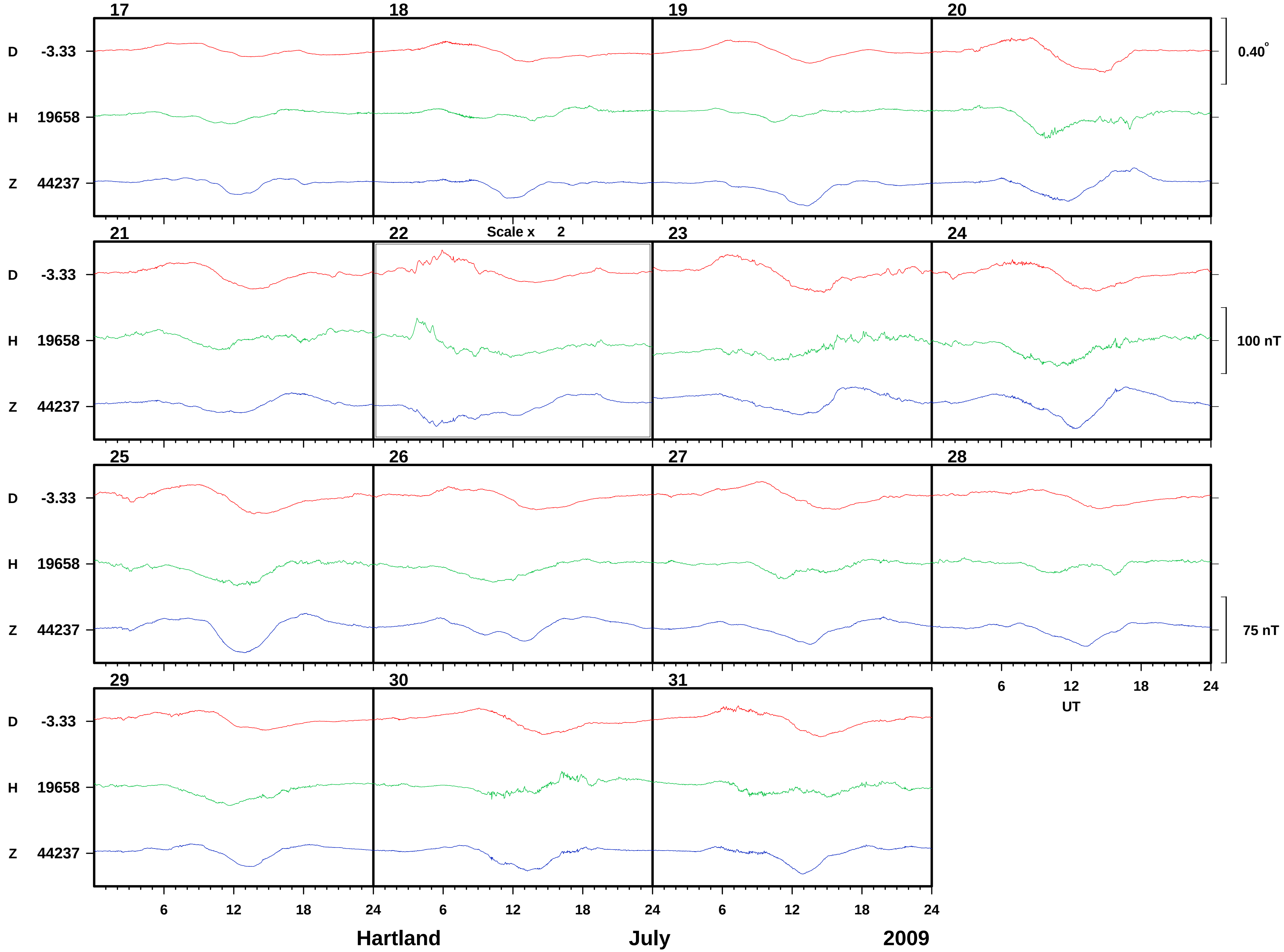
ABSOLUTE OBSERVATIONS

		DECLINATION			INCLINATION							
Date	**Day Number**	**Time (UT)**	**Absolute (°)**	**Baseline (°)**	**Time (UT)**	**Inclination (°)**	**Total Field Intensity (nT)**	**H Absolute (nT)**	**H Baseline (nT)**	**Z Absolute (nT)**	**Z Baseline (nT)**	**Observer**
02-Jul-09	183	09:01	-3.3154	-3.5567	09:12	66.0525	48403.1	19646.9	19666.5	44236.5	44218.7	ST
02-Jul-09	183	09:20	-3.3157	-3.5500	09:28	66.0531	48402.3	19646.1	19667.1	44236.0	44218.5	ST
10-Jul-09	191	08:48	-3.2397	-3.5483	08:58	66.0522	48402.9	19647.0	19666.7	44236.1	44218.7	ST
10-Jul-09	191	09:04	-3.2410	-3.5500	09:12	66.0538	48402.4	19645.5	19667.1	44236.2	44218.5	ST
16-Jul-09	197	09:11	-3.2487	-3.5483	09:19	66.0431	48406.2	19655.3	19666.5	44236.1	44218.7	ST
16-Jul-09	197	09:25	-3.2531	-3.5500	09:32	66.0444	48404.6	19653.7	19666.2	44235.0	44218.9	ST
23-Jul-09	204	08:51	-3.2633	-3.5517	08:59	66.0598	48401.0	19640.3	19666.5	44237.1	44218.8	ST
23-Jul-09	204	09:05	-3.2649	-3.5500	09:13	66.0609	48401.6	19639.8	19666.5	44237.9	44218.7	ST
31-Jul-09	212	09:31	-3.283	-3.5517	09:40	66.05223	48404.2	19647.5	19666.6	44237.3	44218.7	ST
31-Jul-09	212	09:47	-3.2733	-3.55	09:55	66.04996	48404.2	19649.3	19666.1	44236.6	44218.9	ST


Hartland 2009
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
-3.55
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
19666
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
44219
20nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
-4.5
20nT
Temperature Inside Variometer Hut
22.3
10°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Hartland July 2009

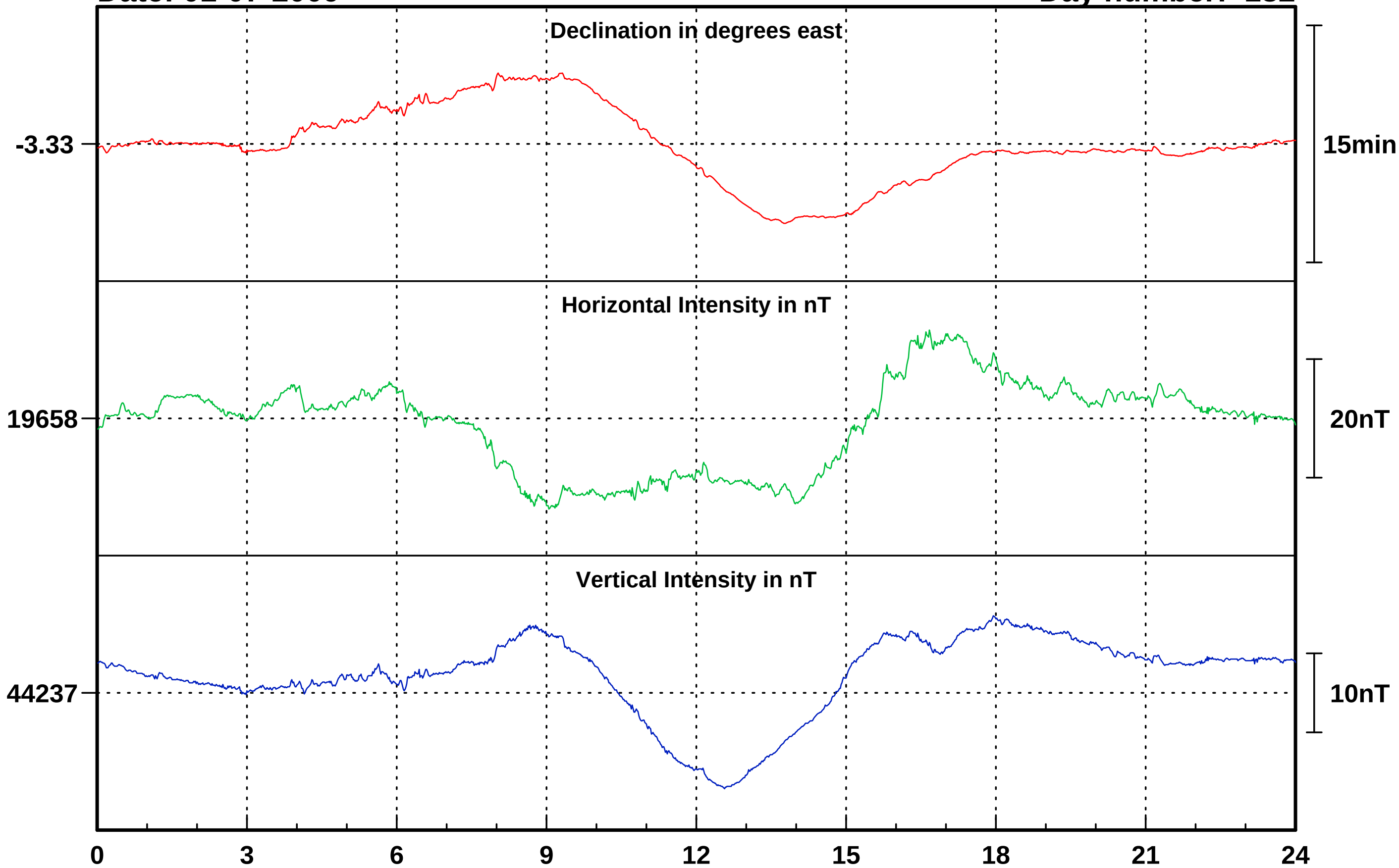




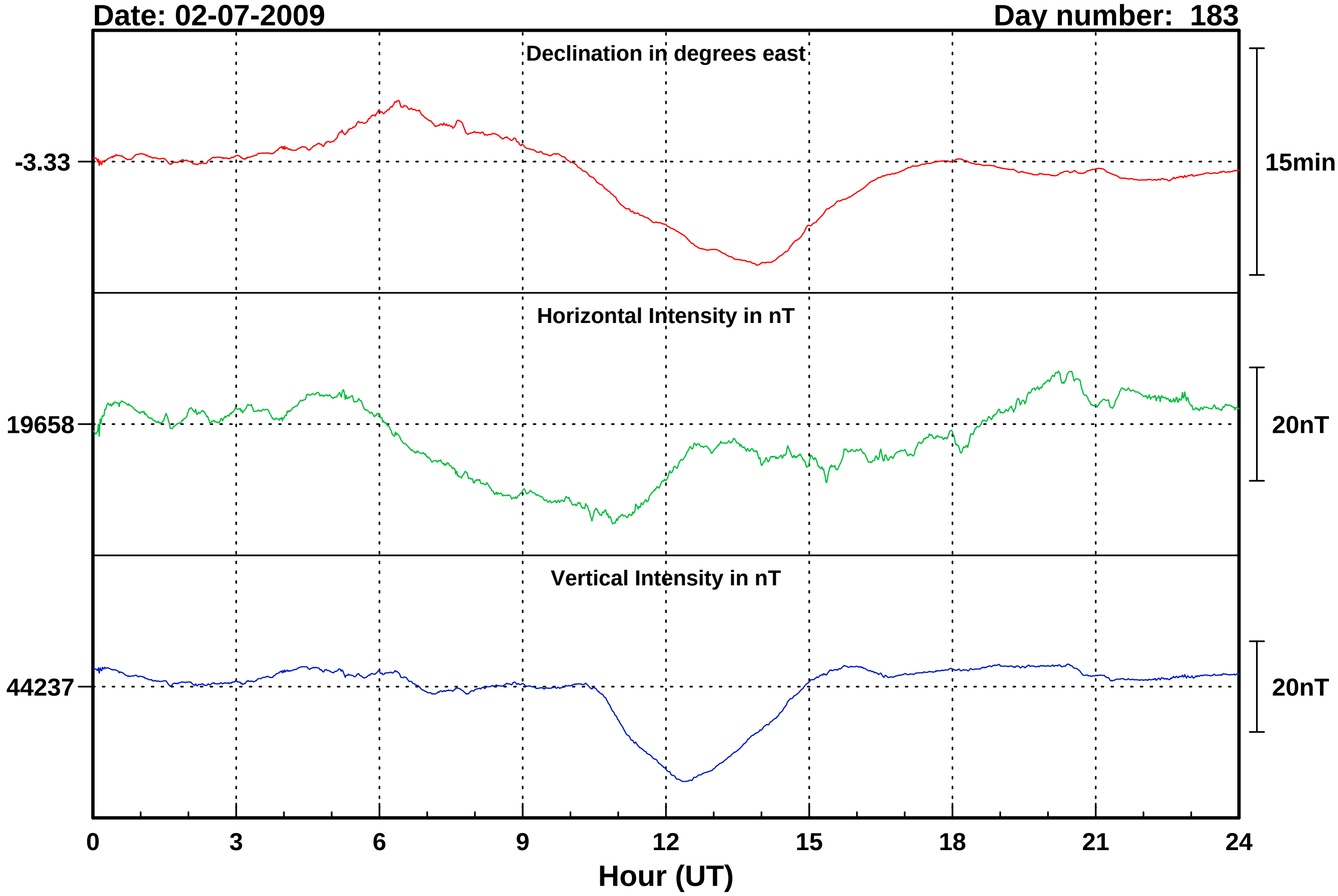
17
18
19
20
21
22
Scale x 2
23
24
25
26
27
28
29
30
31
D -3.33
H 19658
Z 44237
0.40°
100 nT
75 nT
6
12
18
24
UT
Hartland
July
2009

