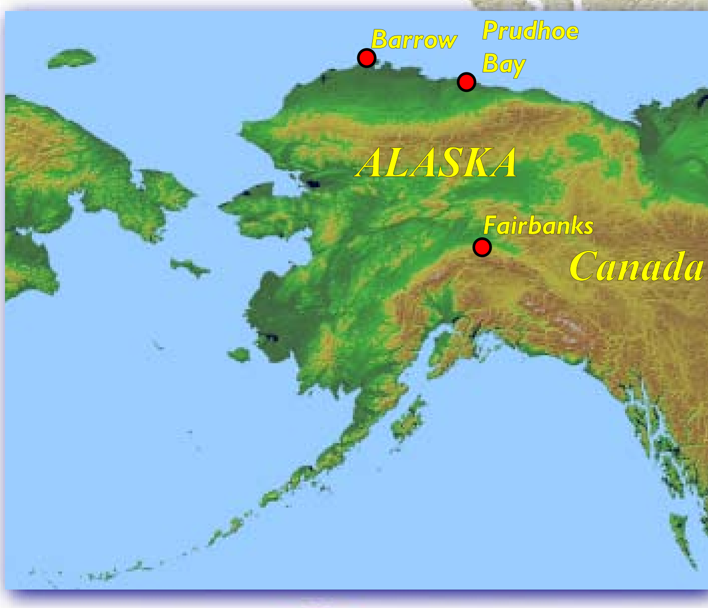
BRITISH GEOLOGICAL SURVEY

Jim Carrigan Observatory Prudhoe Bay Monthly Magnetic Bulletin

July 2014

14/07/JC



British
Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

JIM CARRIGAN OBSERVATORY MAGNETIC DATA

1. Introduction

Jim Carrigan observatory is the fourth overseas geomagnetic observatory established by the British Geological Survey (BGS). The installation was a joint venture between BGS and Sperry Drilling Services (SDS), Halliburton in support of directional drilling programmes. SDS operated a prototype station since 1997, which was upgraded by the BGS to a standard high-quality observatory in October 2003.

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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British Geological Survey
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Fax: +44 (0) 131 668 2683
E-mail: enquiries@bgs.ac.uk
Internet: www.geomag.bgs.ac.uk

2. Position

Jim Carrigan Observatory is situated at T-Pad, a man-made gravel bed close to the drilling sites at Prudhoe Bay, Alaska, USA. The observatory co-ordinates are:-

Geographic: *70° 21'22"N* *211° 12'04" E*
Geomagnetic: *70° 21' 18"N* *256° 12' 18" E*
Height above mean sea level: *10m (approx)*

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 11th generation International Geomagnetic Reference Field (IGRF) at epoch 2014.5. 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 fully operational from October 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 0.05Hz.

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 13-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 month. A fluxgate sensor mounted on a theodolite is used to determine *D* and inclination (*I*); the GDAS PPM measurements, with a site difference correction applied, are used for *F*. The absolute observations are used in conjunction with the GDAS variometer measurements to produce a continuous record of the absolute values of the geomagnetic field elements as if they had been measured at the observatory reference pillar.

4. Observatory Results

The data presented in the bulletin are in the form of plots and tabulations described in the following sections.

4.1 Absolute Observations

The absolute observation measurements made during the month are tabulated. Also included are the corresponding baseline values, which are the differences between the absolute measurements and the variometer measurements of *D*, *H* and *Z* (in the sense absolute–variometer). These are also plotted (markers) along with the derived preliminary daily baseline values (line) throughout the year. Daily mean differences between the measured absolute *F* and the *F* computed from the baseline corrected *H* and *Z* values are plotted in the fourth panel (in the sense measured–derived). The bottom panel shows the daily mean temperature in the fluxgate chamber.

4.2 Summary magnetograms

Small-scale magnetograms are plotted which allow the month's data to be viewed at a glance. They are plotted 16 days to a page and show the one-minute variations in *D*, *H* and Z. The scales are shown on the right-hand side of the page. On disturbed days the scales are multiplied by a factor, which is indicated above the panel for that day. The variations are centred on the monthly mean value, shown on the left side of the page.

4.3 Magnetograms

The daily magnetograms are plotted using one-minute values of *D*, *H* and *Z* from the fluxgate sensors, with any gaps filled using back-up data. The magnetograms are plotted to a variable scale; scale bars are shown to the right of each plot. The absolute level (the monthly mean value) is indicated on the left side of the plots.

4.4 Hourly Mean Value Plots

Hourly mean values of *D*, *H* and *Z* for the past 12 months are plotted in 27-day segments corresponding to the Bartels solar rotation number. Magnetic disturbances associated with active regions and/or coronal holes on the Sun may recur after 27 days: the same is true for geomagnetically quiet intervals. Plotting the data in this way highlights this recurrence. Diurnal variations are also clear in these plots and the amplitude changes throughout the year highlight the seasonal changes. Longer term secular variation is also illustrated.

4.5 Daily and Monthly Mean Values

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

5. Conditions of Use

The data presented in this bulletin are provided for personal, academic, educational, non-commercial research or other non-commercial use and are not for sale or distribution to third parties without written permission from BGS.

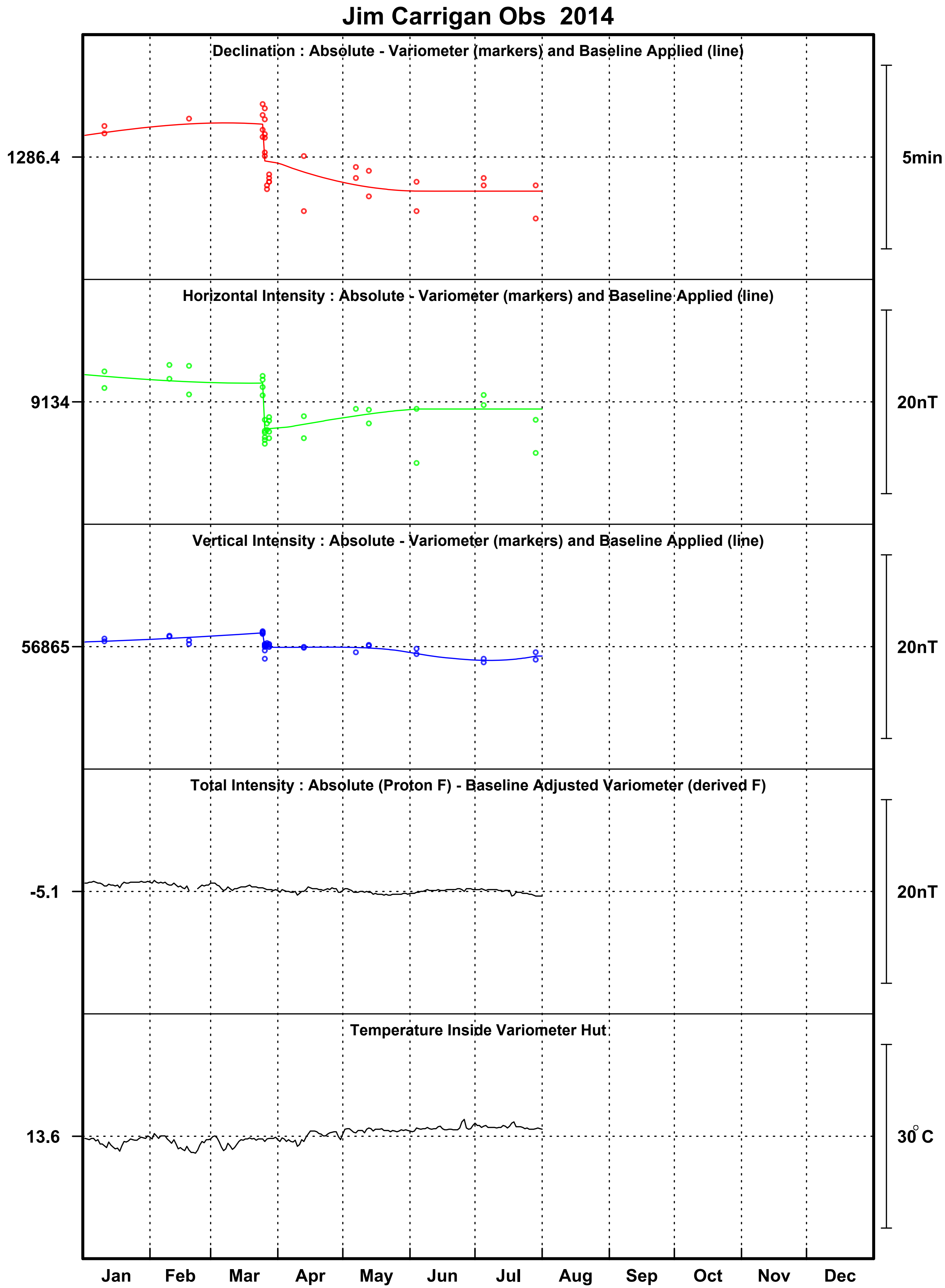
Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: ‘The results presented in this paper rely on the data collected at Jim Carrigan magnetic observatory, operated by Sperry Drilling Services, Halliburton and the British Geological Survey with support from BP.’