Hartland

Date: 01-07-2009 Day number: 182

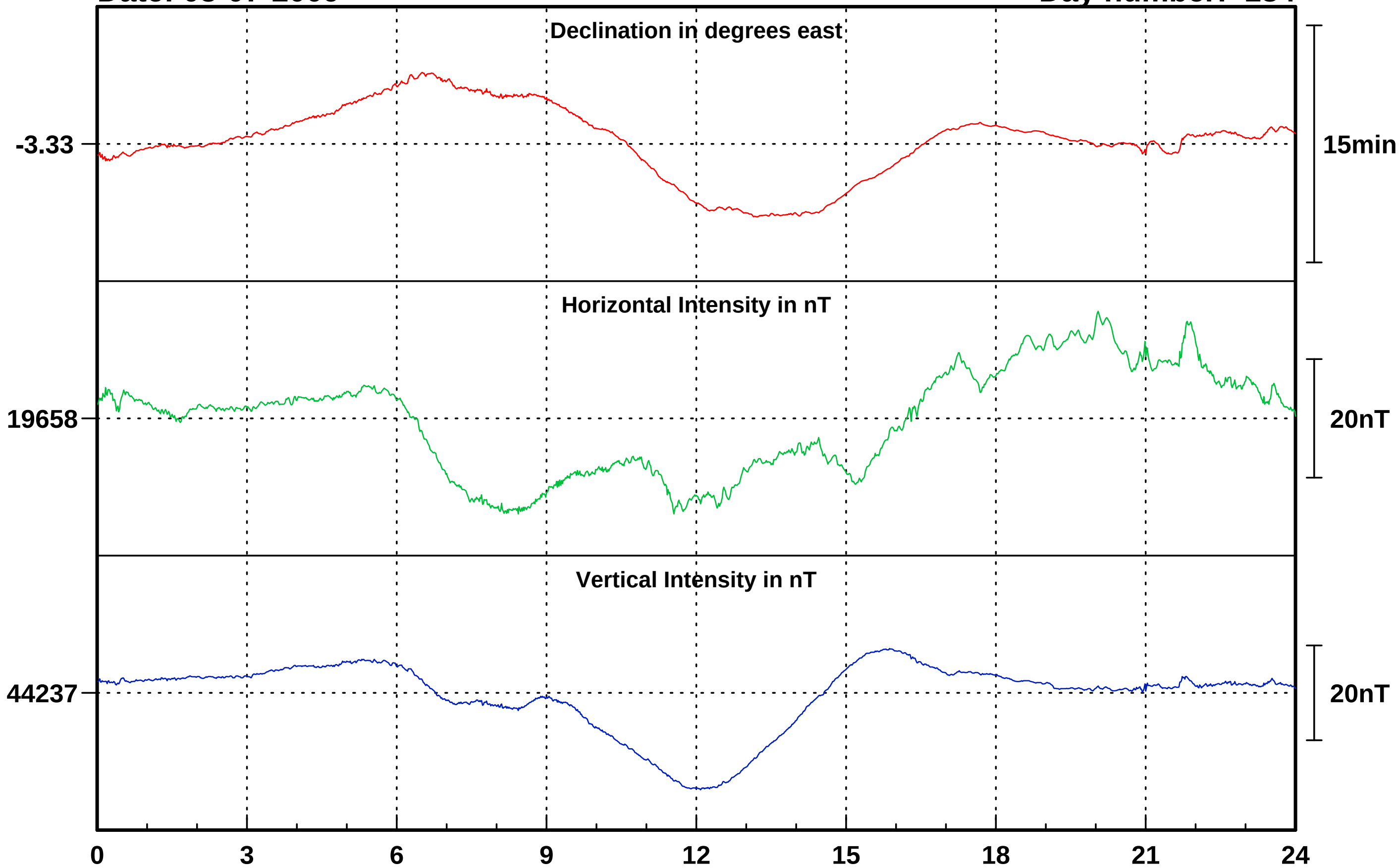


Date: 02-07-2009 Day number: 183

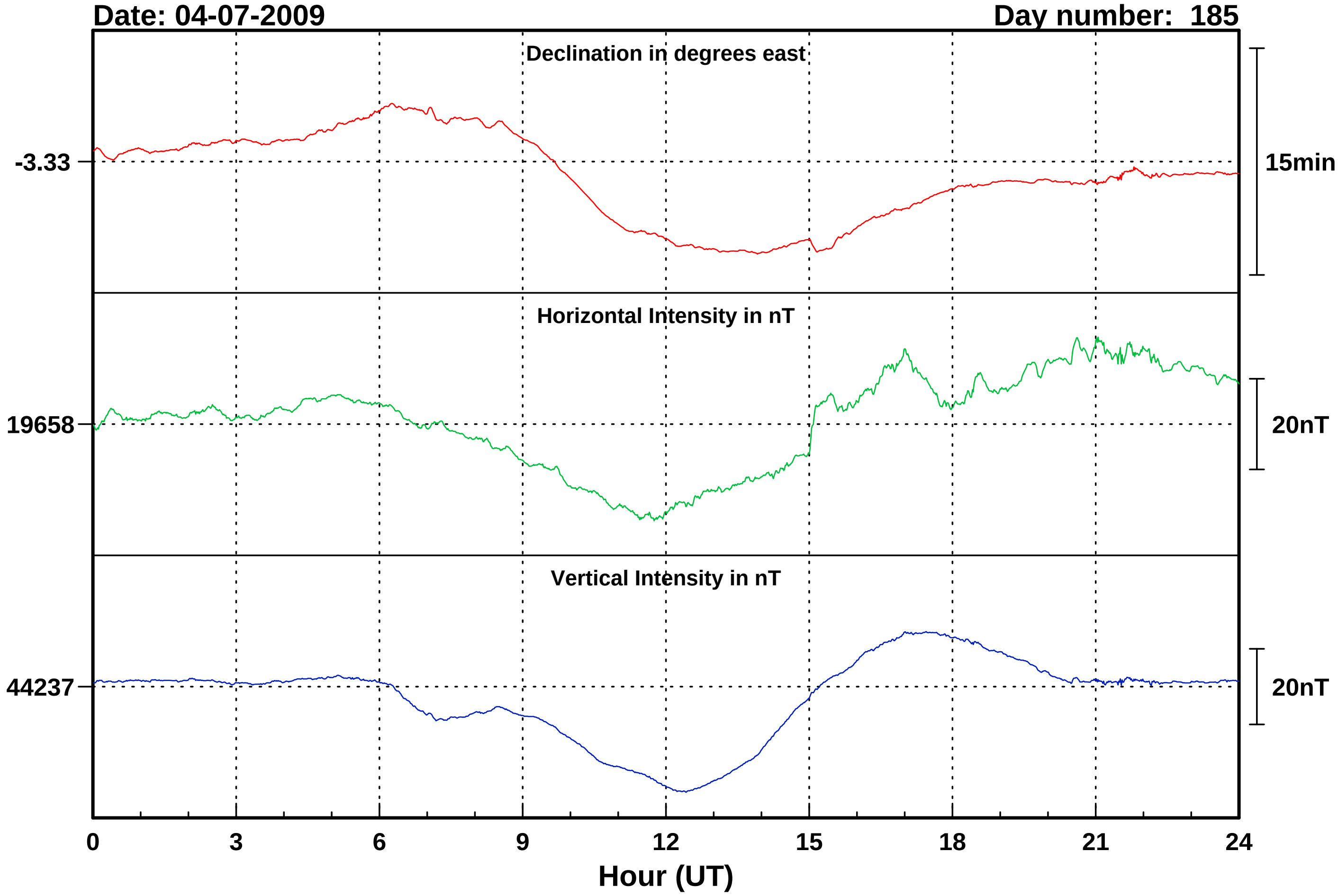


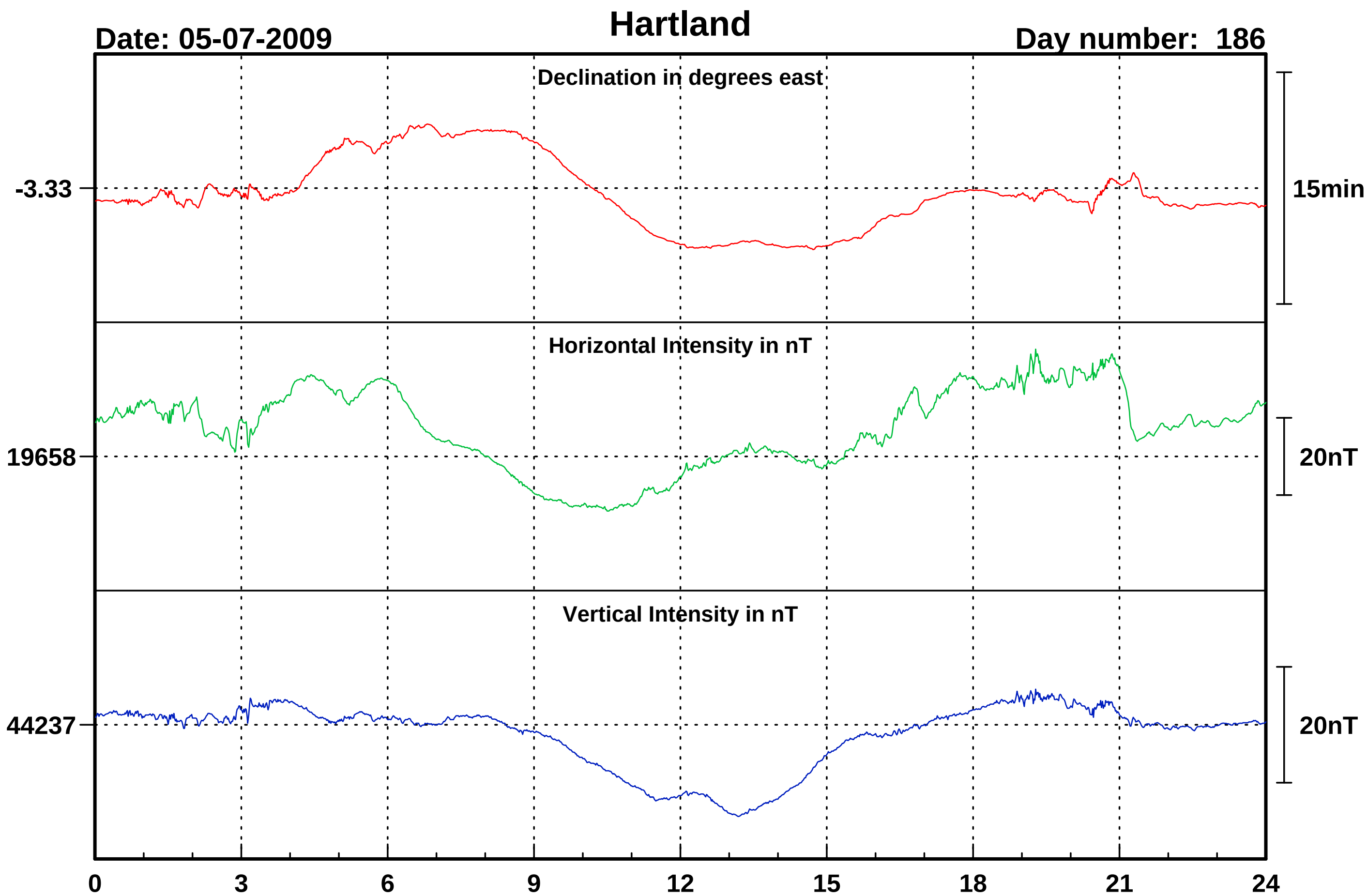
Hartland

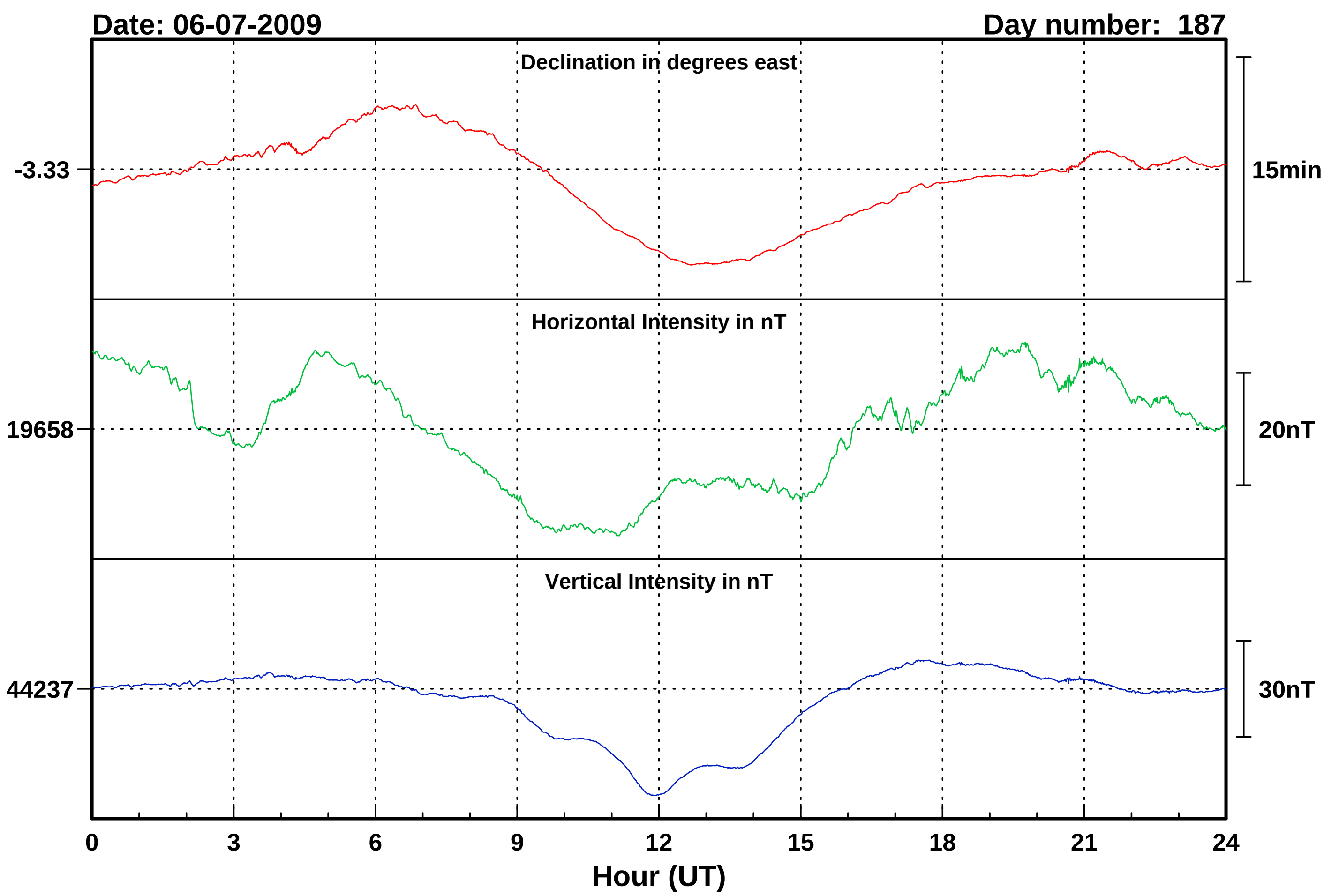
Date: 03-07-2009 Day number: 184



Date: 04-07-2009 Day number: 185

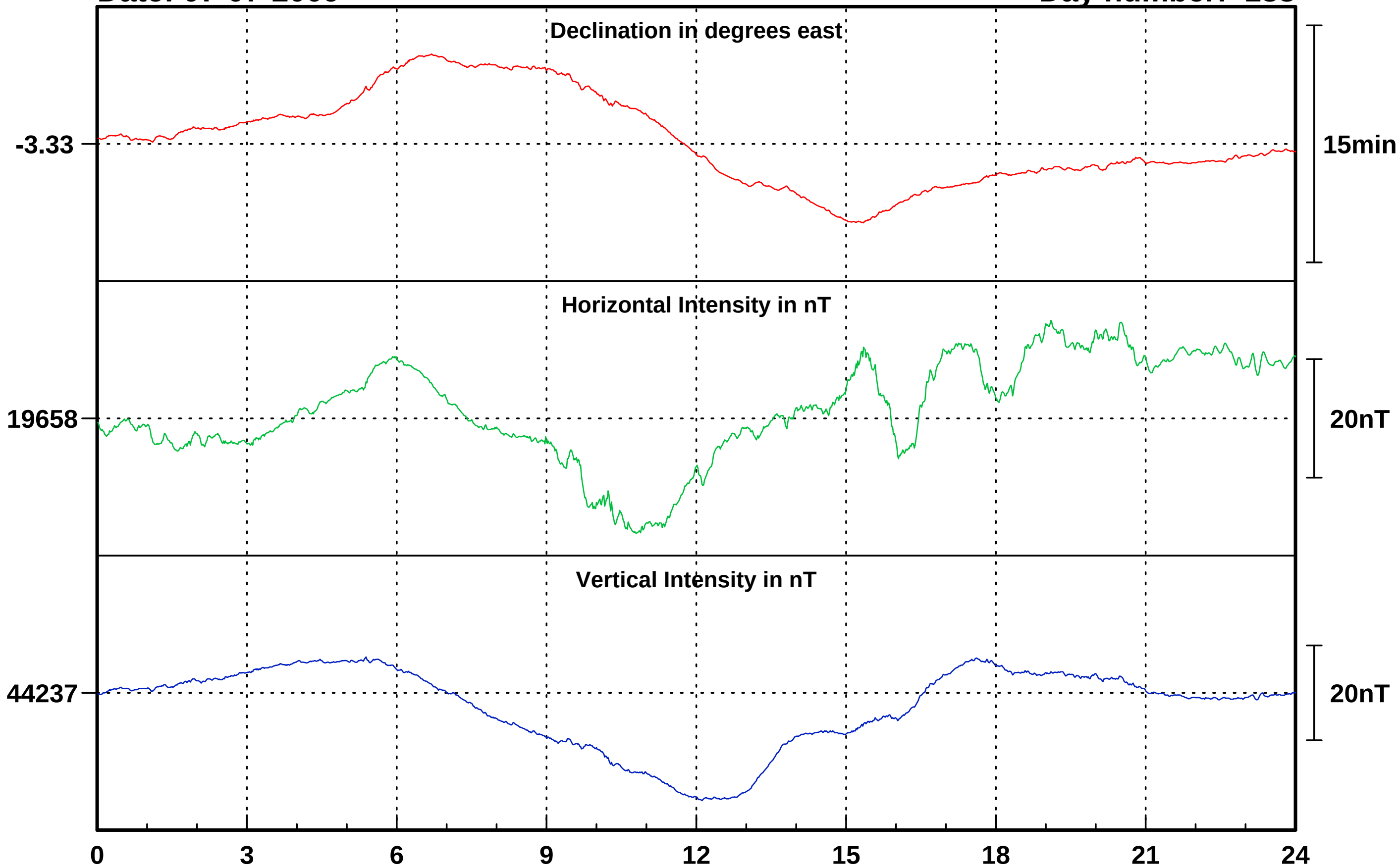



Hartland
Date: 05-07-2009
Day number: 186
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24

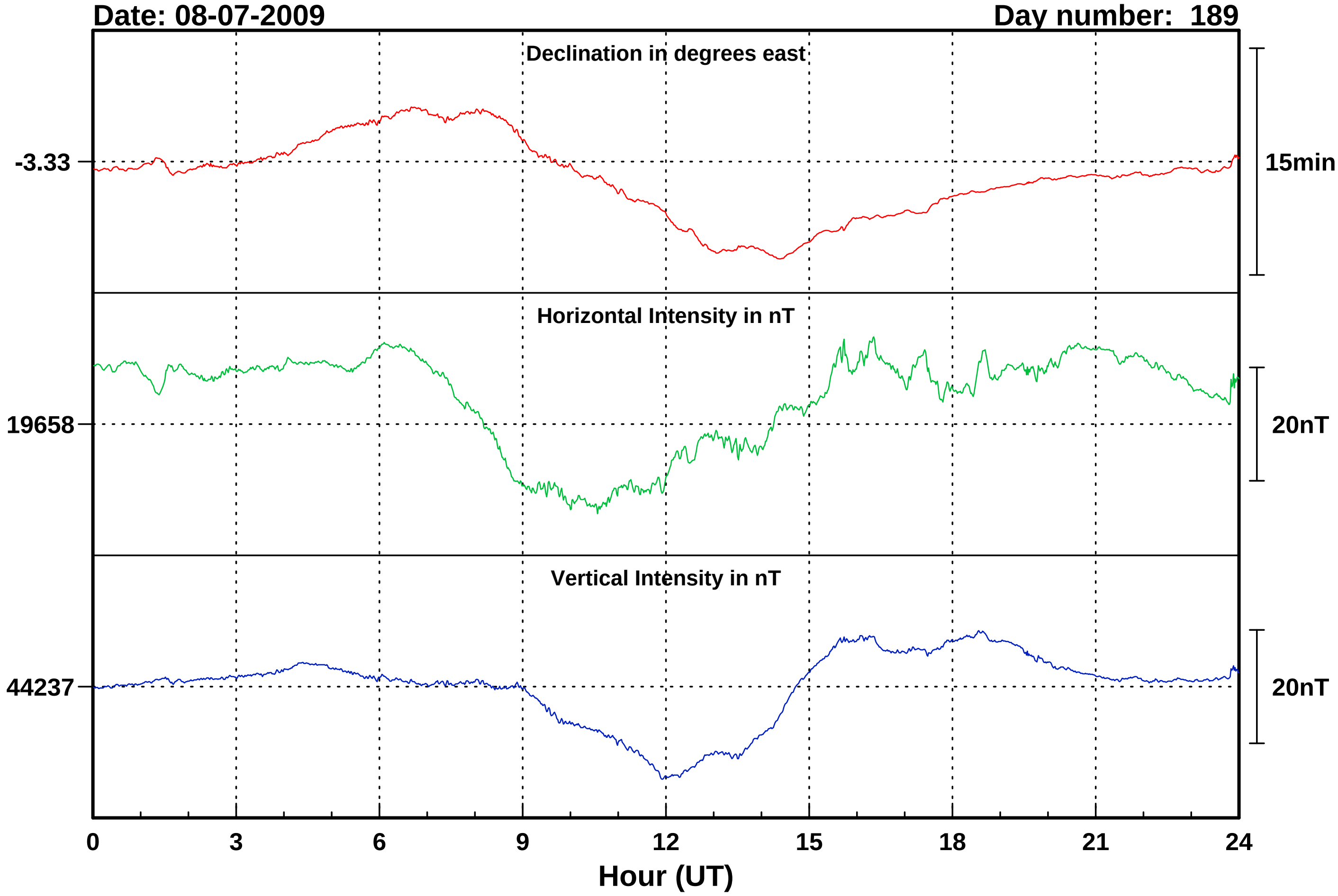

Date: 06-07-2009
Day number: 187
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
30nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Hartland

Date: 07-07-2009 Day number: 188

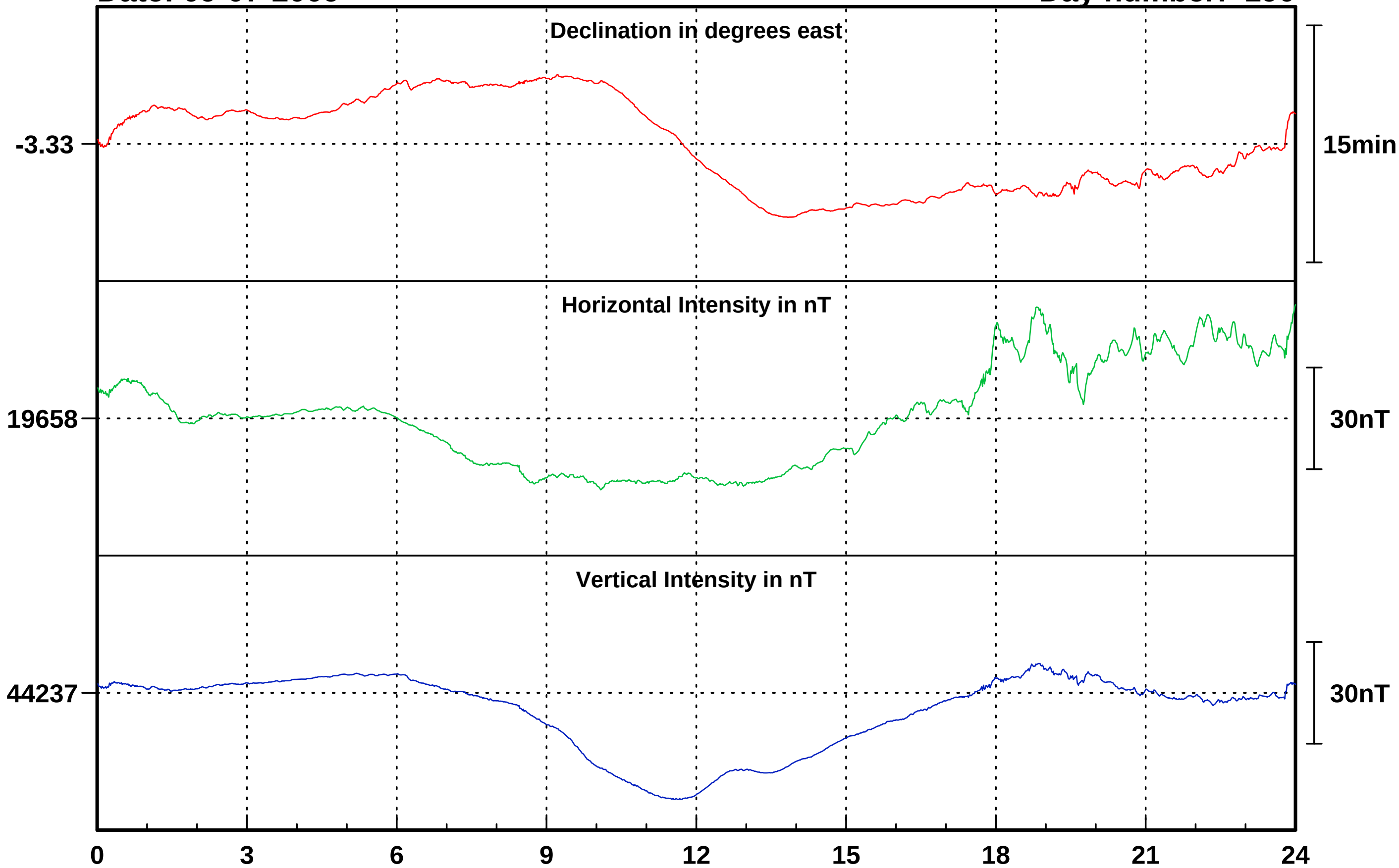


Date: 08-07-2009 Day number: 189

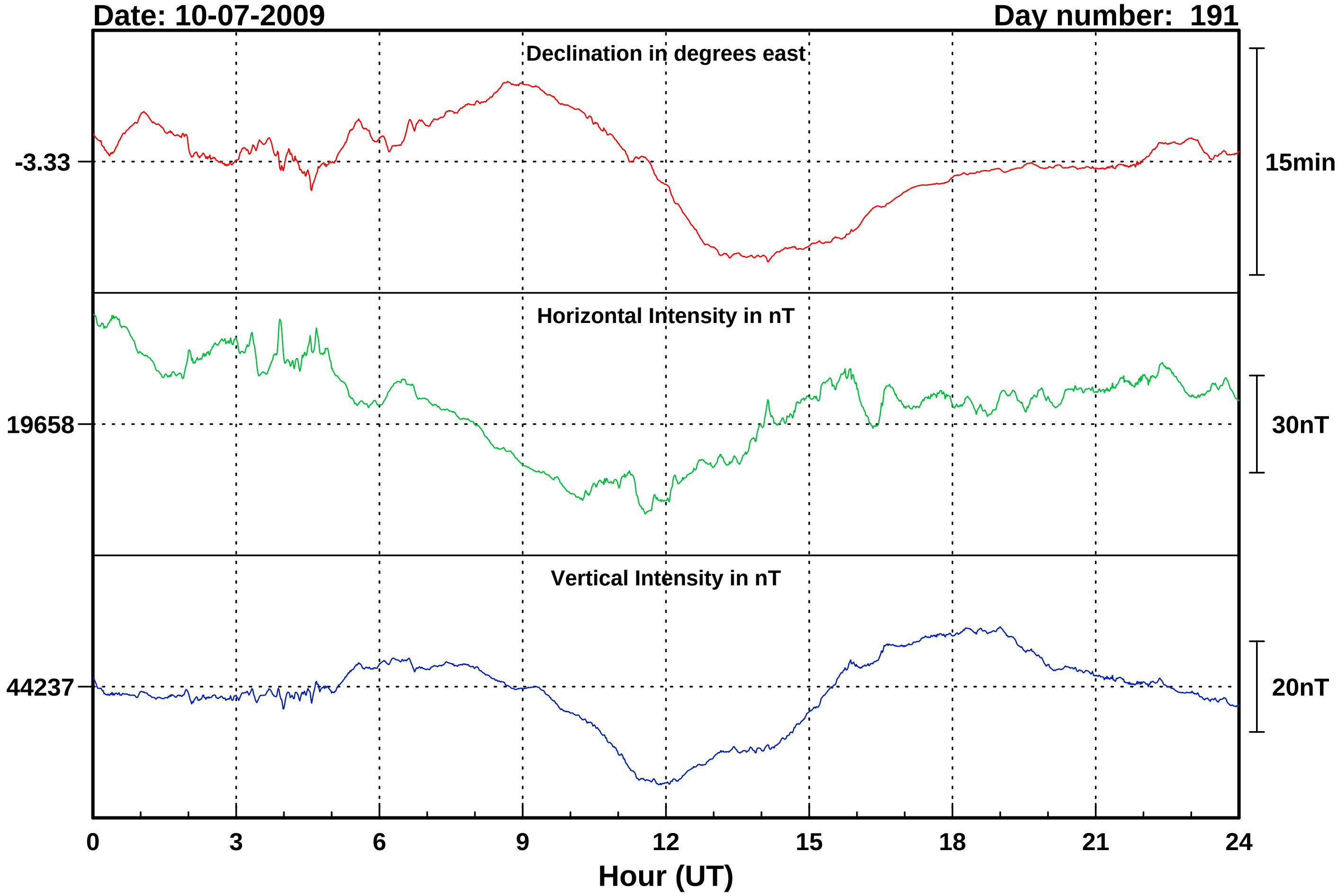


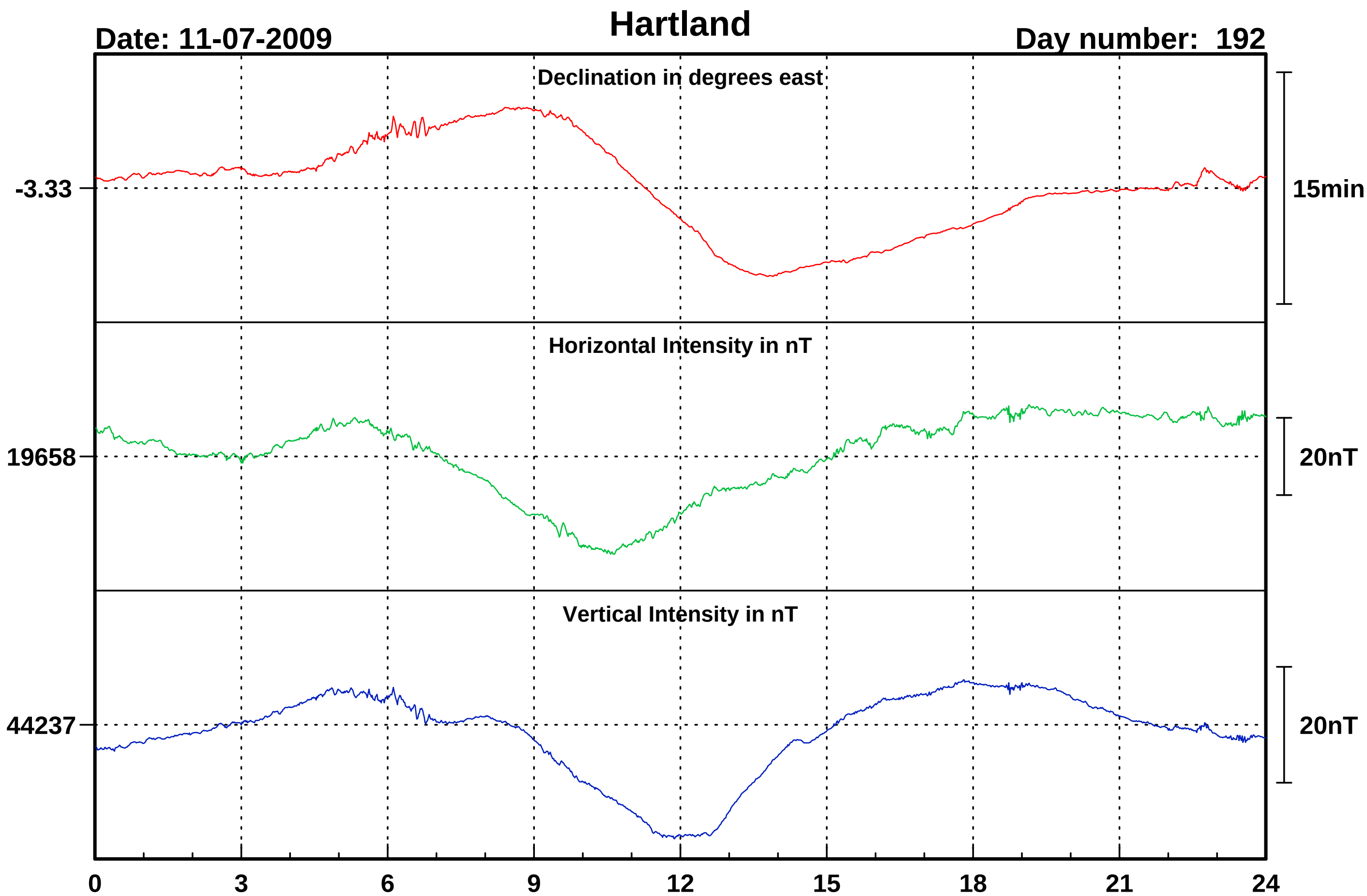
Hartland

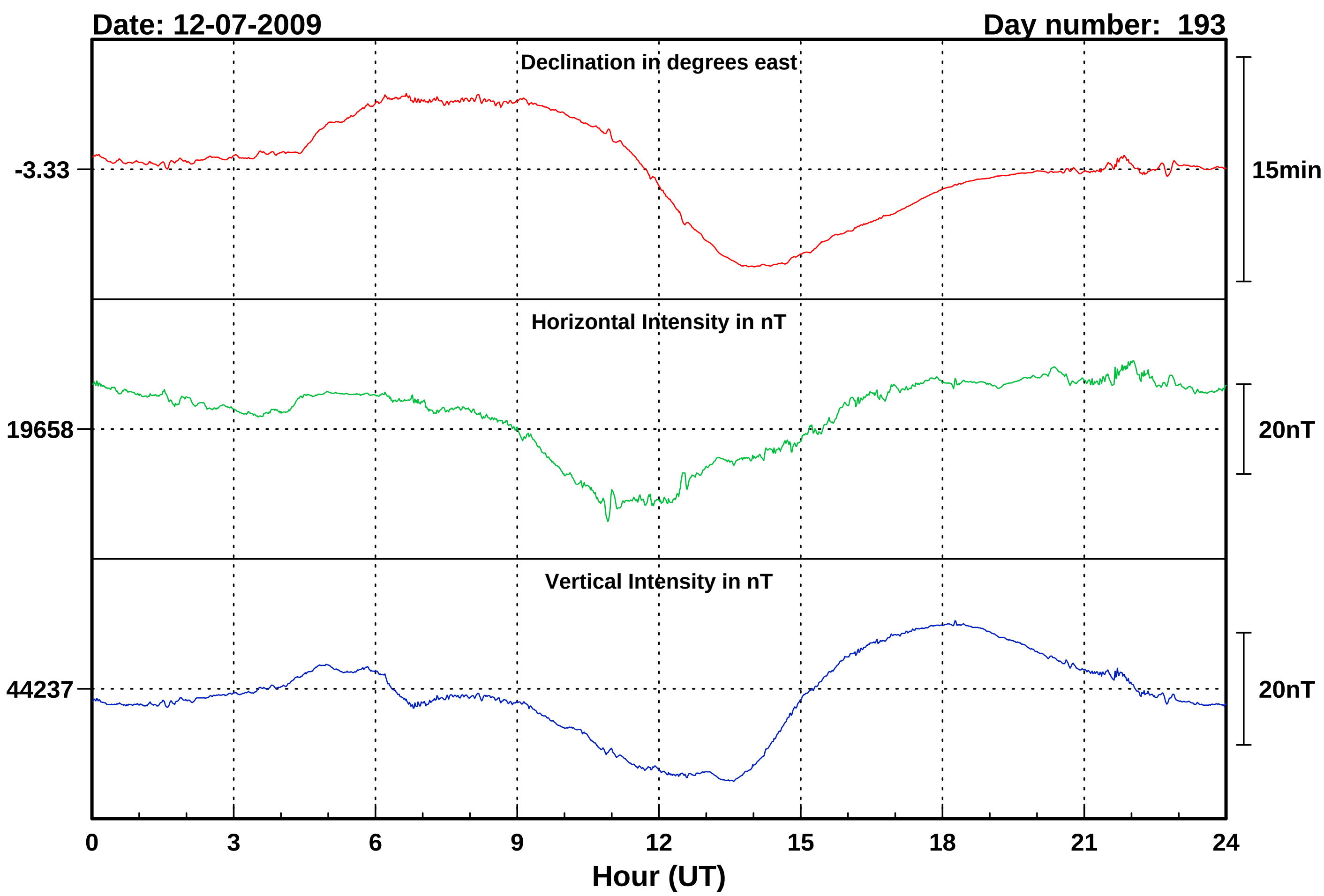
Date: 09-07-2009 Day number: 190



Date: 10-07-2009 Day number: 191

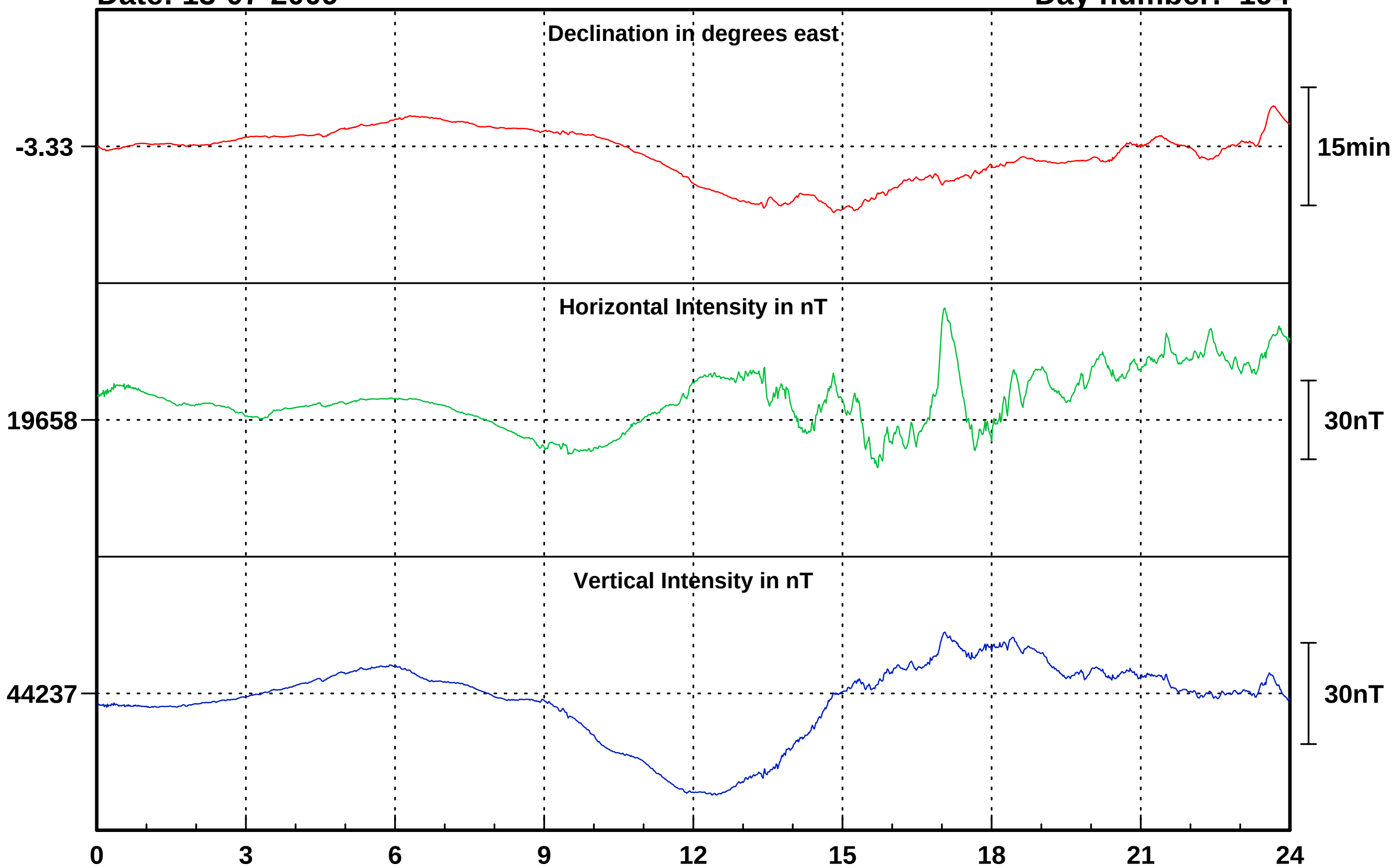



Hartland
Date: 11-07-2009
Day number: 192
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24