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

JIM CARRIGAN OBSERVATORY

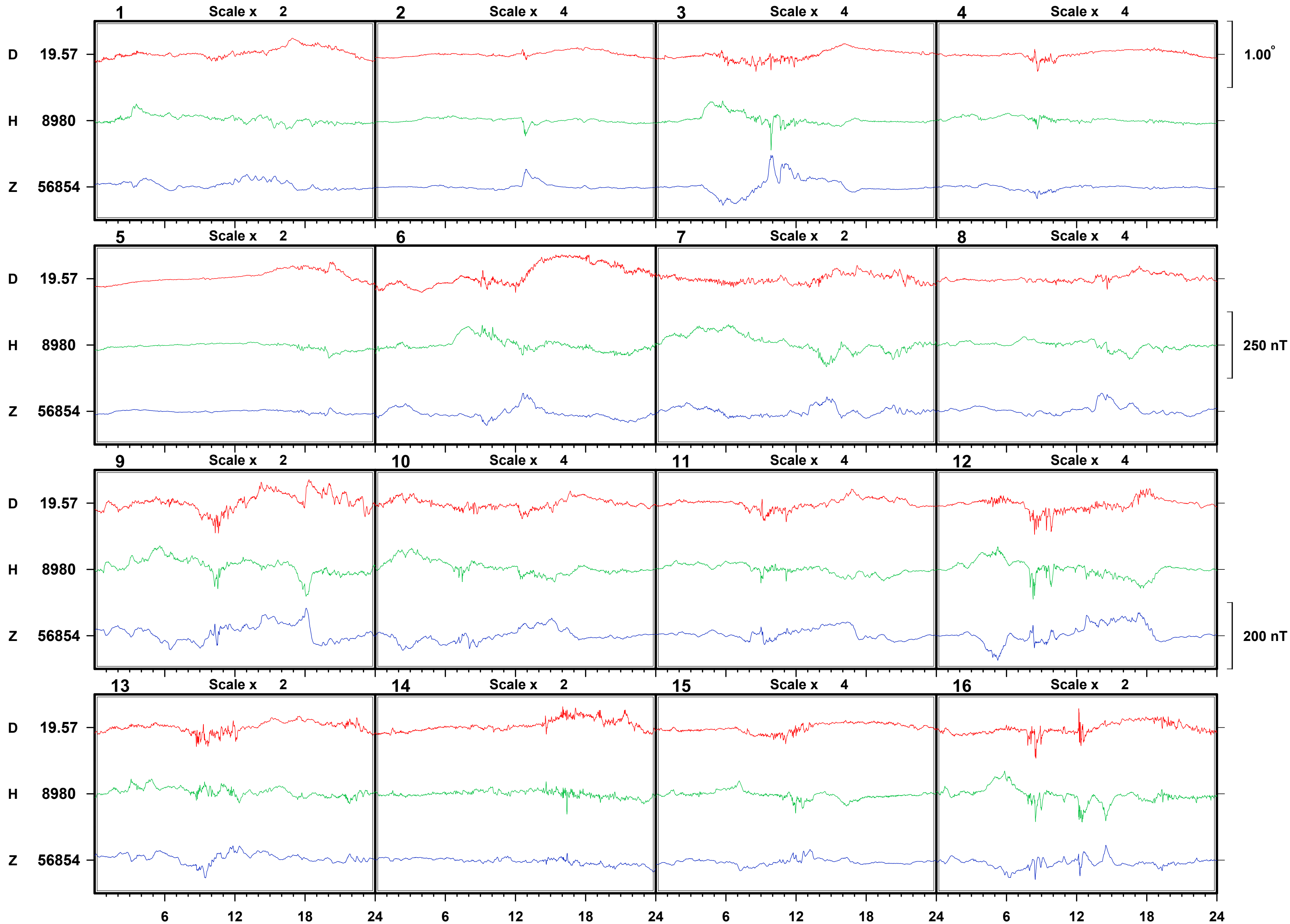
ABSOLUTE OBSERVATIONS

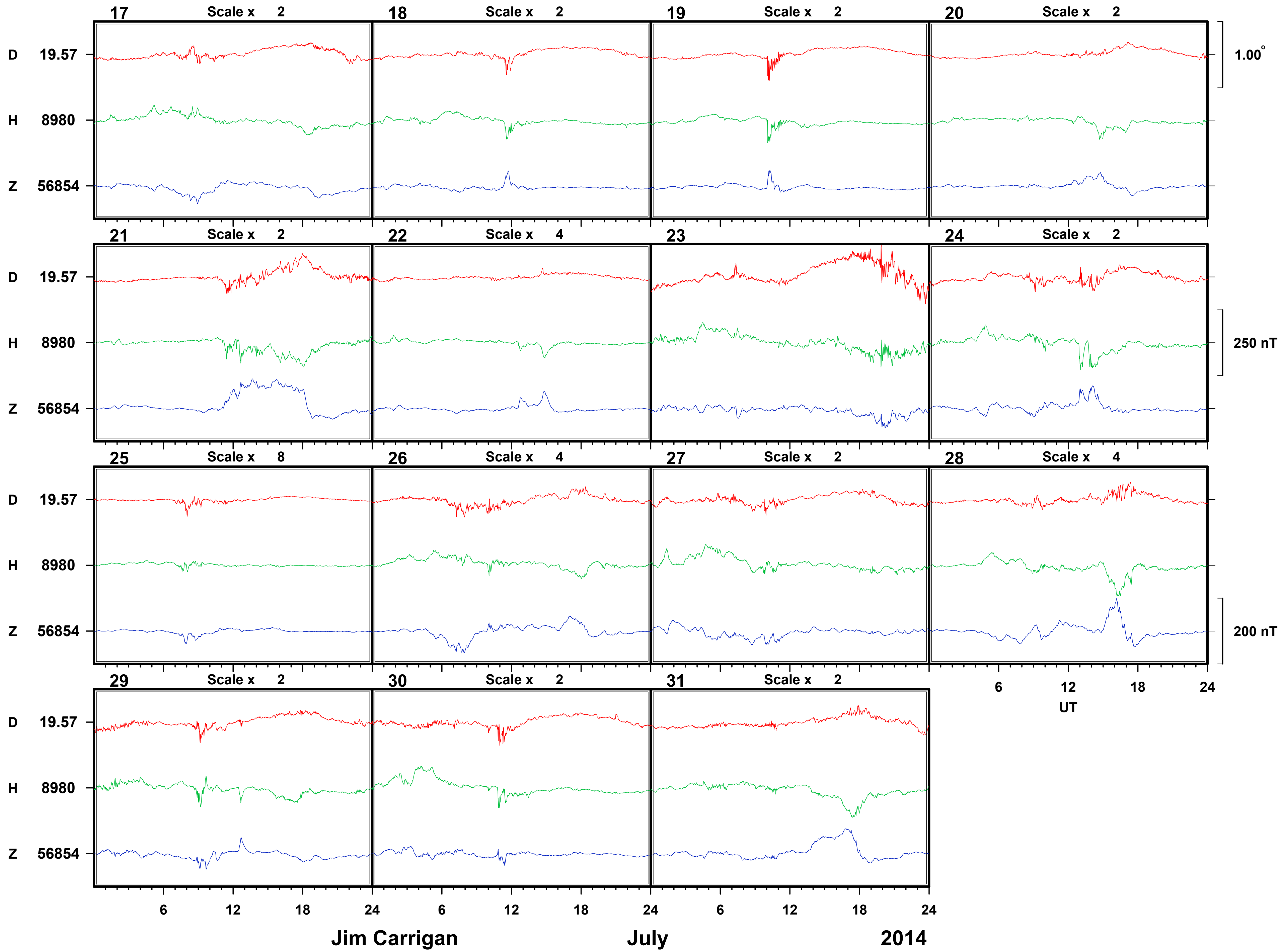
		Declination			Inclination		Total Field		Horizontal Intensity		Vertical Intensity		
Date	**Day Number**	**Time (UT)**	**Absolute (º)**	**Baseline (º)**	**Time (UT)**	**Absolute (º)**	**Site difference (nT)**	**Absolute corrected (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Observer**
04-Jul-14	185	19:04	19.8478	19.8283	19:13	81.0237	5.1	57541.9	8978.0	9006.4	56837.2	56863.9	KF
04-Jul-14	185	19:22	19.7829	19.8250	19:31	81.0288	5.1	57541.3	8972.9	9005.3	56837.4	56863.5	KF
28-Jul-14	209	18:44	19.9443	19.8250	18:55	81.0641	5.1	57505.9	8932.4	9003.7	56807.9	56863.8	JC
28-Jul-14	209	19:19	19.7523	19.8100	19:38	81.0527	5.1	57503.1	8943.2	9000.1	56803.4	56864.6	ST



Jim Carrigan Obs 2014
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
1286.4
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
9134
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
56865
20nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
-5.1
20nT
Temperature Inside Variometer Hut
13.6
30°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Jim Carrigan July 2014

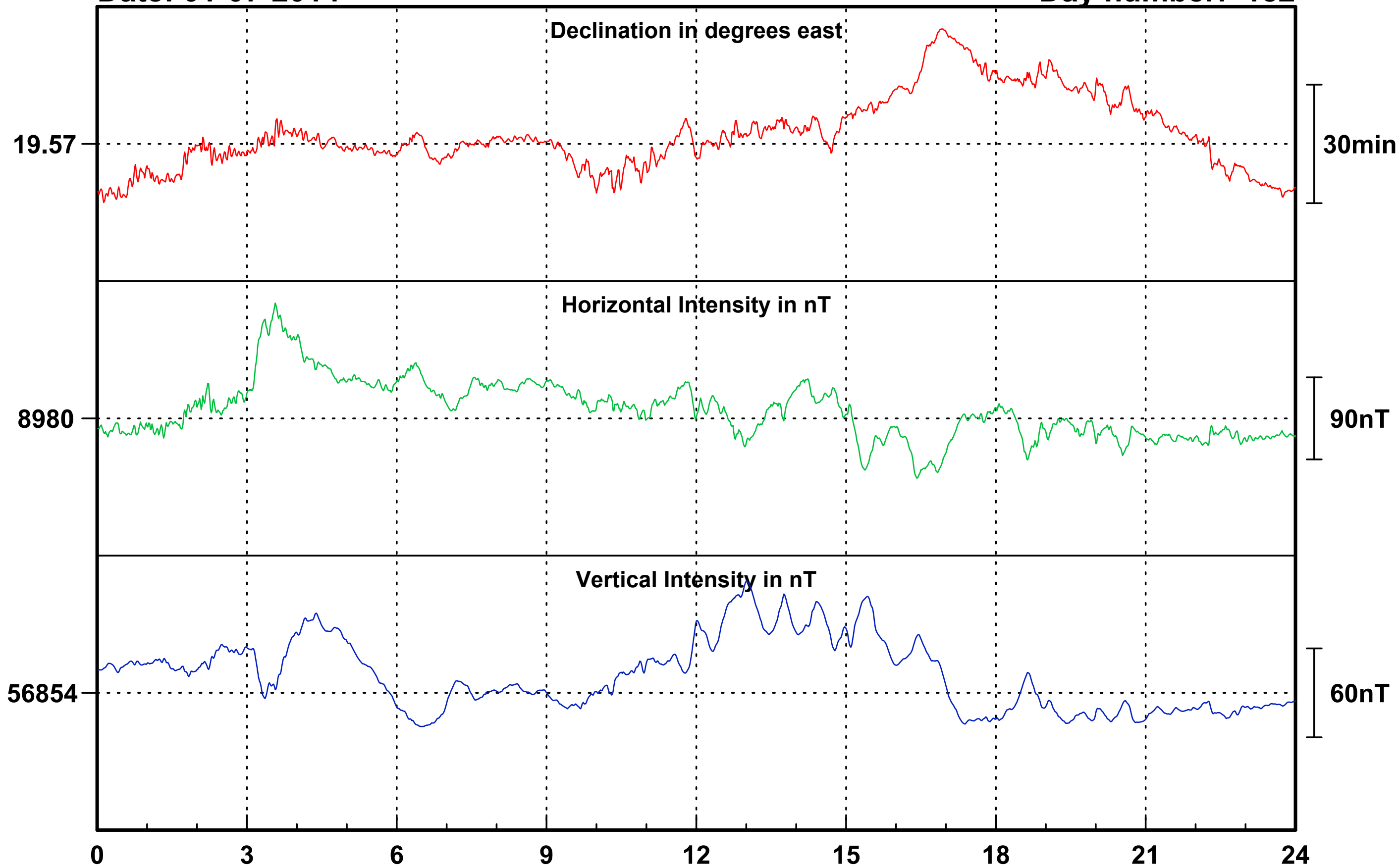




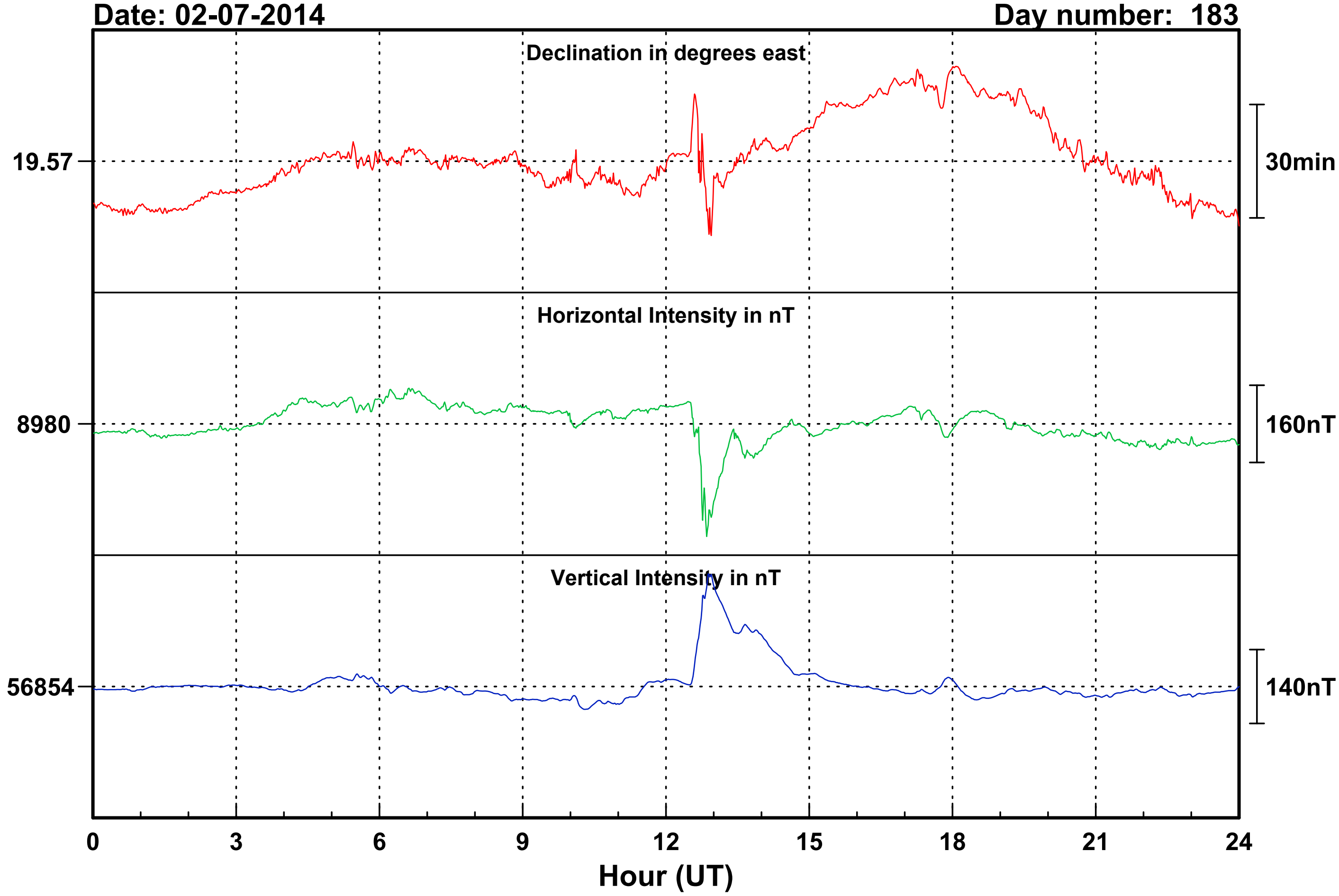
17 Scale x 2
18 Scale x 2
19 Scale x 2
20 Scale x 2
21 Scale x 2
22 Scale x 4
23
24 Scale x 2
25 Scale x 8
26 Scale x 4
27 Scale x 2
28 Scale x 4
29 Scale x 2
30 Scale x 2
31 Scale x 2
D 19.57
H 8980
Z 56854
1.00°
250 nT