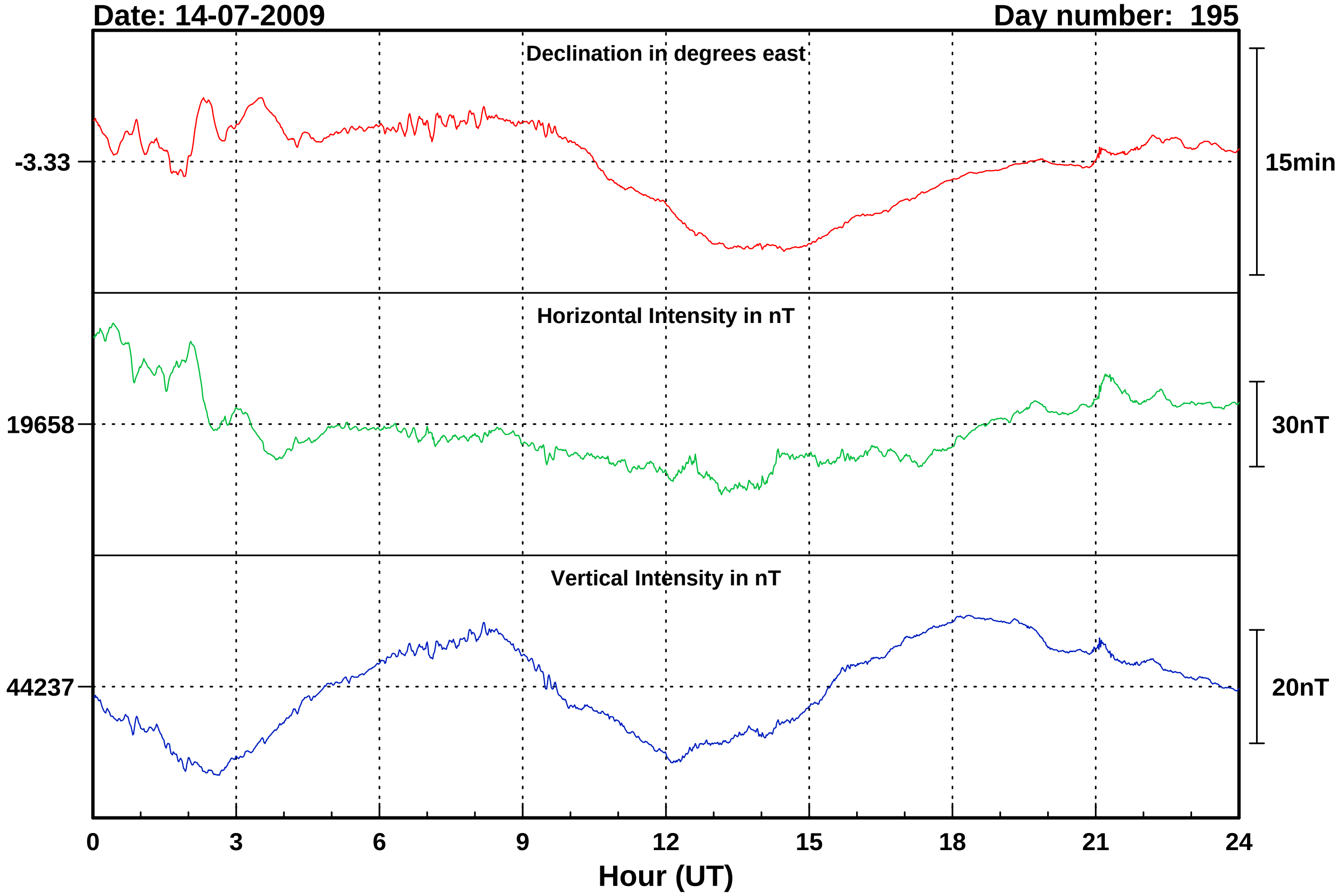

Date: 12-07-2009
Day number: 193
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Hartland