200 nT
6 12 18 24
UT
Jim Carrigan
July
2014

Jim Carrigan

Date: 01-07-2014 **Day number: 182**



Date: 02-07-2014 **Day number: 183**



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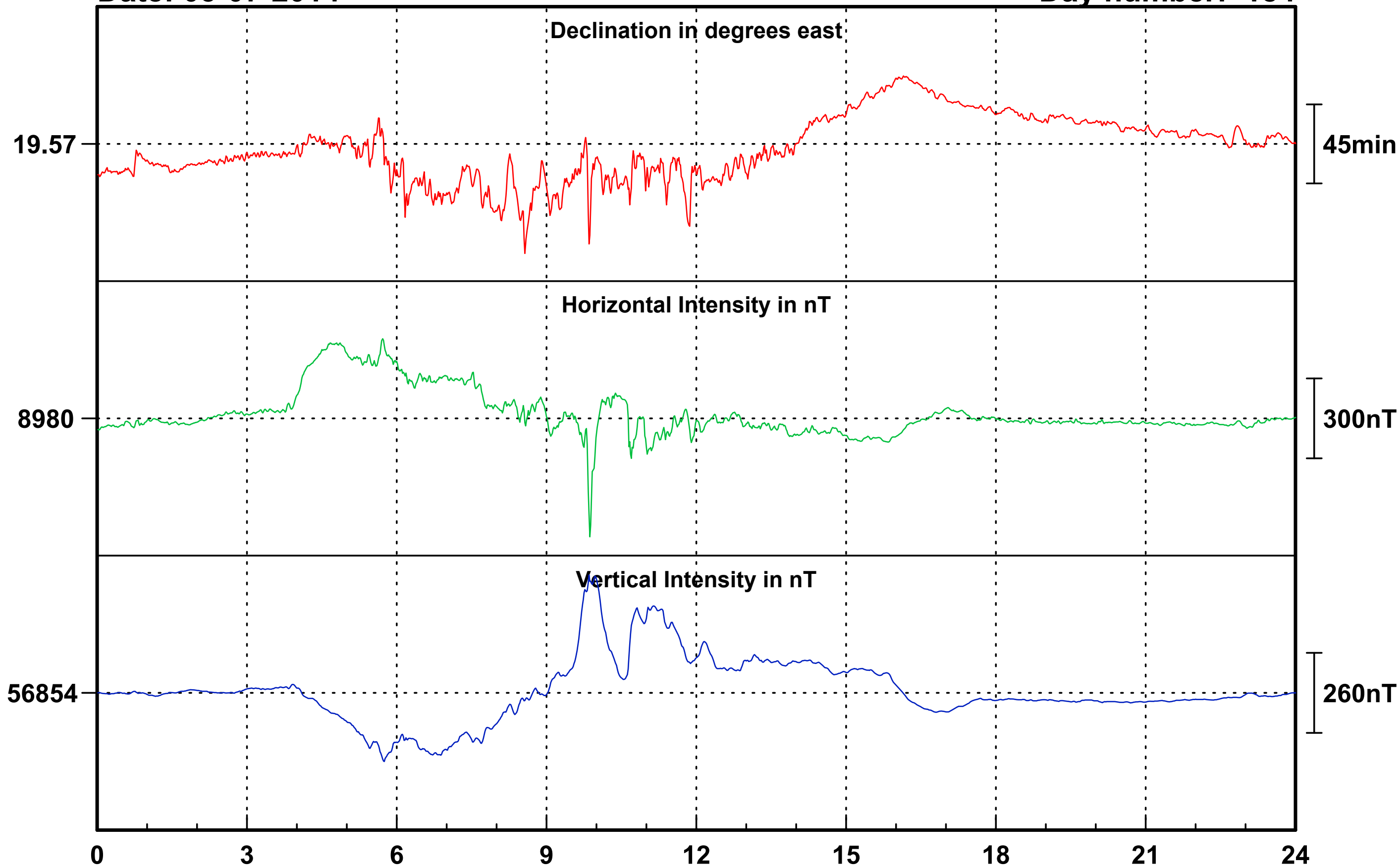
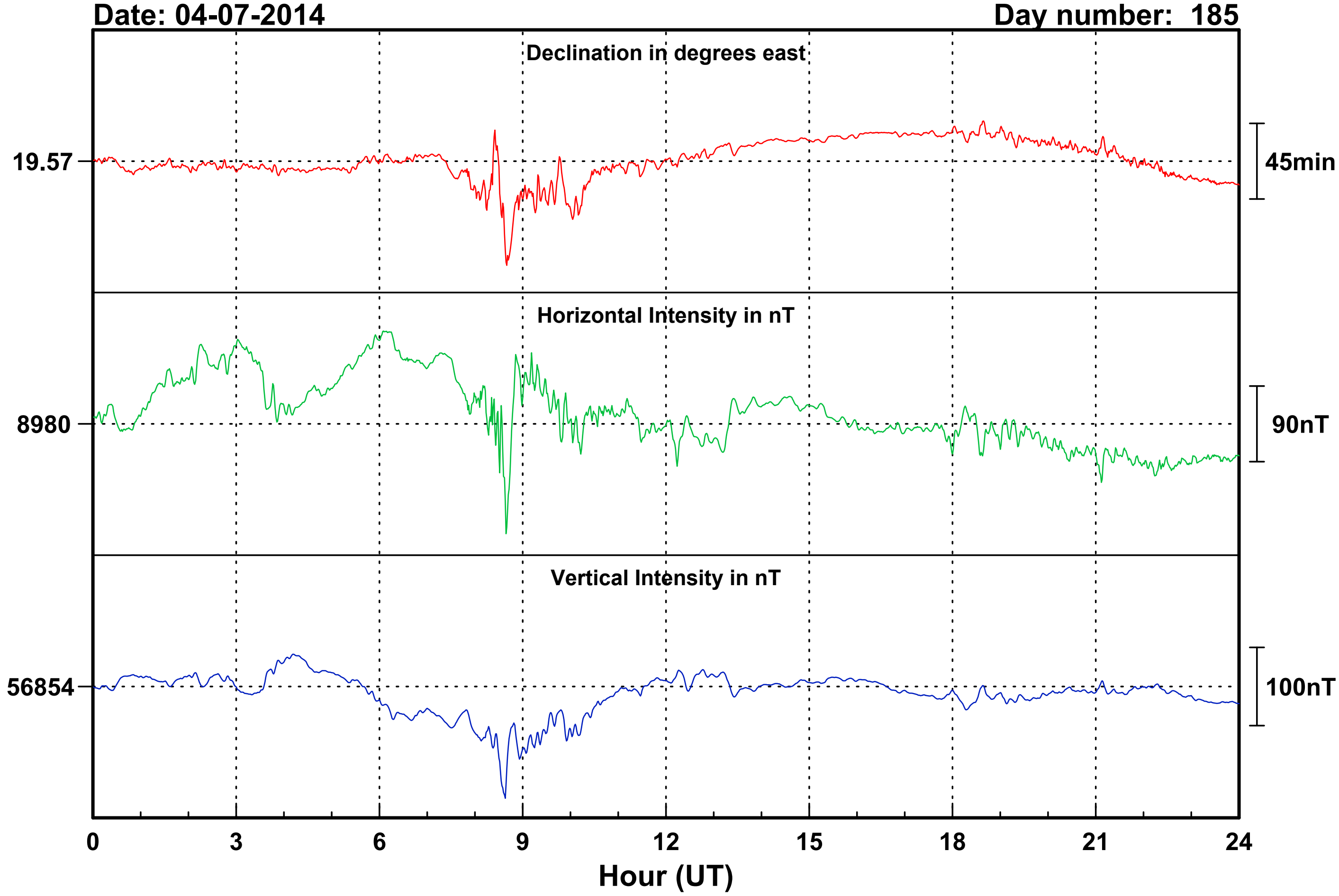
Date: 03-07-2014 Day number: 184



Date: 04-07-2014 Day number: 185



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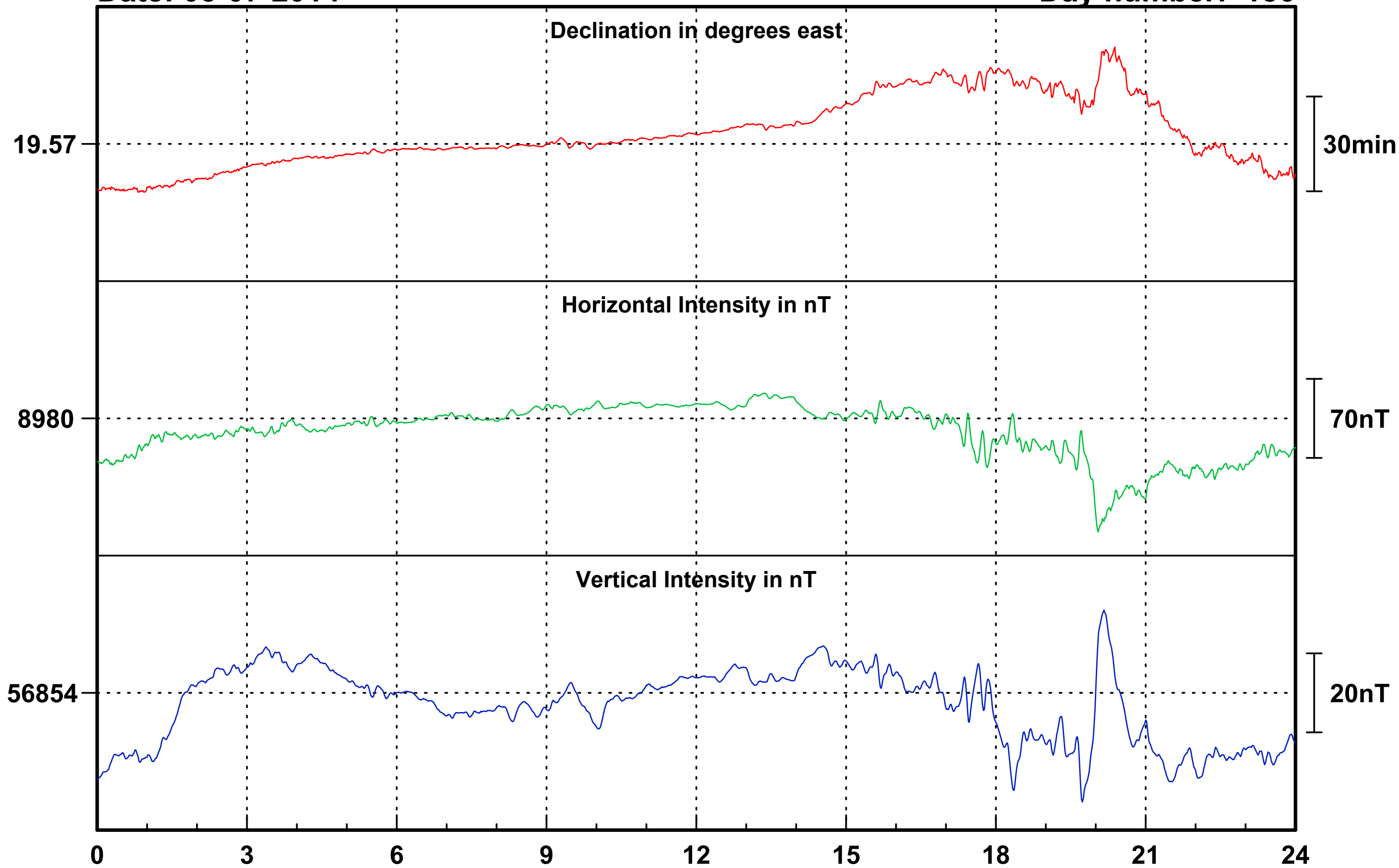
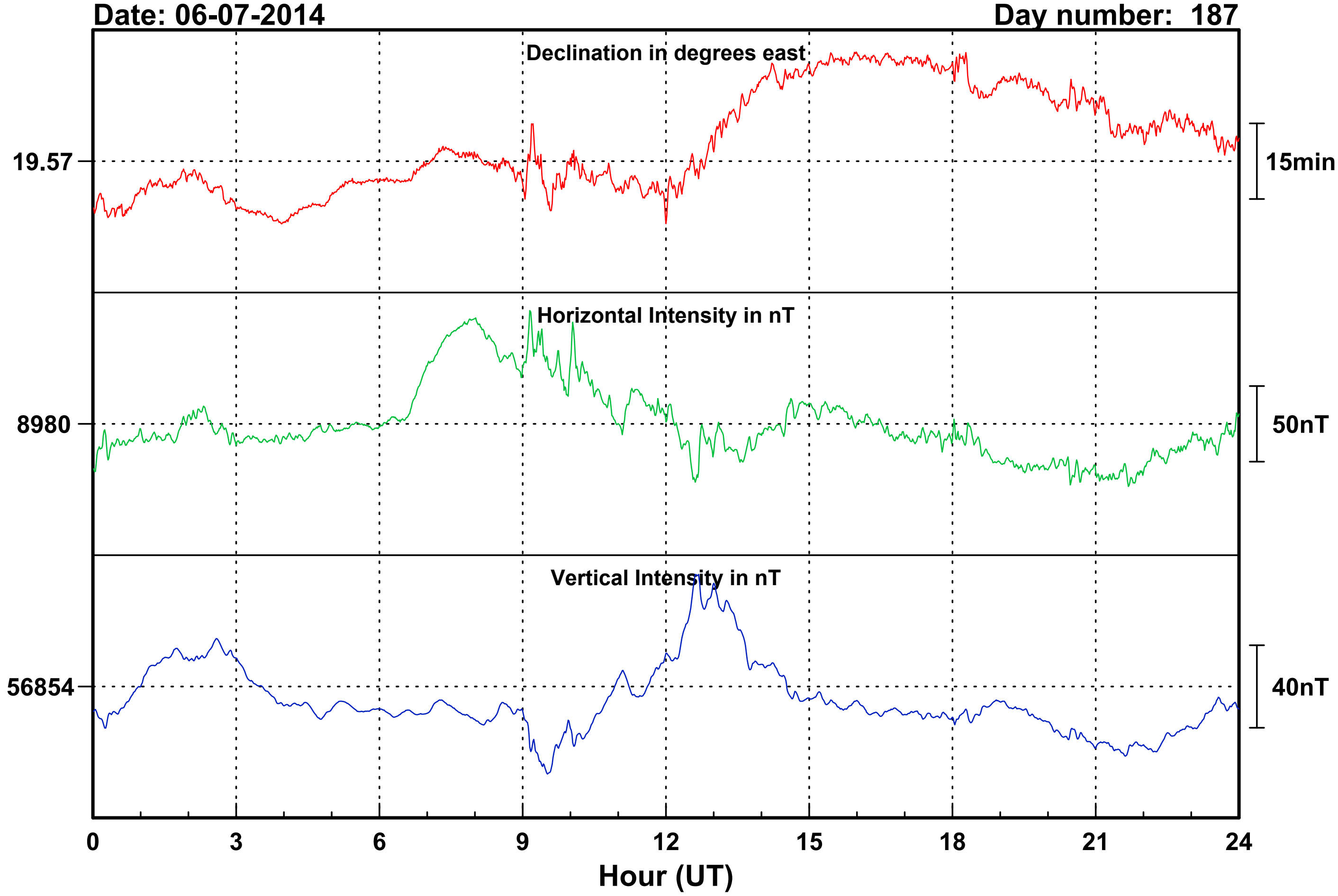
Date: 05-07-2014 Day number: 186