Date: 13-07-2009 Day number: 194

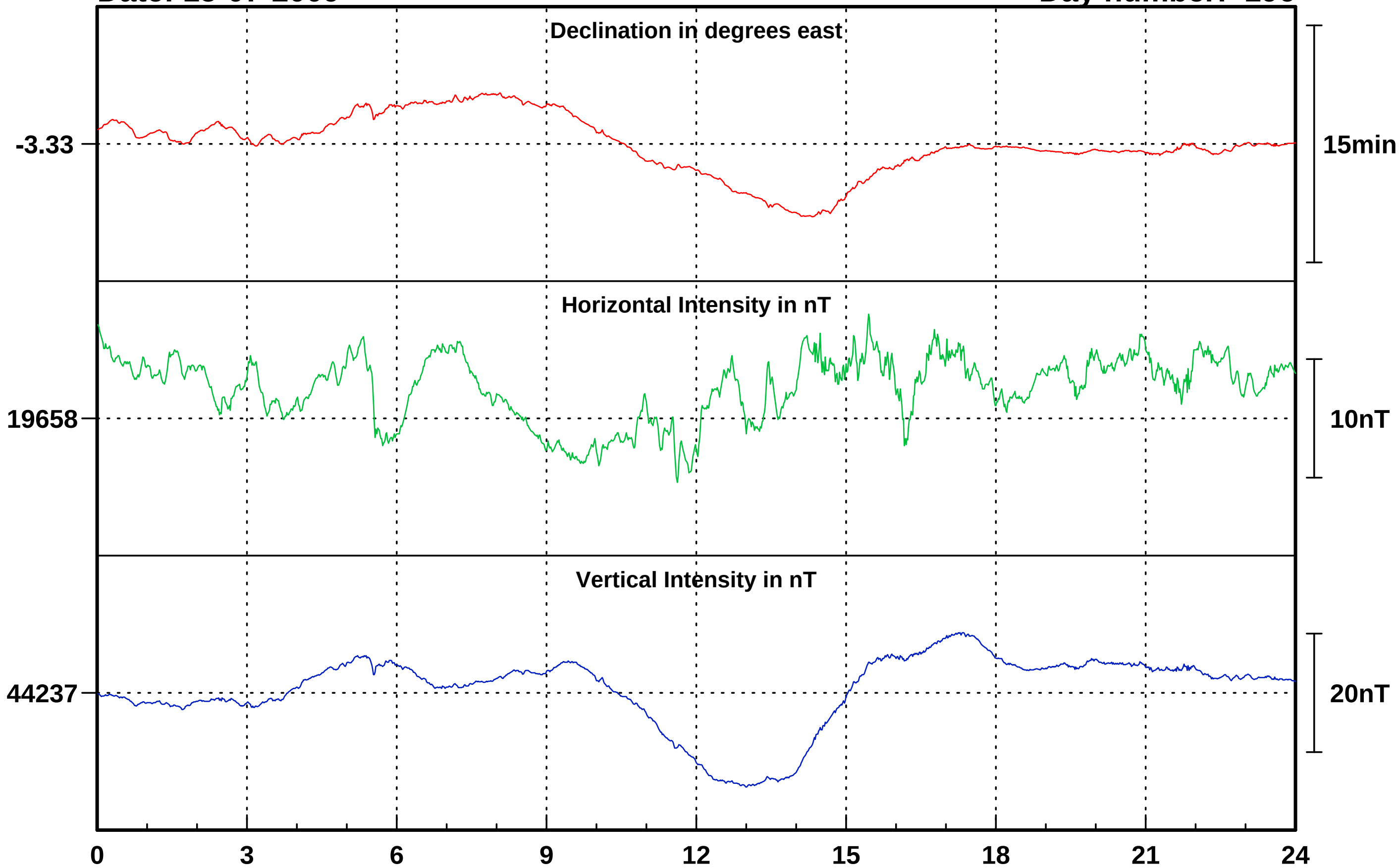


Date: 14-07-2009 Day number: 195

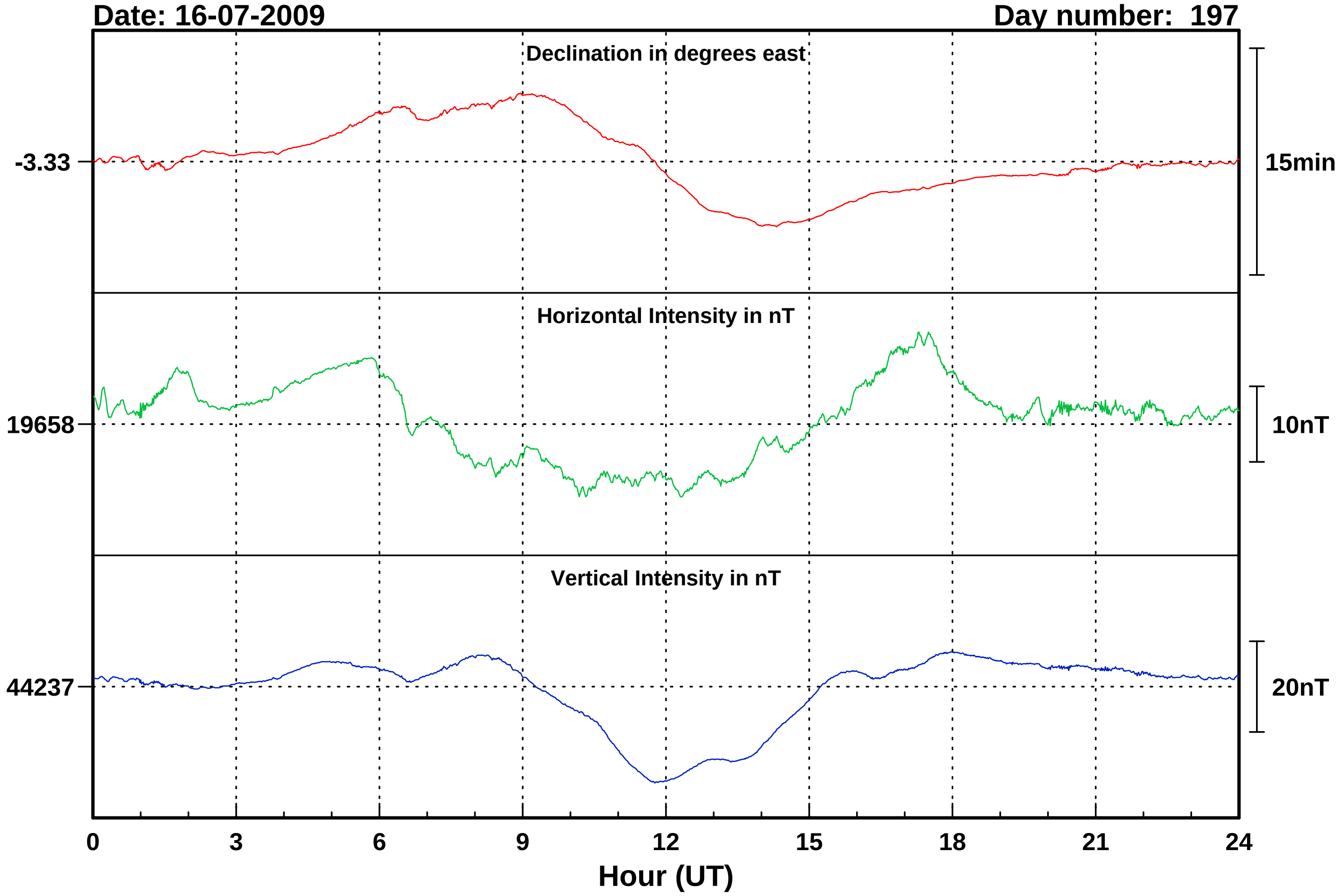


Hartland

Date: 15-07-2009 Day number: 196

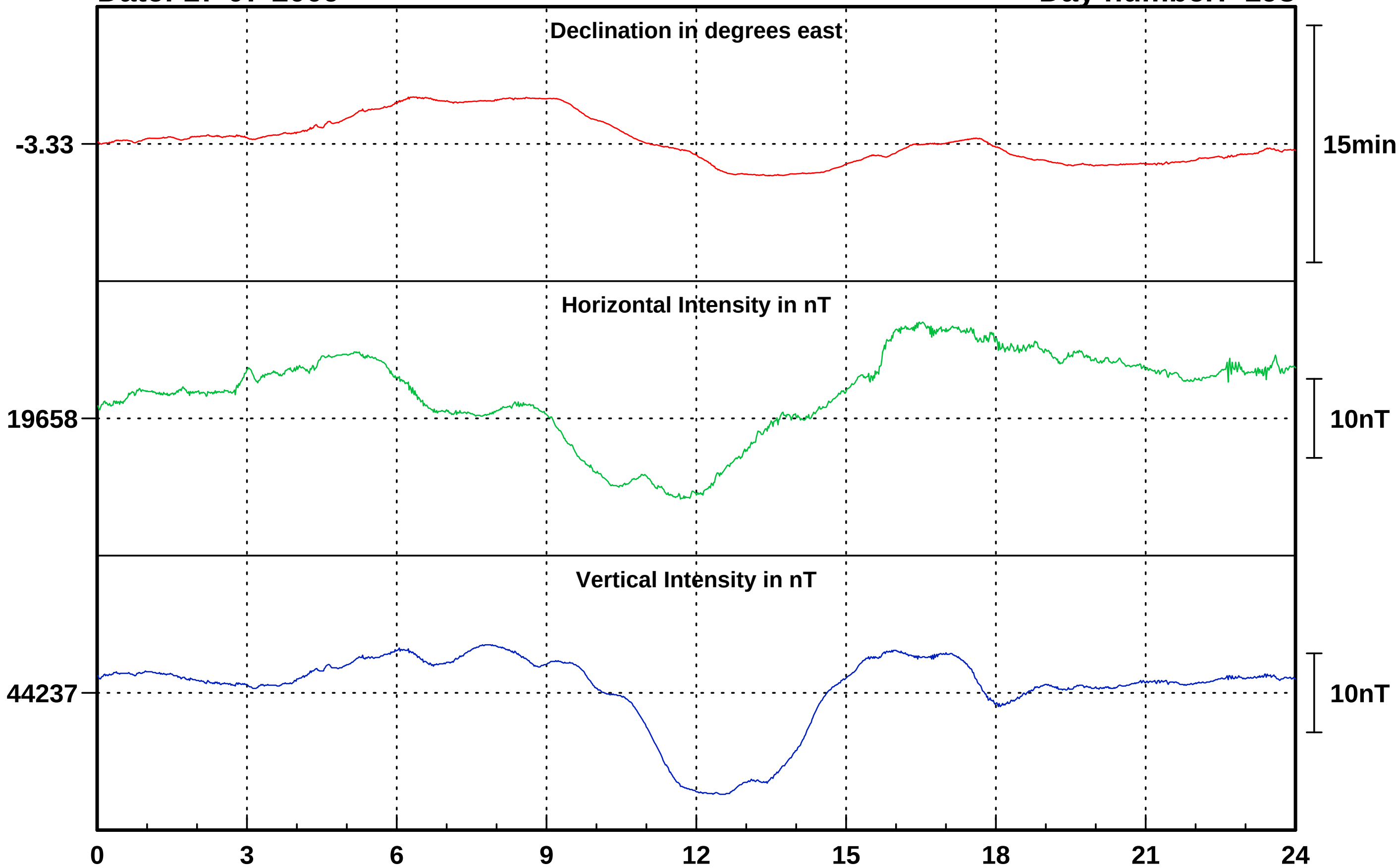


Date: 16-07-2009 Day number: 197

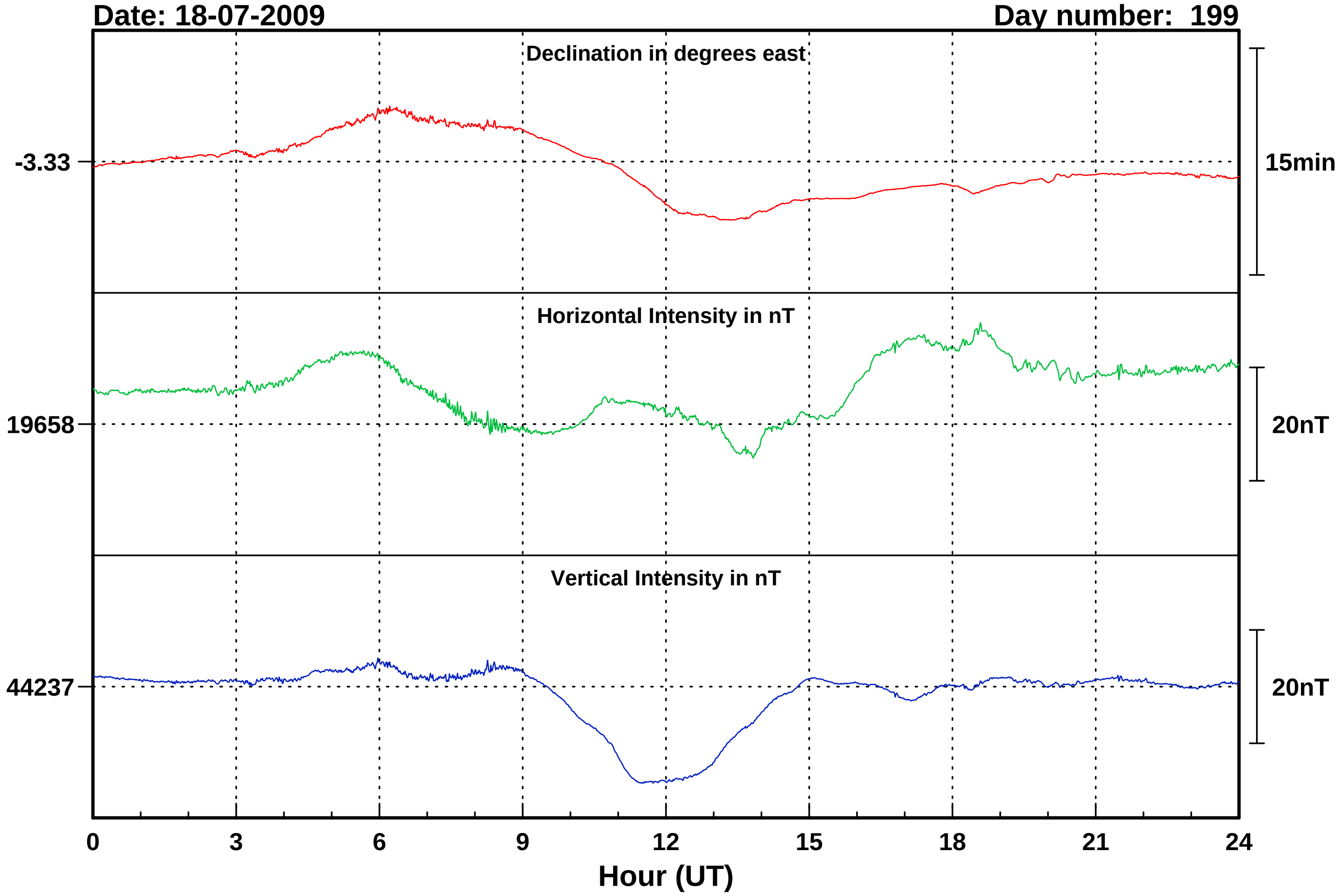


Hartland

Date: 17-07-2009 Day number: 198

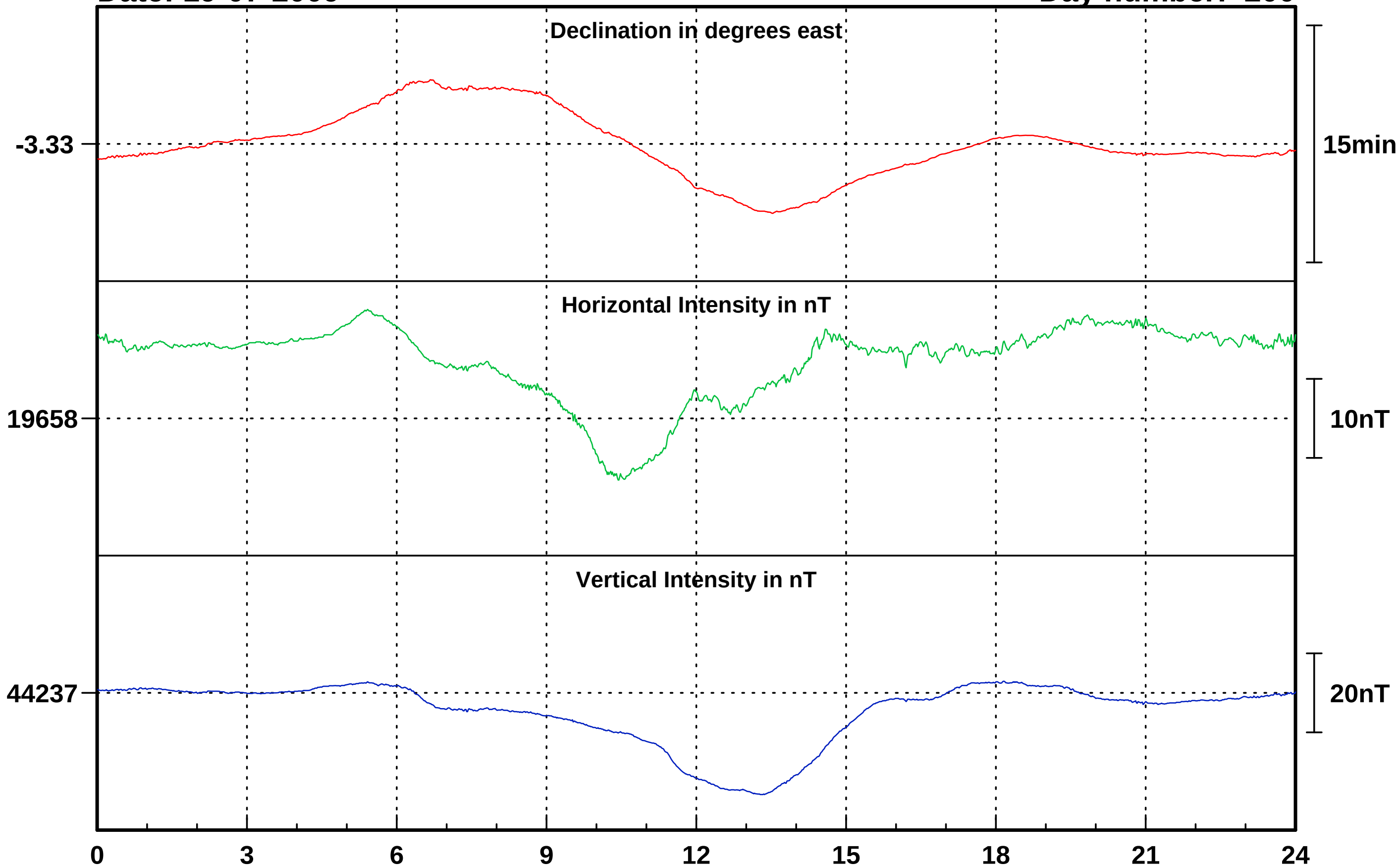


Date: 18-07-2009 Day number: 199

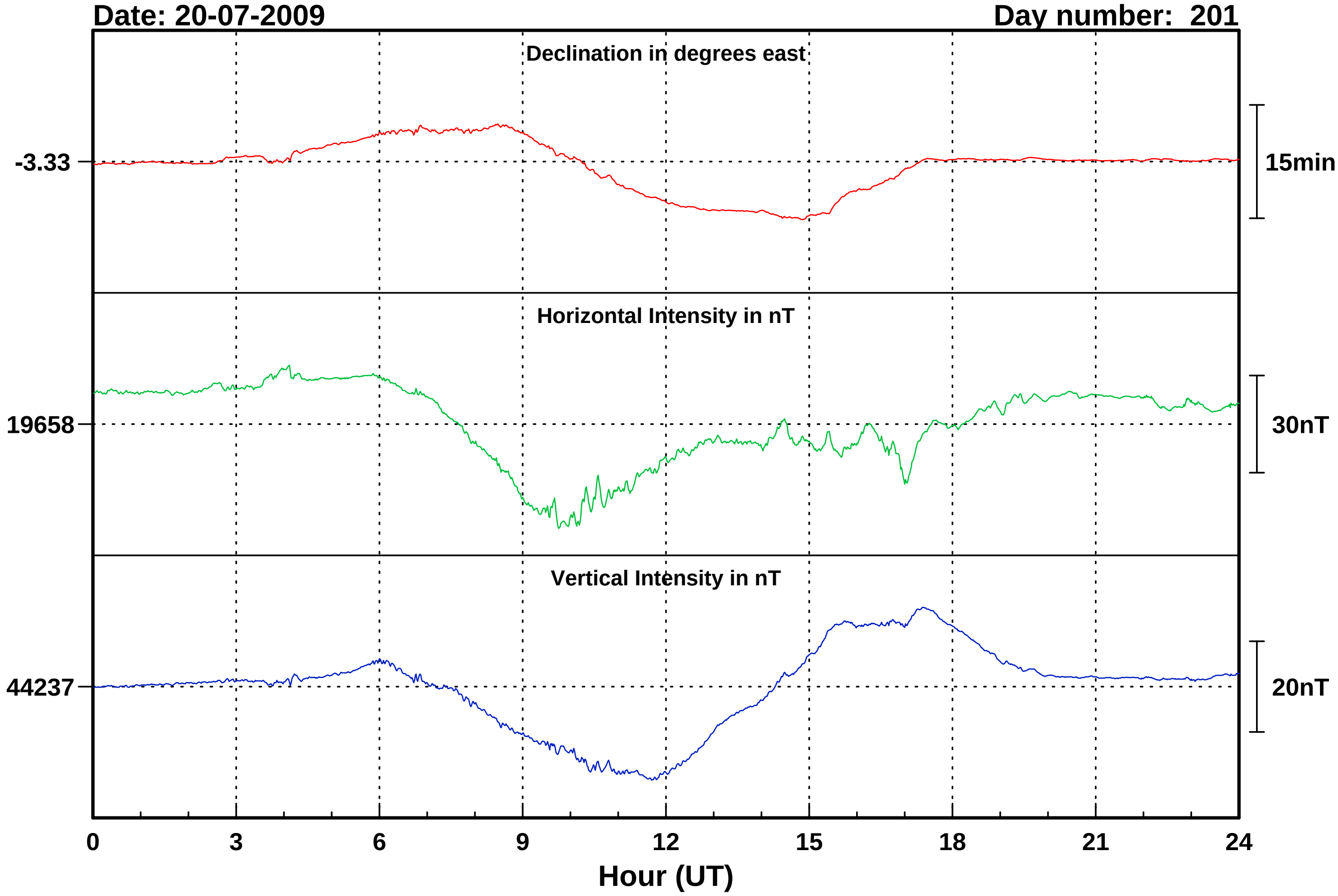


Hartland

Date: 19-07-2009 Day number: 200

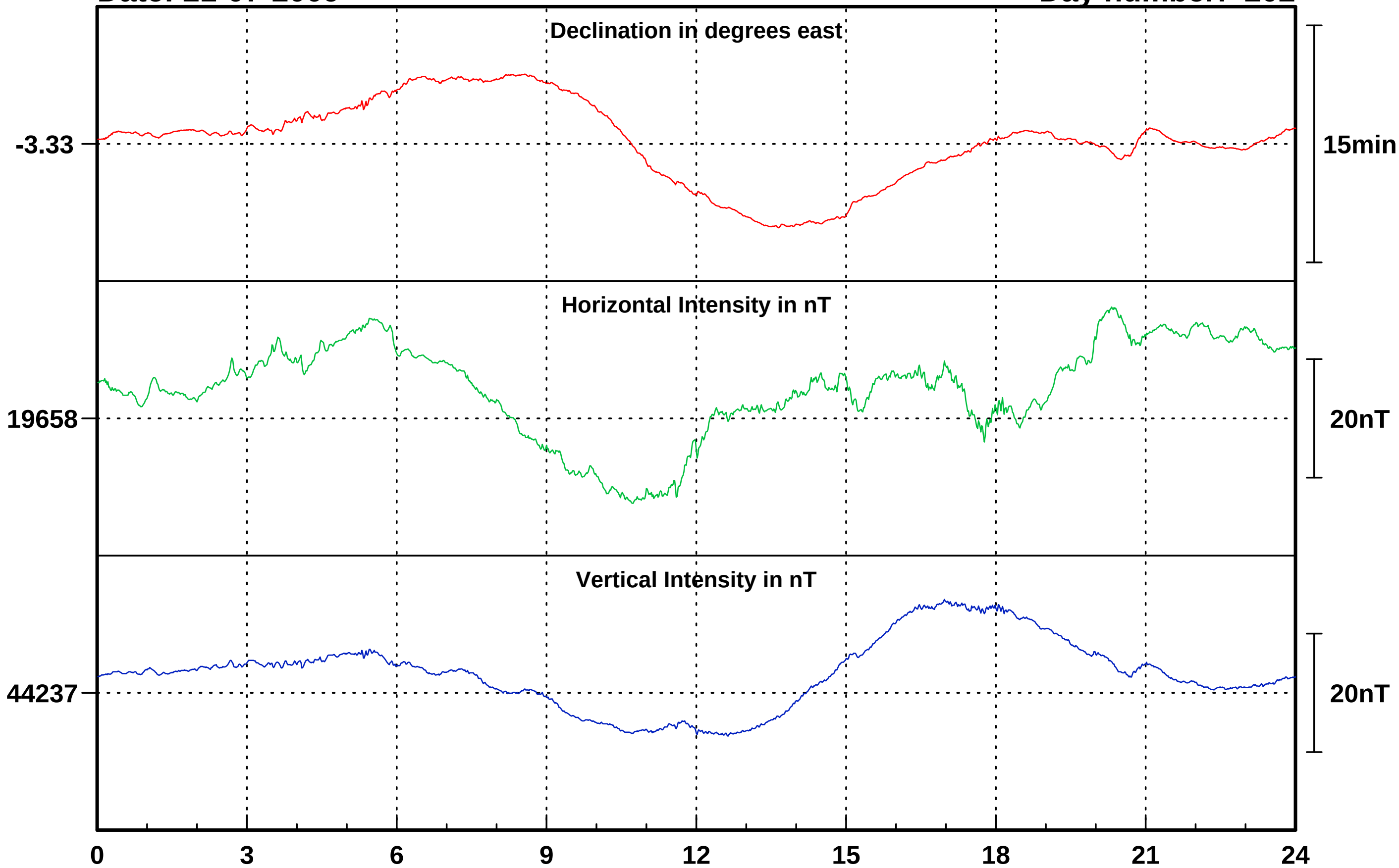


Date: 20-07-2009 Day number: 201

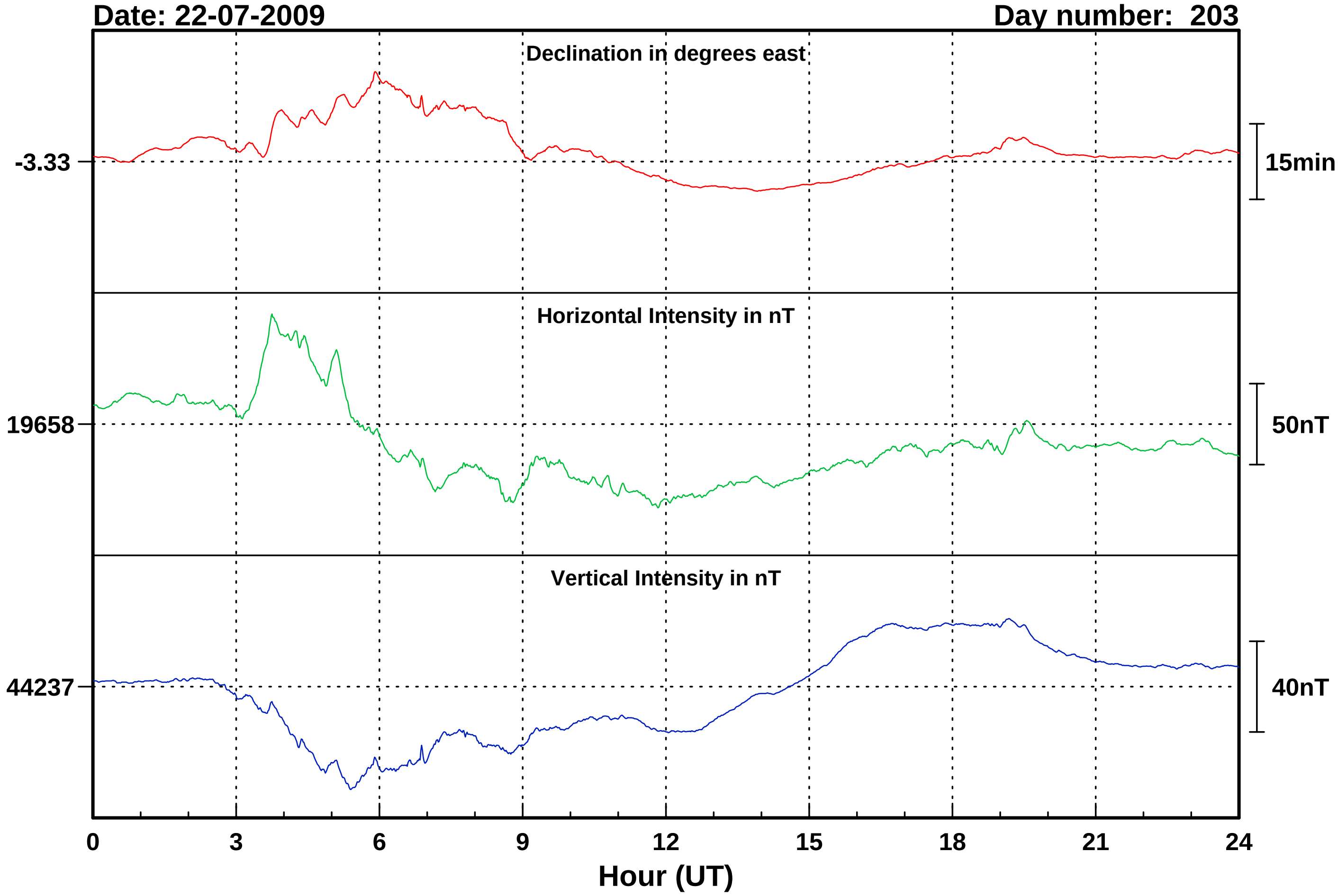


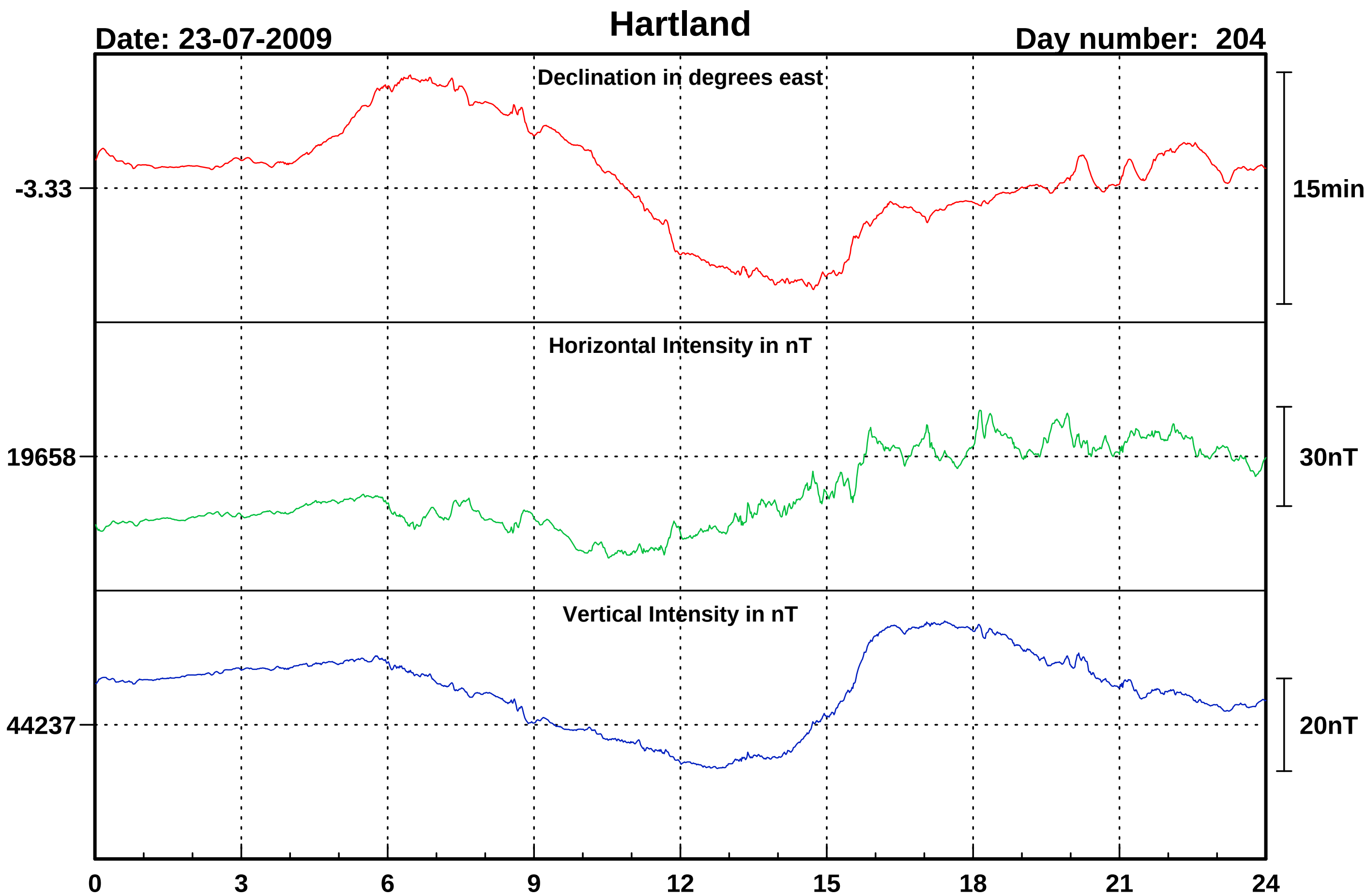
Hartland