Date: 06-07-2014 Day number: 187



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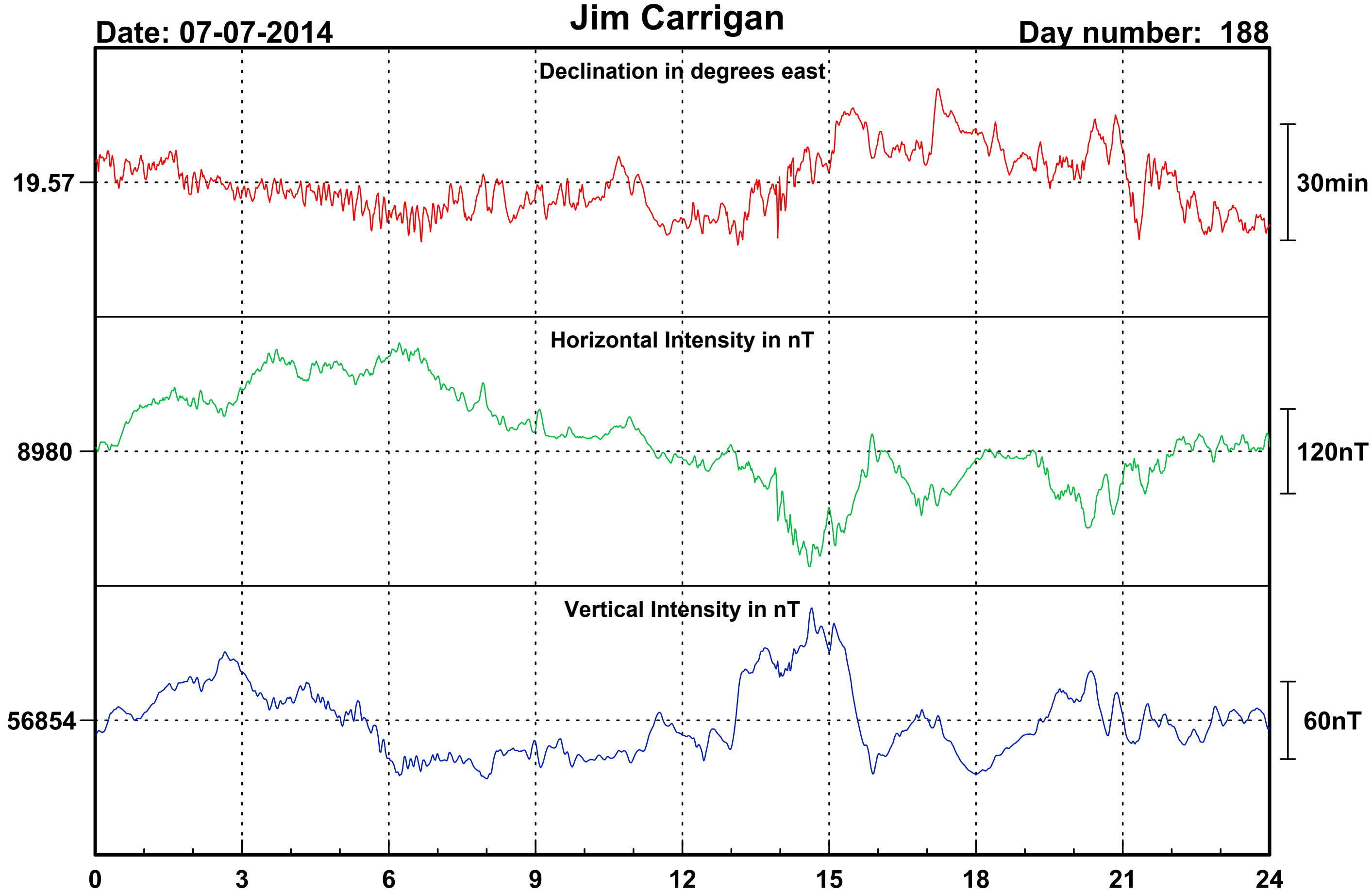

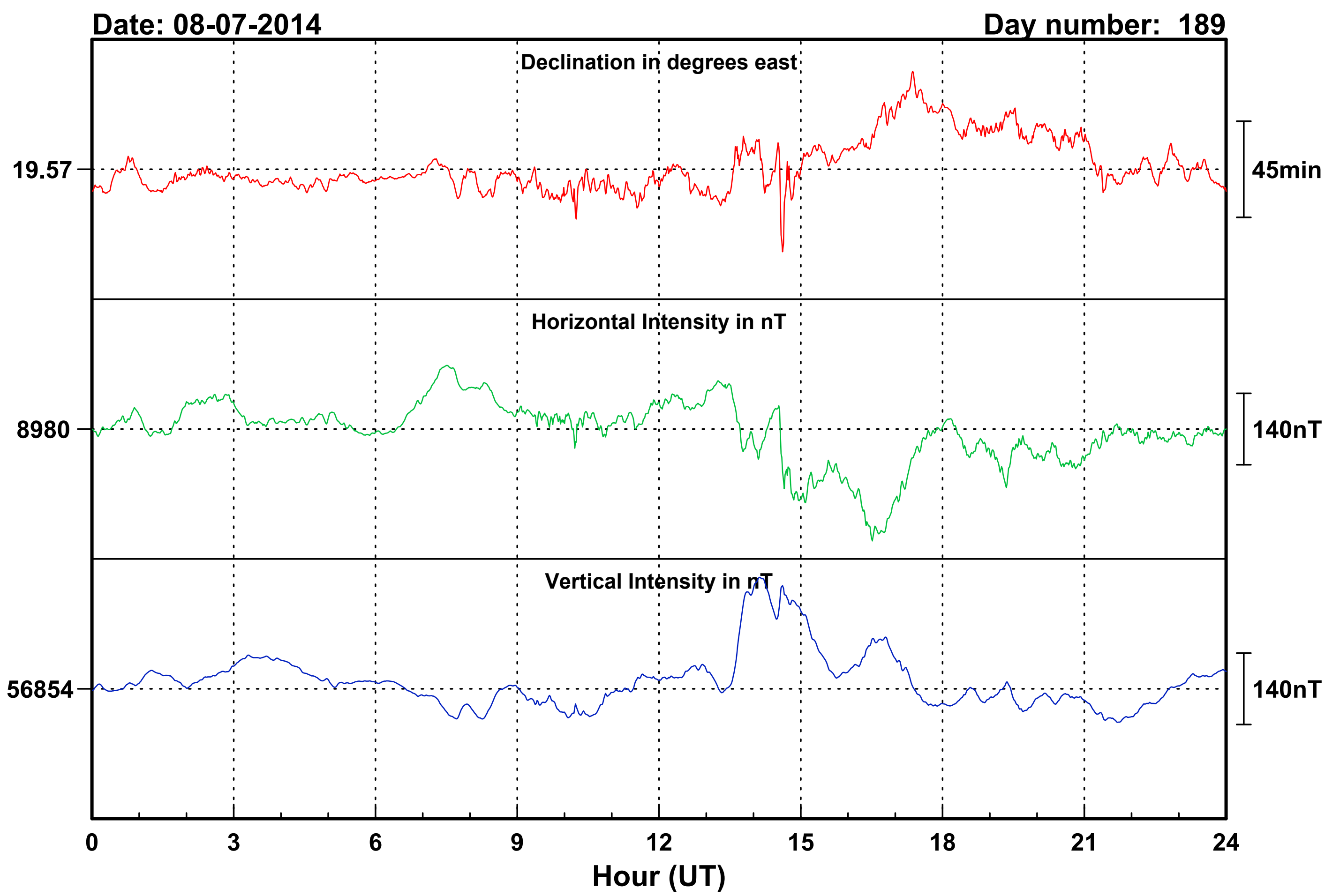

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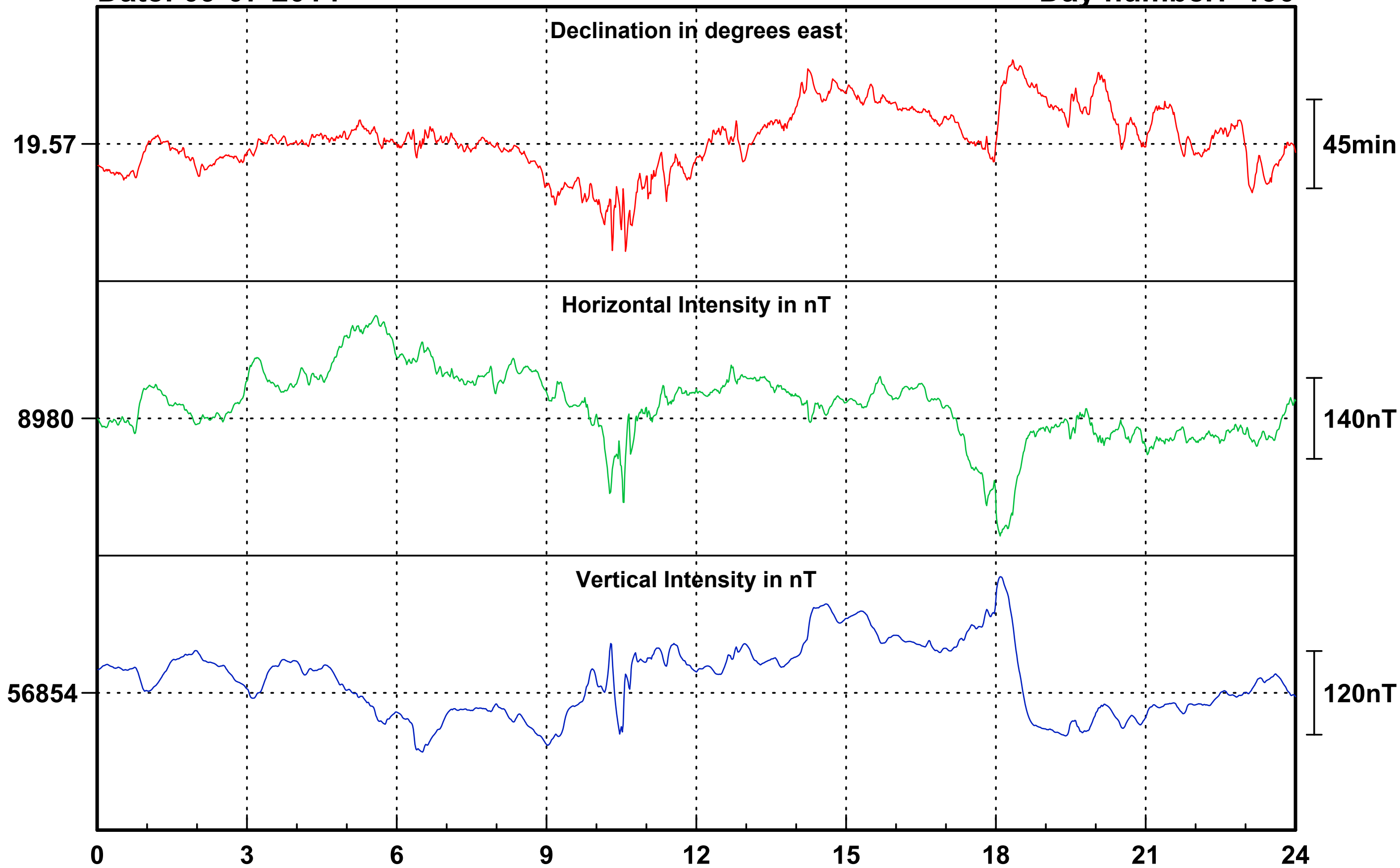
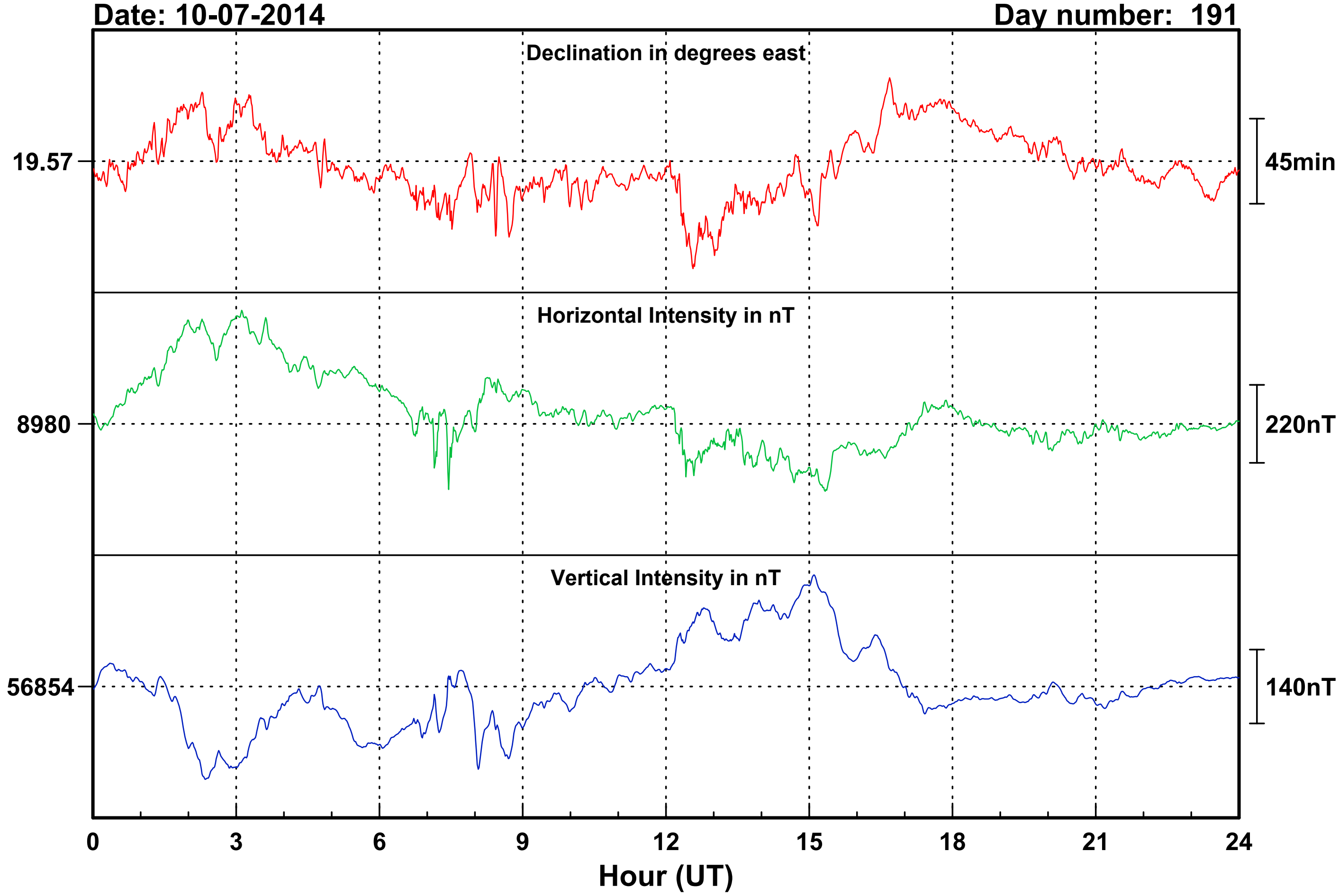
Date: 09-07-2014 **Day number: 190**