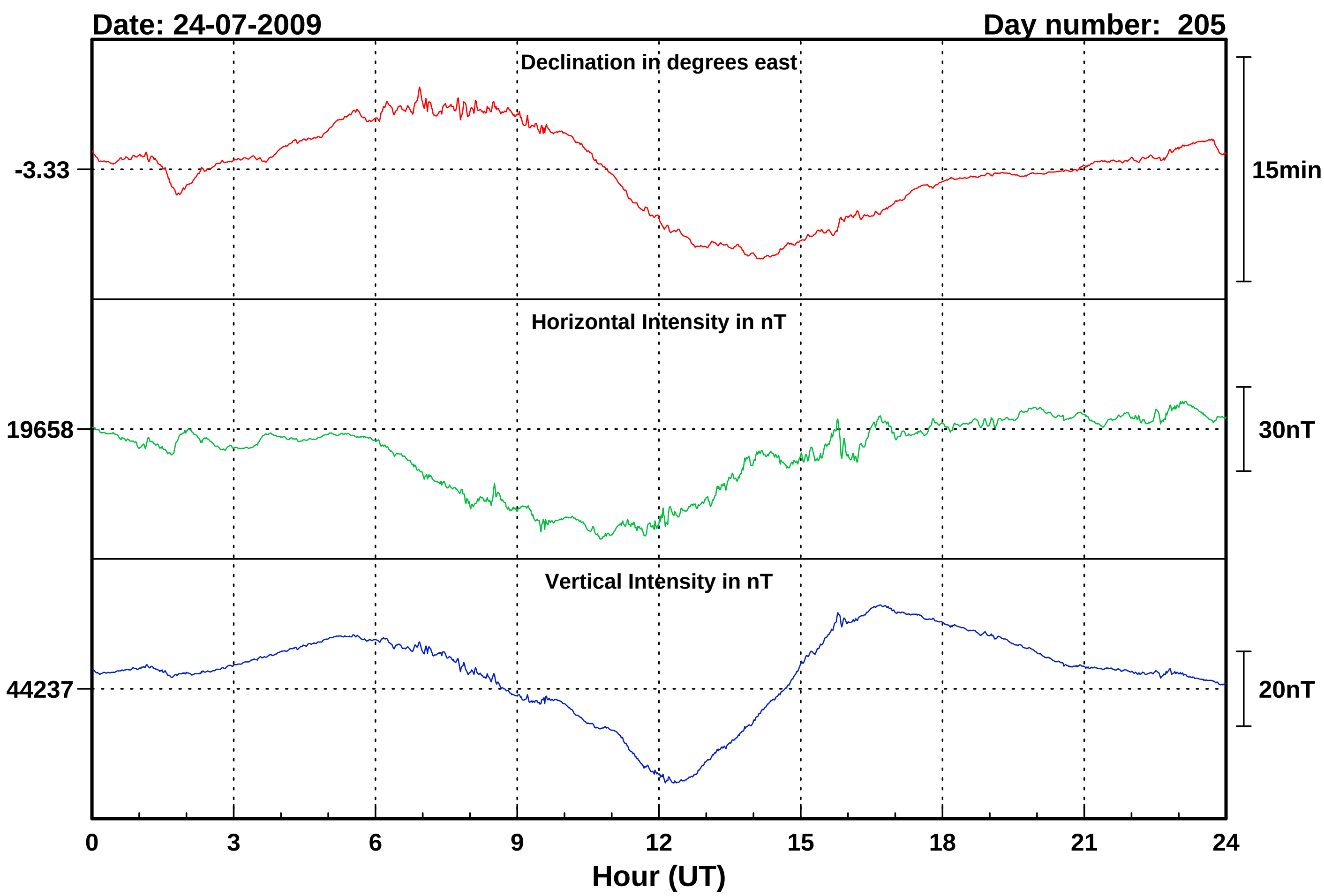
Date: 21-07-2009 Day number: 202



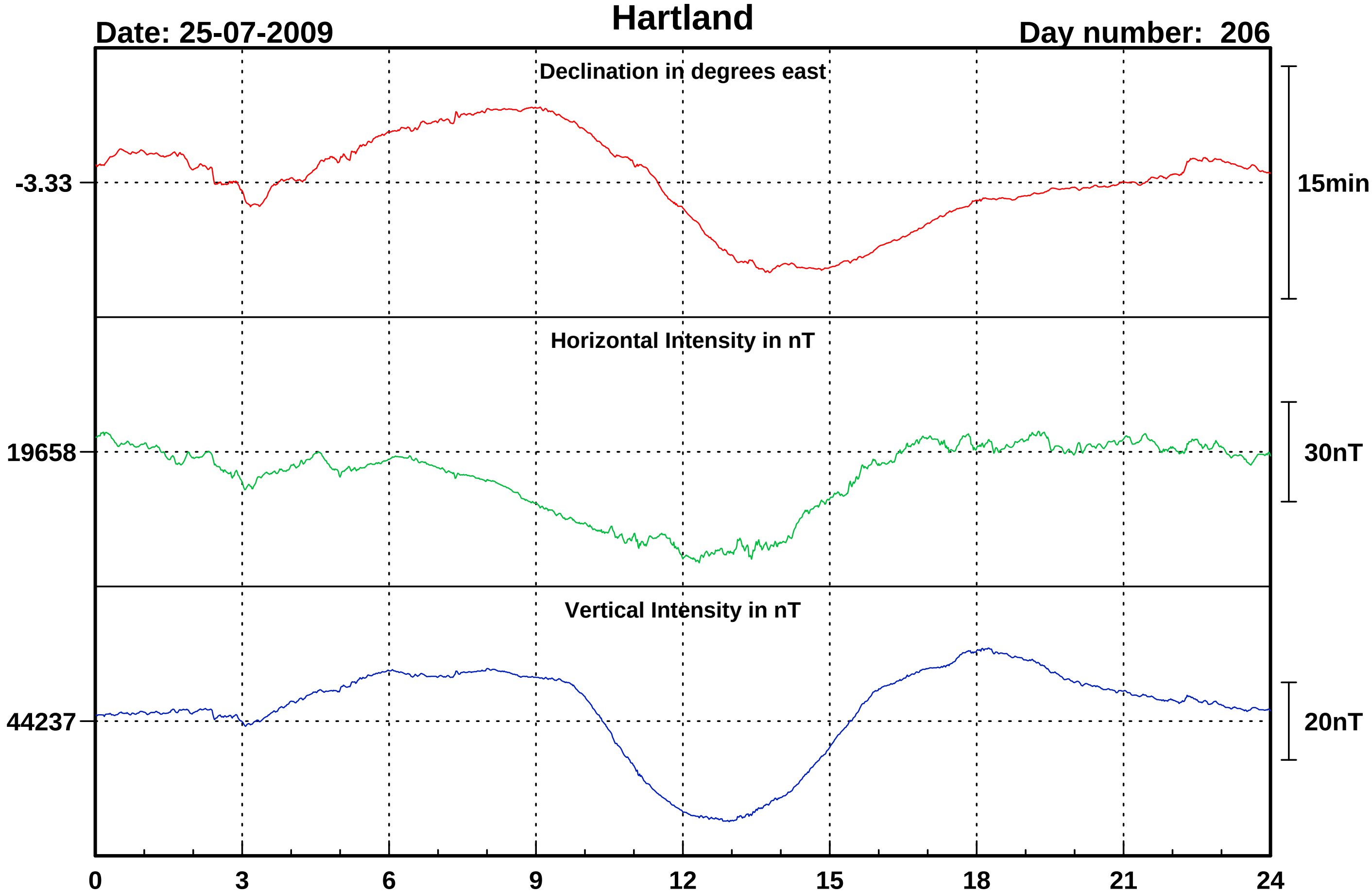
Date: 22-07-2009 Day number: 203



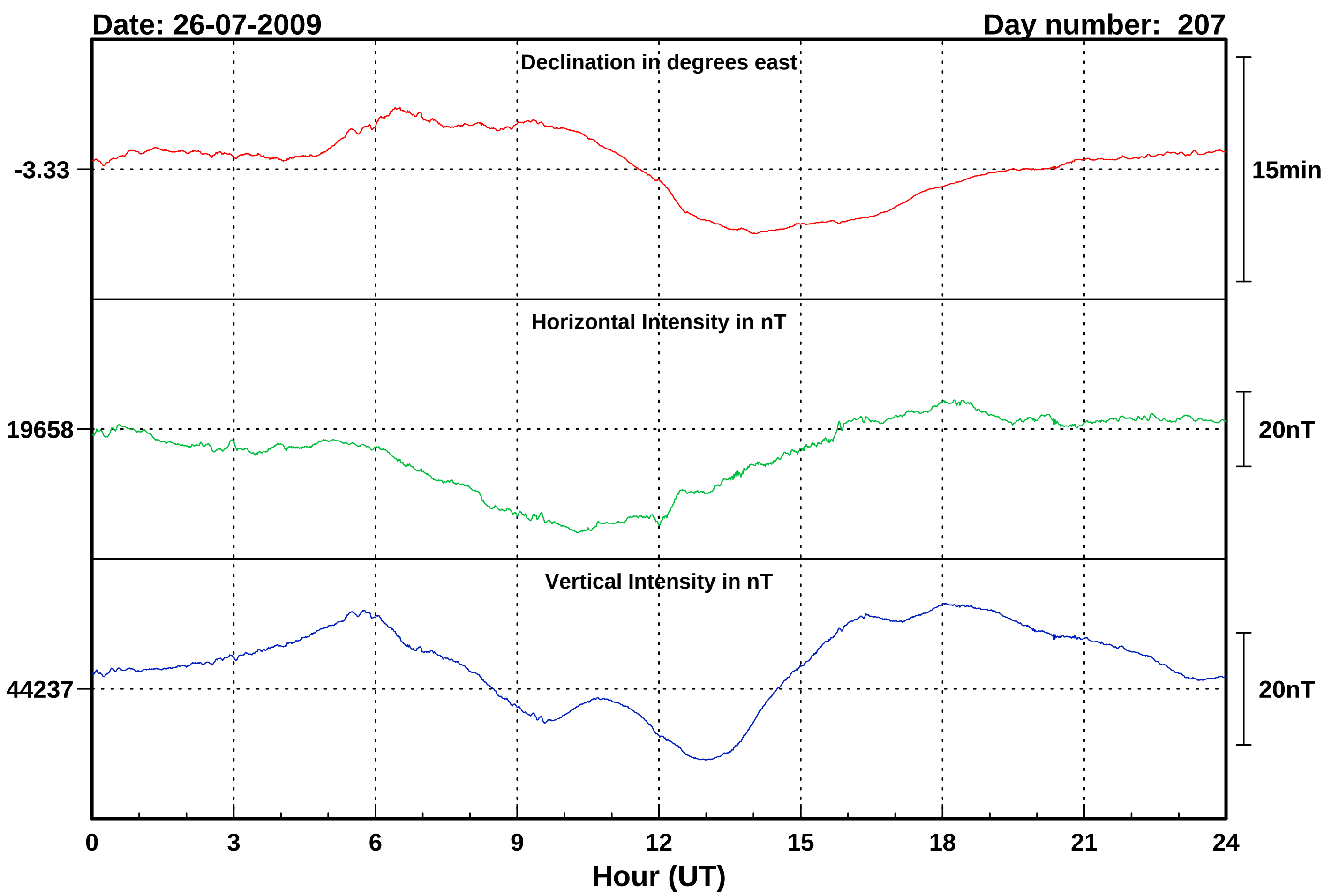

Hartland
Date: 23-07-2009
Day number: 204
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
30nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24


Date: 24-07-2009
Day number: 205
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
30nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Hartland

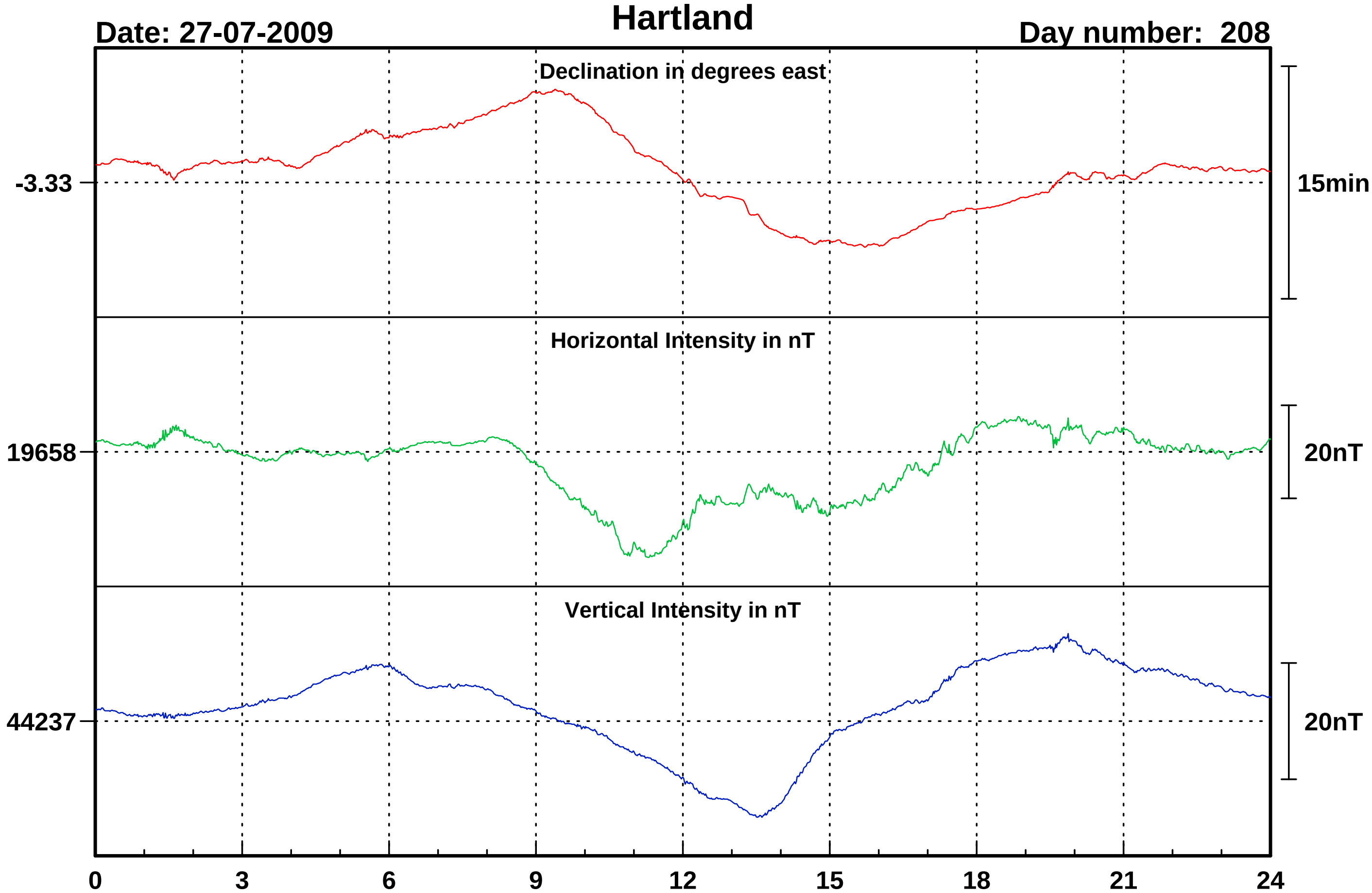


Date: 25-07-2009
Day number: 206
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
30nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24

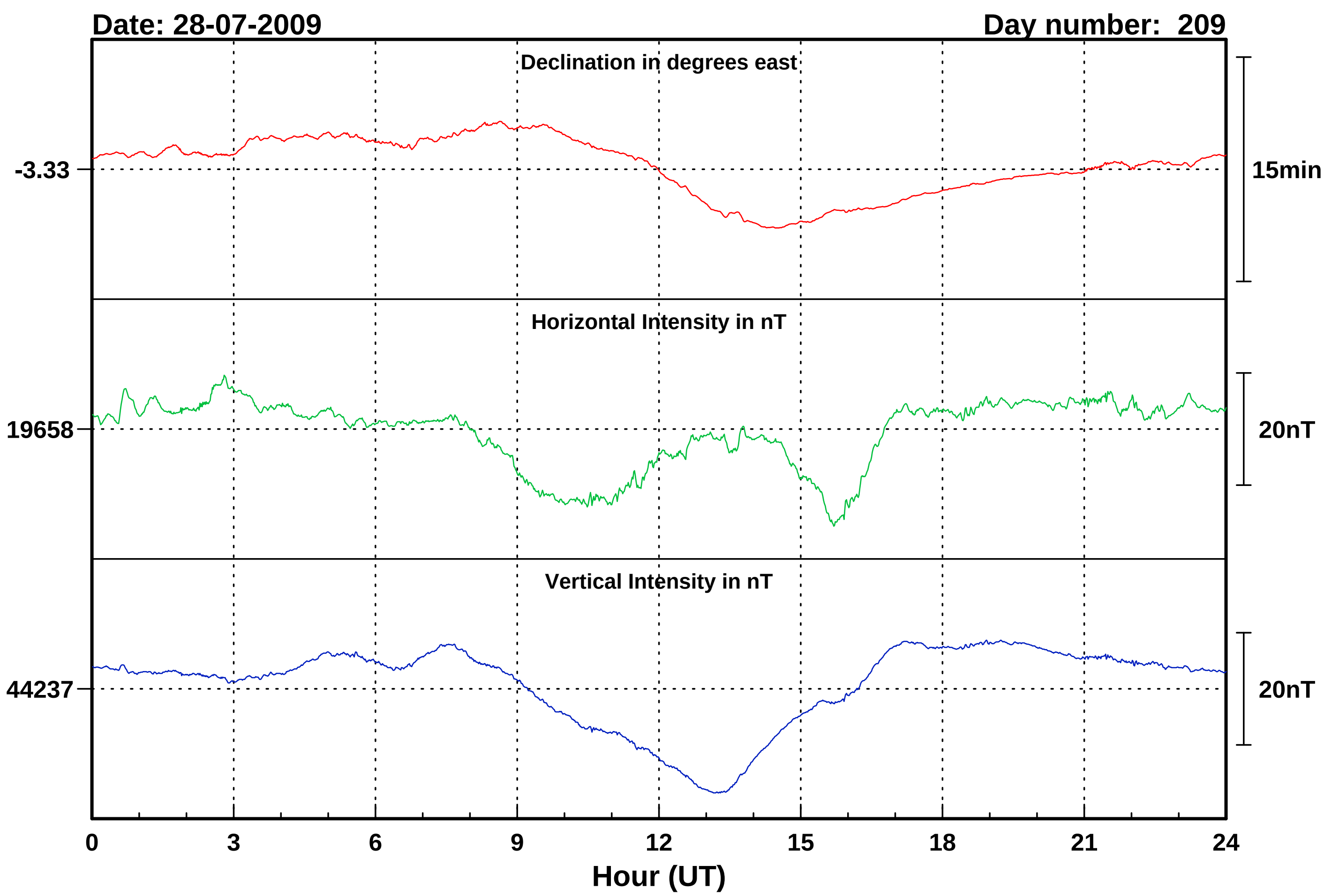


Date: 26-07-2009
Day number: 207
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Hartland

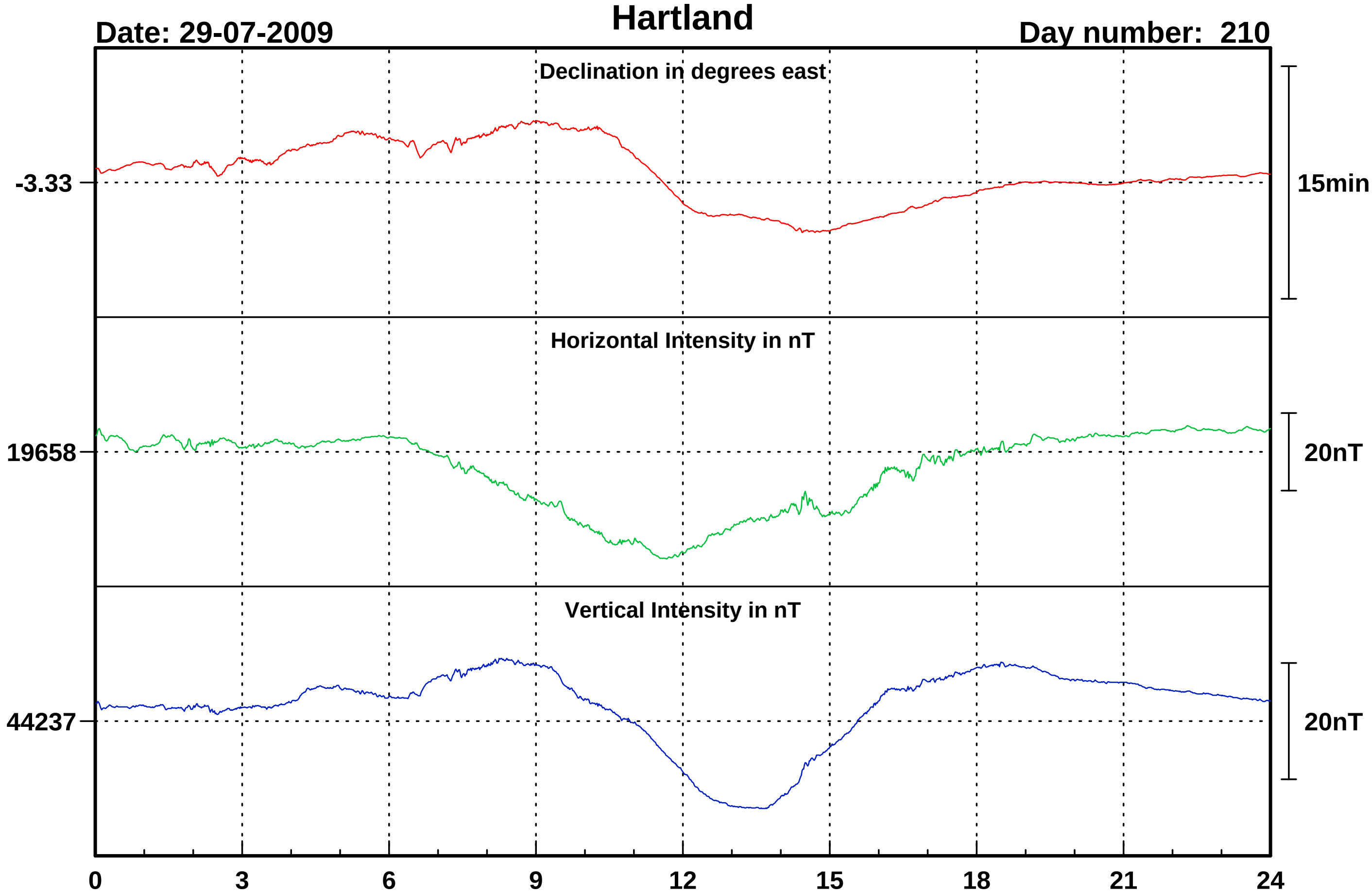


Date: 27-07-2009
Day number: 208
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24

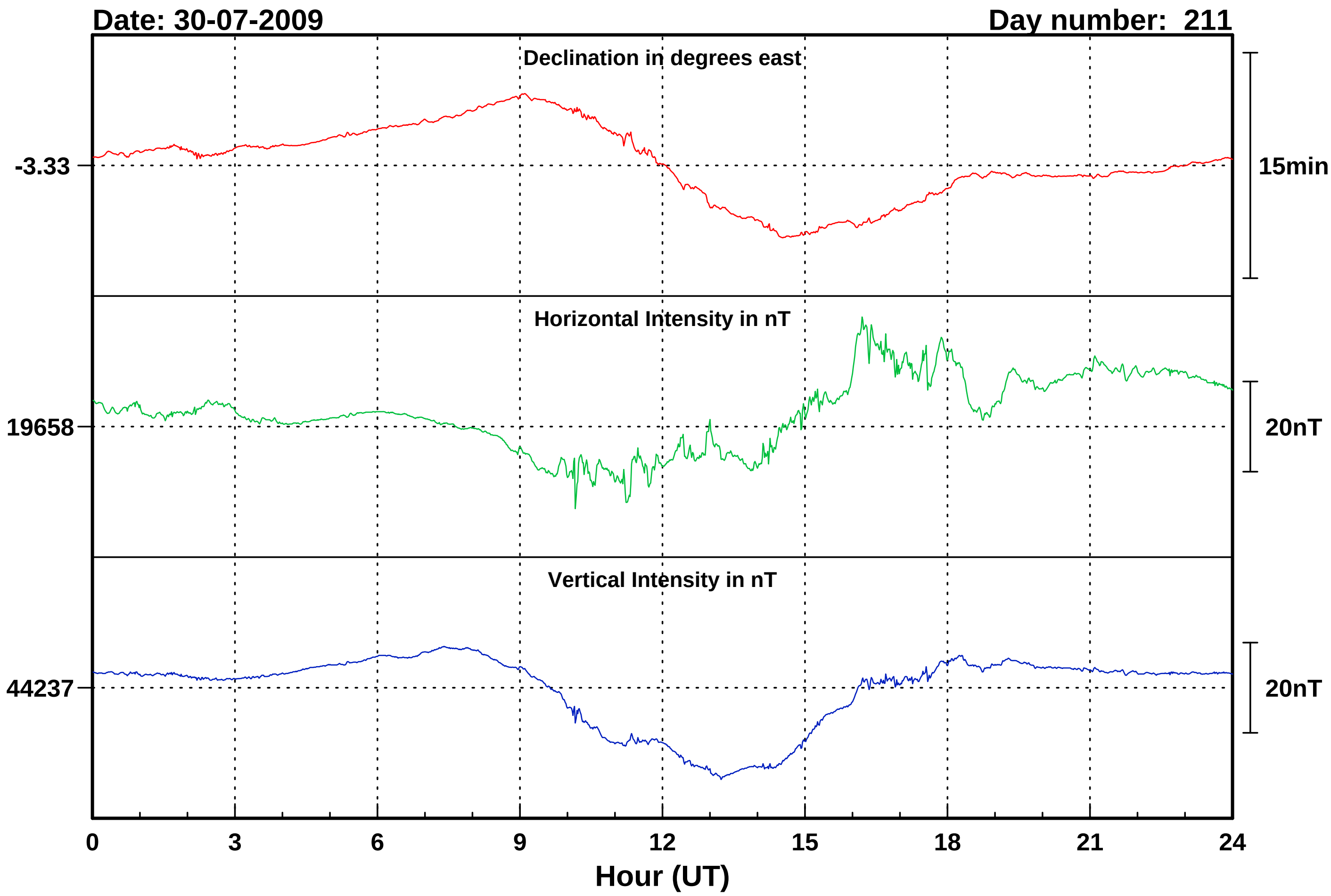


Date: 28-07-2009
Day number: 209
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)

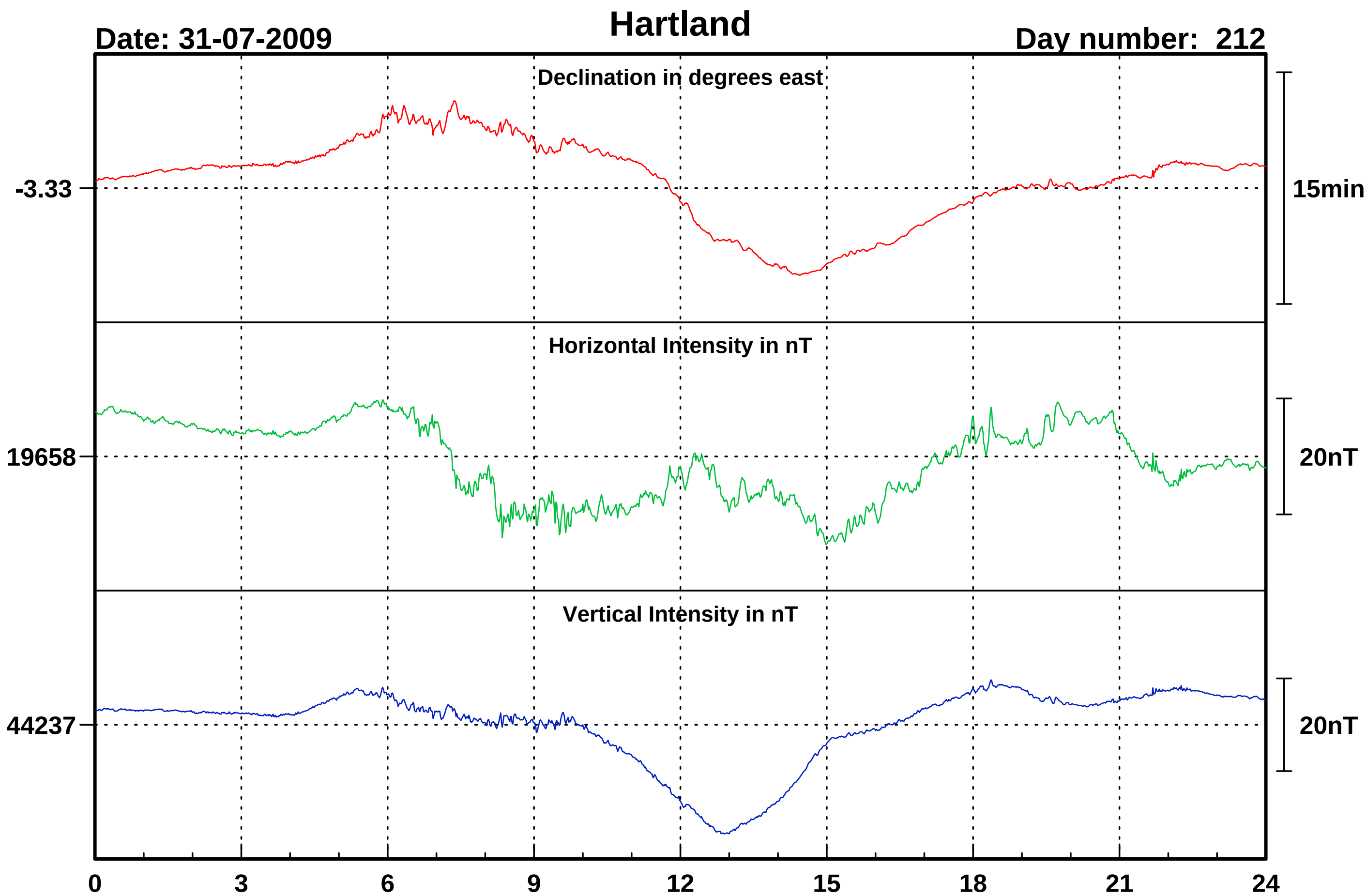
Hartland



Date: 29-07-2009
Day number: 210
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24

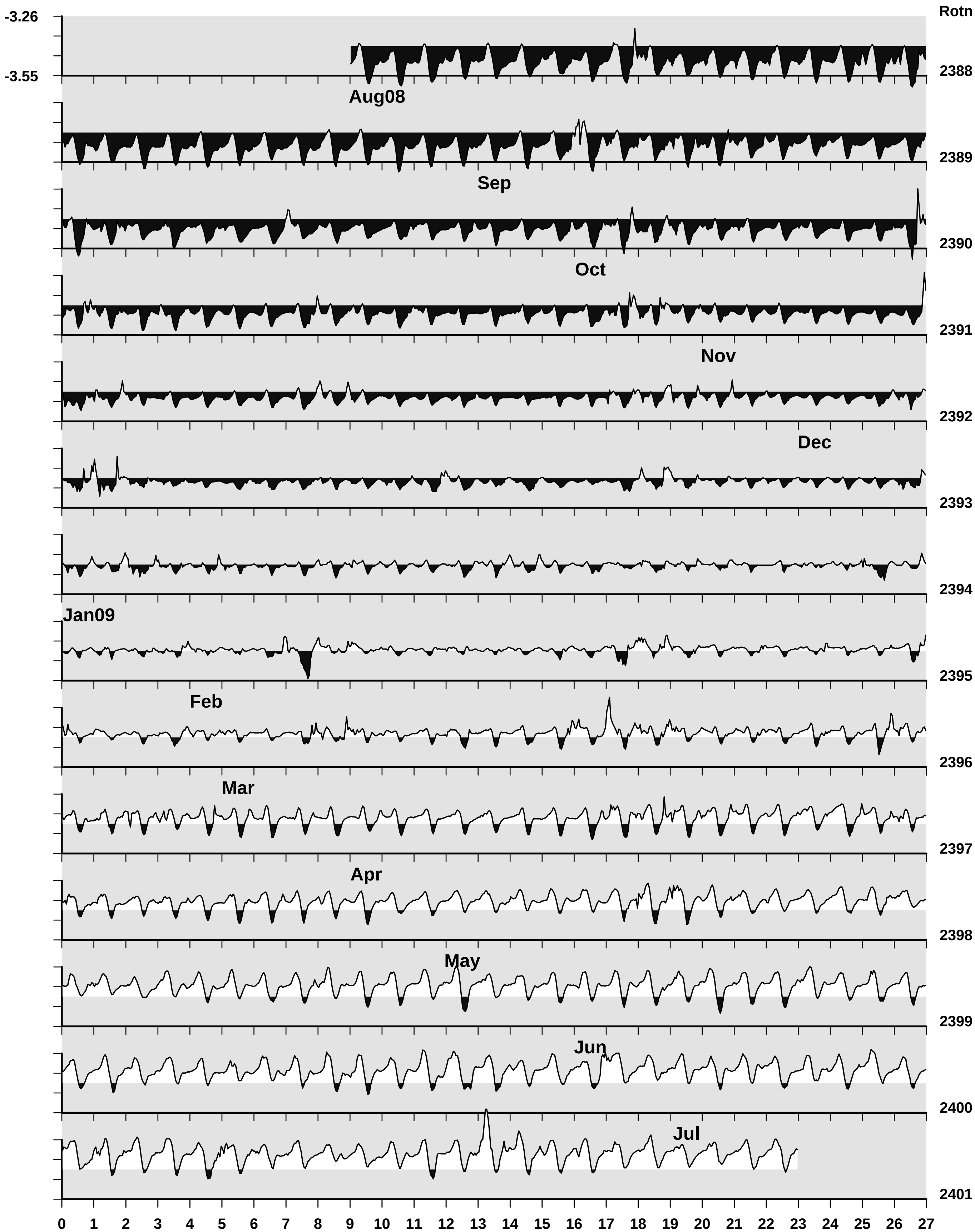


Date: 30-07-2009
Day number: 211
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24
Hour (UT)



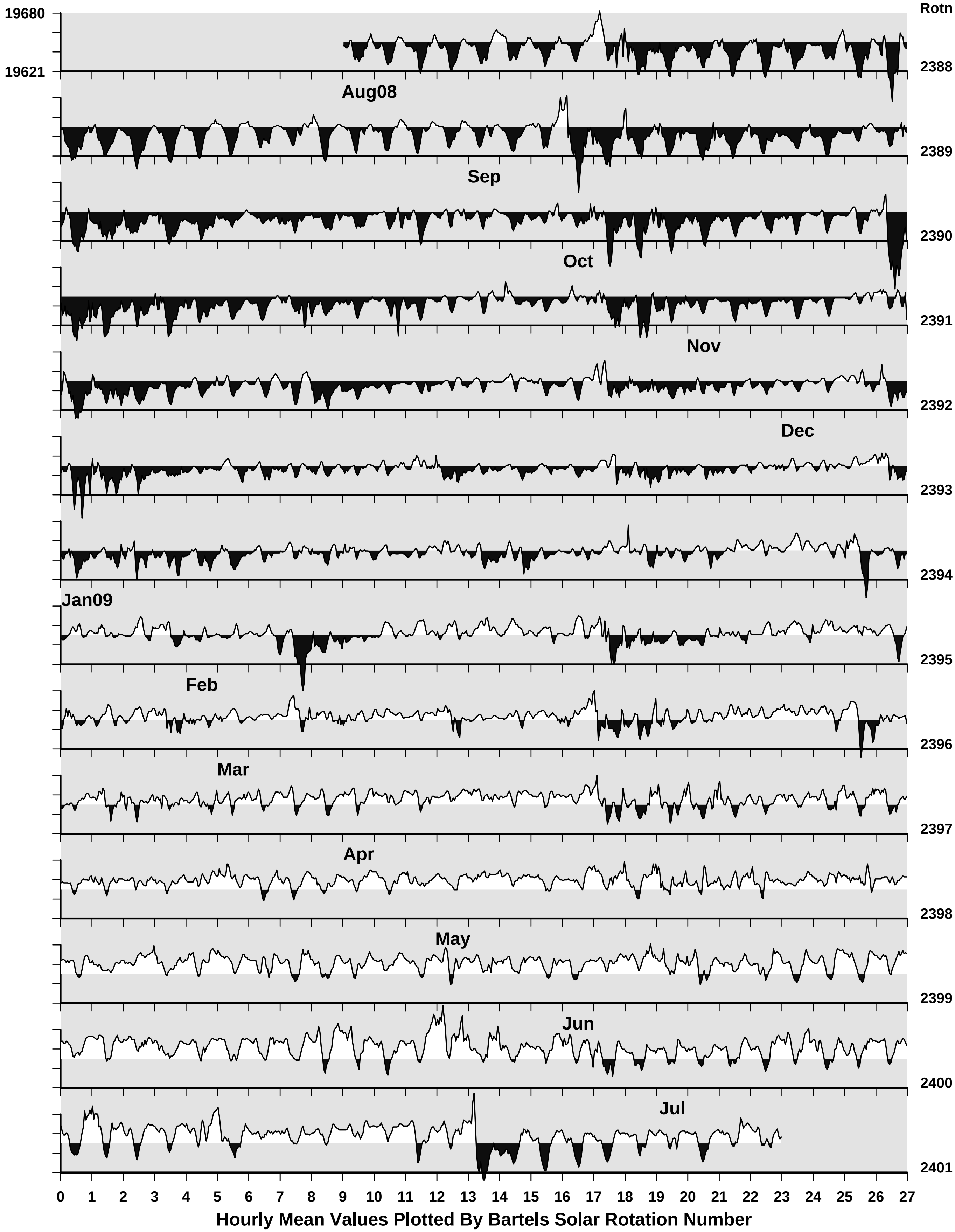
Date: 31-07-2009
Hartland
Day number: 212
Declination in degrees east
-3.33
15min
Horizontal Intensity in nT
19658
20nT
Vertical Intensity in nT
44237
20nT
0
3
6
9
12
15
18
21
24

Hartland Observatory: Declination (degrees)

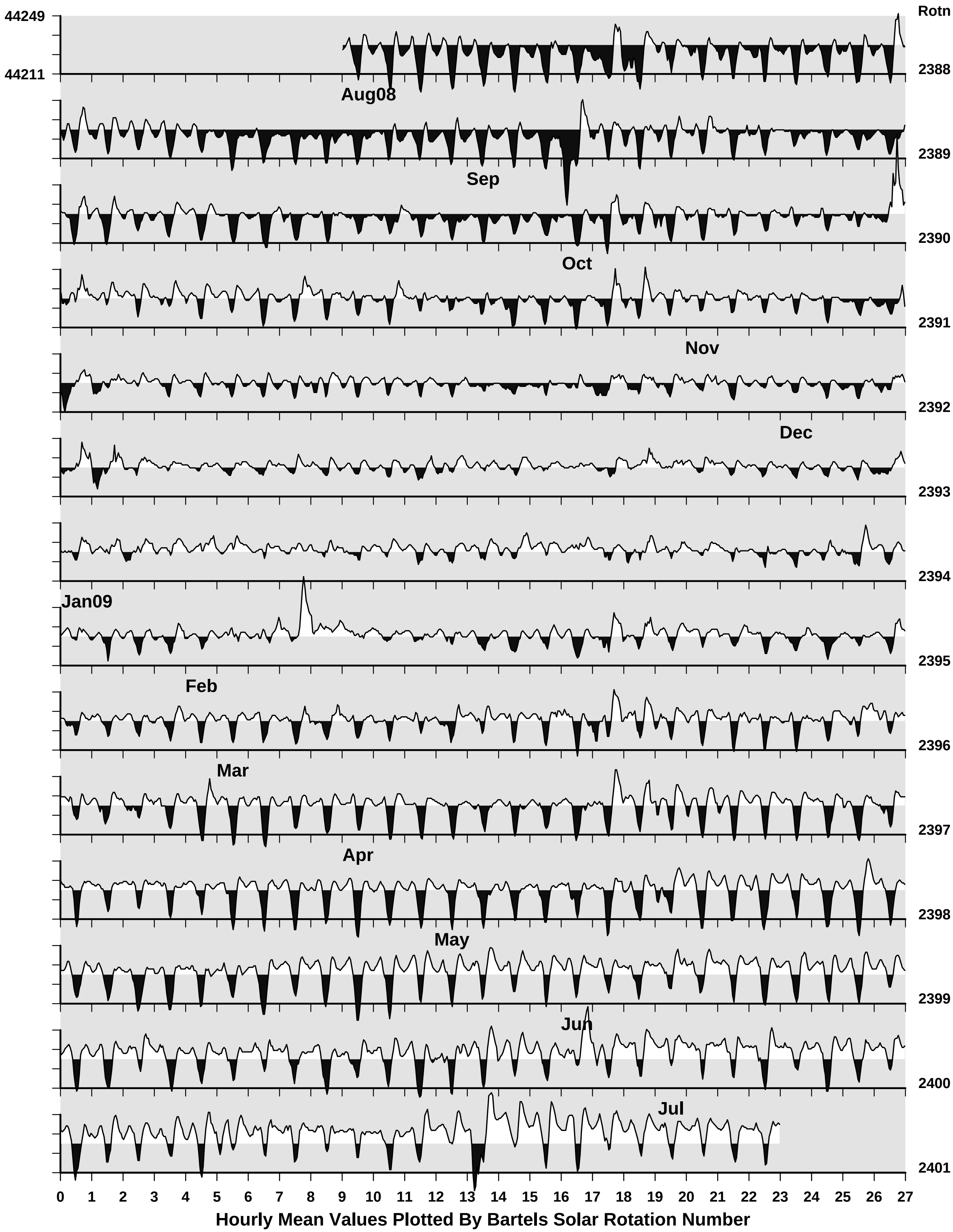


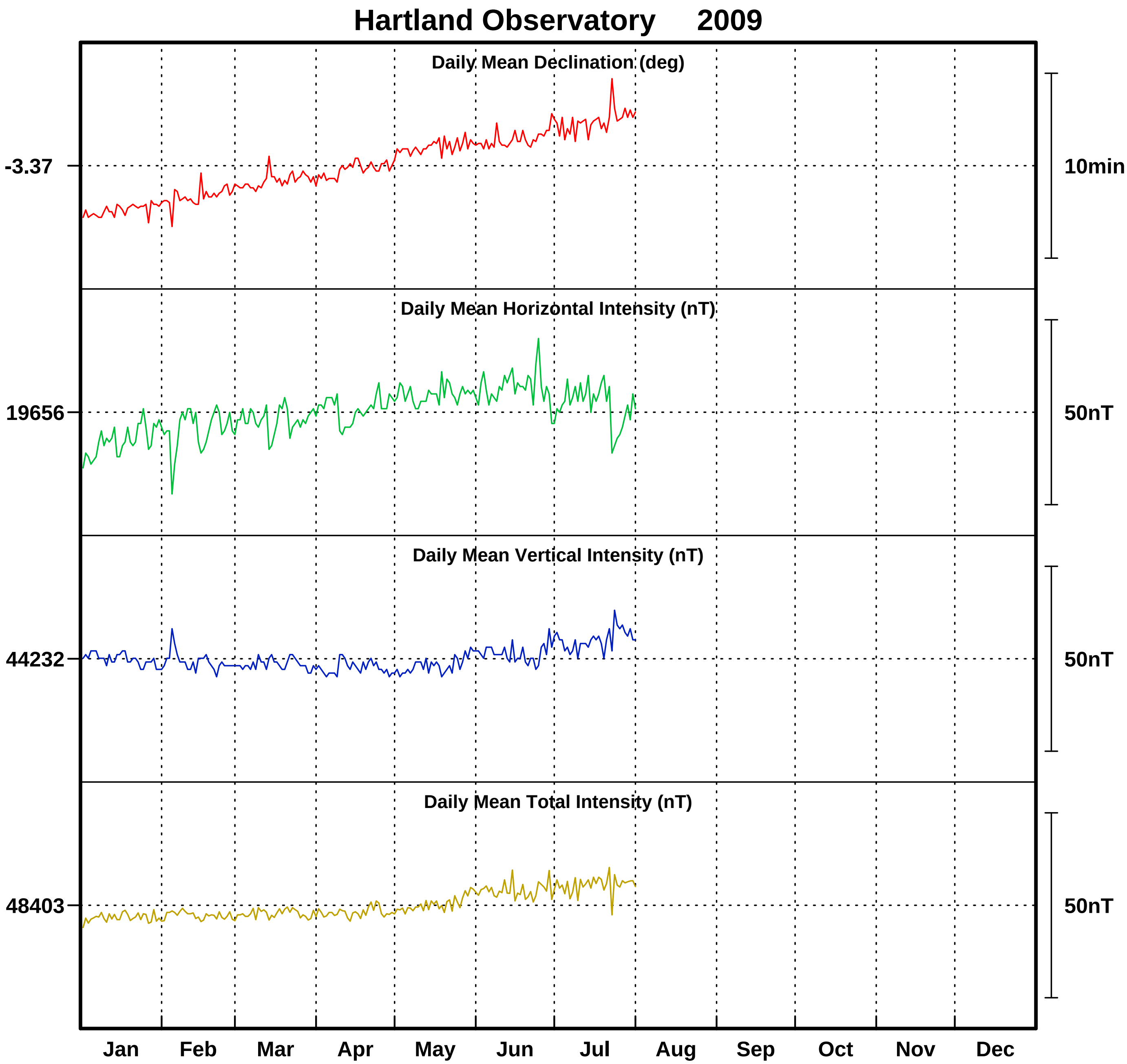
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Hartland Observatory: Horizontal Intensity (nT)



Hartland Observatory: Vertical Intensity (nT)




Hartland Observatory 2009
Daily Mean Declination (deg)
-3.37
10min
Daily Mean Horizontal Intensity (nT)
19656
50nT
Daily Mean Vertical Intensity (nT)
44232
50nT
Daily Mean Total Intensity (nT)
48403
50nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Hartland Observatory 2009

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	-3° 24.6′	19648 nT	66° 2.9′	19614 nT	-1169 nT	44232 nT	48399 nT
February	-3° 23.9′	19651 nT	66° 2.7′	19617 nT	-1165 nT	44231 nT	48400 nT
March	-3° 23.0′	19654 nT	66° 2.5′	19620 nT	-1160 nT	44230 nT	48400 nT
April	-3° 22.4′	19657 nT	66° 2.3′	19623 nT	-1157 nT	44229 nT	48401 nT
May	-3° 21.2′	19661 nT	66° 2.1′	19627 nT	-1150 nT	44230 nT	48403 nT
June	-3° 20.7′	19662 nT	66° 2.0′	19629 nT	-1147 nT	44233 nT	48407 nT
July	-3° 19.8′	19658 nT	66° 2.4′	19625 nT	-1142 nT	44237 nT	48408 nT

<u>Note</u>

i. The values shown here are provisional.

HARTLAND RAPID VARIATIONS

SIs and SSCs

Date	Time (UT)	Type	Quality	H (nT)	D (min)	Z (nT)
13-07-09	13 19	SSC*	B	5.7	-0.73	2.8

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			
NONE						

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

INDICES OF GEOMAGNETIC ACTIVITY

The K Index

Hartland Observatory July 2009

Day	K – INDICES FOR THREE-HOUR INTERVAL								SUM
	00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24	
1	1	1	1	0	1	1	0	0	5
2	1	1	1	0	1	1	1	0	6
3	0	0	1	1	1	2	1	2	8
4	1	0	1	0	0	2	1	1	6
5	2	2	1	0	1	2	2	2	12
6	1	2	1	0	1	1	1	1	8
7	0	1	1	1	1	3	2	1	10
8	1	0	1	0	1	2	1	1	7
9	2	1	1	0	0	3	3	2	12
10	2	3	2	2	2	2	1	2	16
11	1	1	2	0	1	1	0	1	7
12	0	1	1	1	1	0	0	1	5
13	1	1	1	1	3	4	3	3	17
14	3	2	2	1	2	2	1	2	15
15	1	1	1	1	1	2	1	1	9
16	1	1	1	0	0	1	0	0	4
17	0	0	0	0	0	0	0	0	0
18	0	1	1	0	1	1	1	0	5
19	0	0	0	1	1	0	0	0	2
20	0	1	1	2	1	3	1	0	9
21	1	1	0	1	1	2	2	1	9
22	3	5	5	3	1	2	3	1	23
23	1	1	1	1	2	3	2	2	13
24	2	1	2	1	1	2	1	1	11
25	2	2	0	1	1	1	1	1	9
26	1	1	1	1	1	0	1	0	6
27	1	1	0	1	1	1	1	1	7
28	1	1	1	0	1	2	0	1	7
29	1	1	1	0	1	1	0	0	5
30	1	0	0	2	2	2	2	1	10
31	0	1	2	1	1	1	1	1	8

Lower bound (nT) for the range for each index value at Hartland Observatory K-Index									
0	1	2	3	4	5	6	7	8	9
0	5	10	20	40	70	120	200	330	500

The aa Index

Date	Day	K-North	K-South	(a)	(b)	(c)	(d)	(e)
01-07-09	182	1 1 1 0 1 1 0 0	0 1 1 0 0 0 0 0	6	4	6	4	5
02-07-09	183	1 1 1 0 1 1 1 0	0 0 1 0 0 0 0 0	6	3	5	4	5
03-07-09	184	0 0 1 1 1 2 1 2	0 0 0 2 1 0 0 0	8	5	6	8	7
04-07-09	185	1 0 1 0 0 2 1 1	0 0 0 1 1 1 1 0	7	5	4	8	6
05-07-09	186	2 2 1 0 1 2 2 2	1 2 0 0 0 0 1 0	12	6	9	9	9
06-07-09	187	1 2 1 0 1 1 1 1	1 1 0 0 0 0 0 0	8	4	7	5	6
07-07-09	188	0 1 1 1 1 3 2 1	0 0 1 1 1 1 1 0	11	6	6	11	8
08-07-09	189	1 0 1 0 1 2 1 1	0 0 1 2 1 1 1 0	7	7	6	8	7
09-07-09	190	2 1 1 0 0 3 3 2	0 1 1 0 0 1 1 1	14	6	7	14	10
10-07-09	191	2 3 2 2 2 2 1 2	1 3 1 2 1 1 1 0	17	11	18	10	14
11-07-09	192	1 1 2 0 1 1 0 1	0 1 2 0 0 0 0 0	7	5	8	4	6
12-07-09	193	0 1 1 1 1 0 0 1	0 1 1 1 1 0 0 0	6	5	6	4	5
13-07-09	194	1 1 1 1 3 4 3 3	0 0 1 1 3 3 2 1	23	14	6	30	18
14-07-09	195	3 2 2 1 2 2 1 2	2 1 1 2 3 1 0 0	16	12	15	13	14
15-07-09	196	1 1 1 1 1 2 1 1	0 1 1 1 2 1 0 0	9	7	7	9	8
16-07-09	197	1 1 1 0 0 1 0 0	0 0 0 0 0 0 0 0	5	2	4	3	4
17-07-09	198	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	2	2	2	2	2
18-07-09	199	0 1 1 0 1 1 1 0	0 0 0 0 0 0 0 0	6	2	4	4	4
19-07-09	200	0 0 0 1 1 0 0 0	0 0 0 0 0 0 0 0	4	2	3	3	3
20-07-09	201	0 1 1 2 1 3 1 0	0 1 2 2 2 3 0 0	10	12	10	13	11
21-07-09	202	1 1 0 1 1 2 2 1	0 1 1 1 1 1 0 0	9	6	6	9	7
22-07-09	203	3 5 5 3 1 2 3 1	2 3 5 5 1 2 2 0	41	37	65	13	39
23-07-09	204	1 1 1 1 2 3 2 2	1 1 2 2 2 2 1 1	14	12	10	16	13
24-07-09	205	2 1 2 1 1 2 1 1	1 0 1 1 1 2 1 1	11	8	9	10	10
25-07-09	206	2 2 0 1 1 1 1 1	1 1 0 1 2 0 0 0	9	6	9	7	8
26-07-09	207	1 1 1 1 1 0 1 0	1 0 0 0 1 0 0 0	6	4	6	4	5
27-07-09	208	1 1 0 1 1 1 1 1	0 0 0 1 1 1 2 1	7	7	5	9	7
28-07-09	209	1 1 1 0 1 2 0 1	0 1 1 2 0 0 0 0	7	6	8	5	6
29-07-09	210	1 1 1 0 1 1 0 0	0 0 0 1 0 0 0 0	6	3	5	4	4
30-07-09	211	1 0 0 2 2 2 2 1	0 0 0 2 0 2 1 0	10	7	7	11	9
31-07-09	212	0 1 2 1 1 1 1 1	0 0 2 2 2 2 1 1	8	11	9	10	9
Monthly mean value =			8.7					

(a) The northern daily mean value, Aa_n
(b) The southern daily mean value, Aa_s
(c) The mean value of aa for the interval 00-12 UT
(d) The mean value of aa for the interval 12-24 UT
(e) The daily mean value of aa (Aa)

Notes

i. The values are rounded to the nearest integer.
ii. The units of the aa index are nT.
iii. The values shown here are provisional. The definitive values are computed and published by the International Service for Geomagnetic Indices, Paris