Date: 10-07-2014 **Day number: 191**



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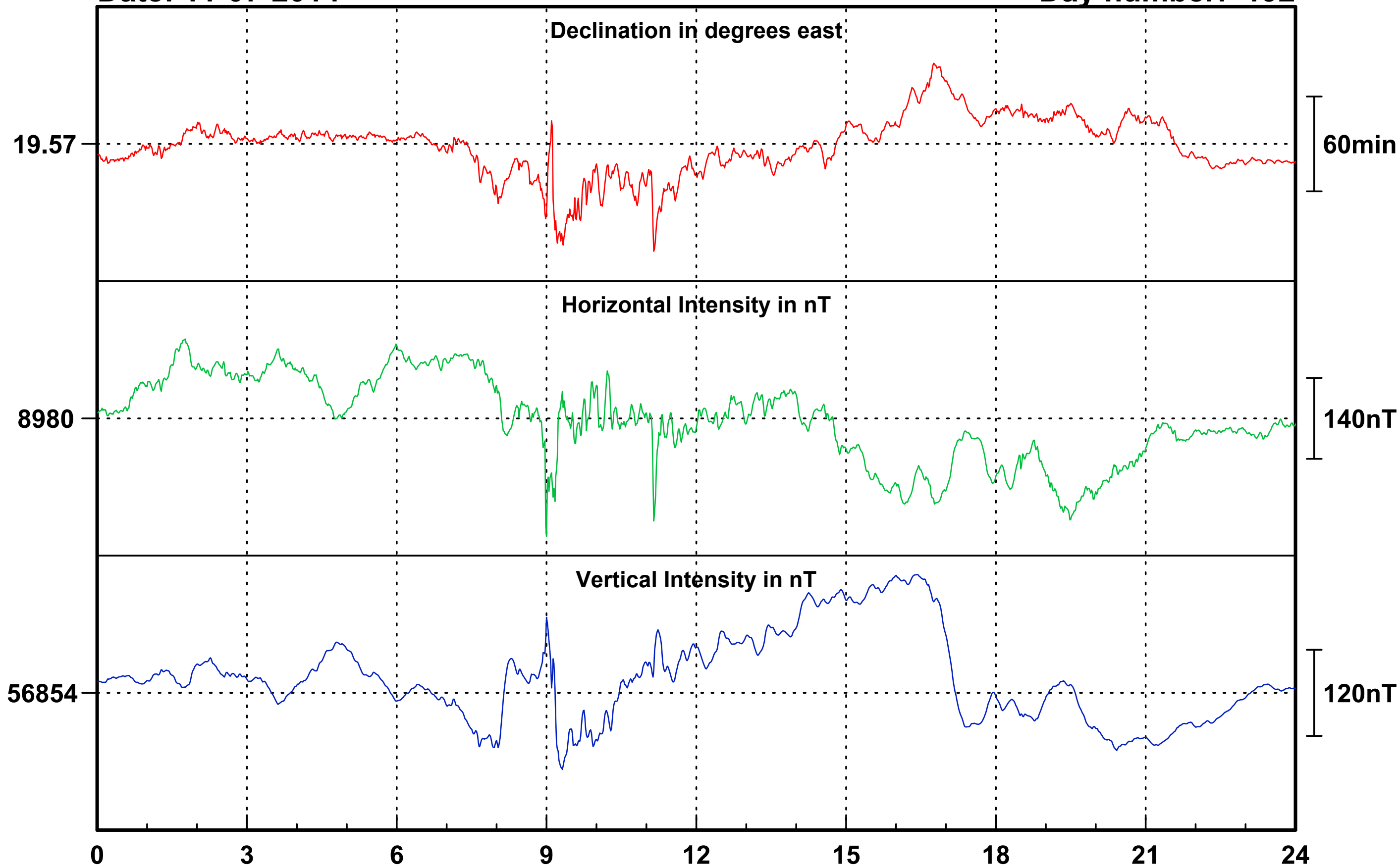
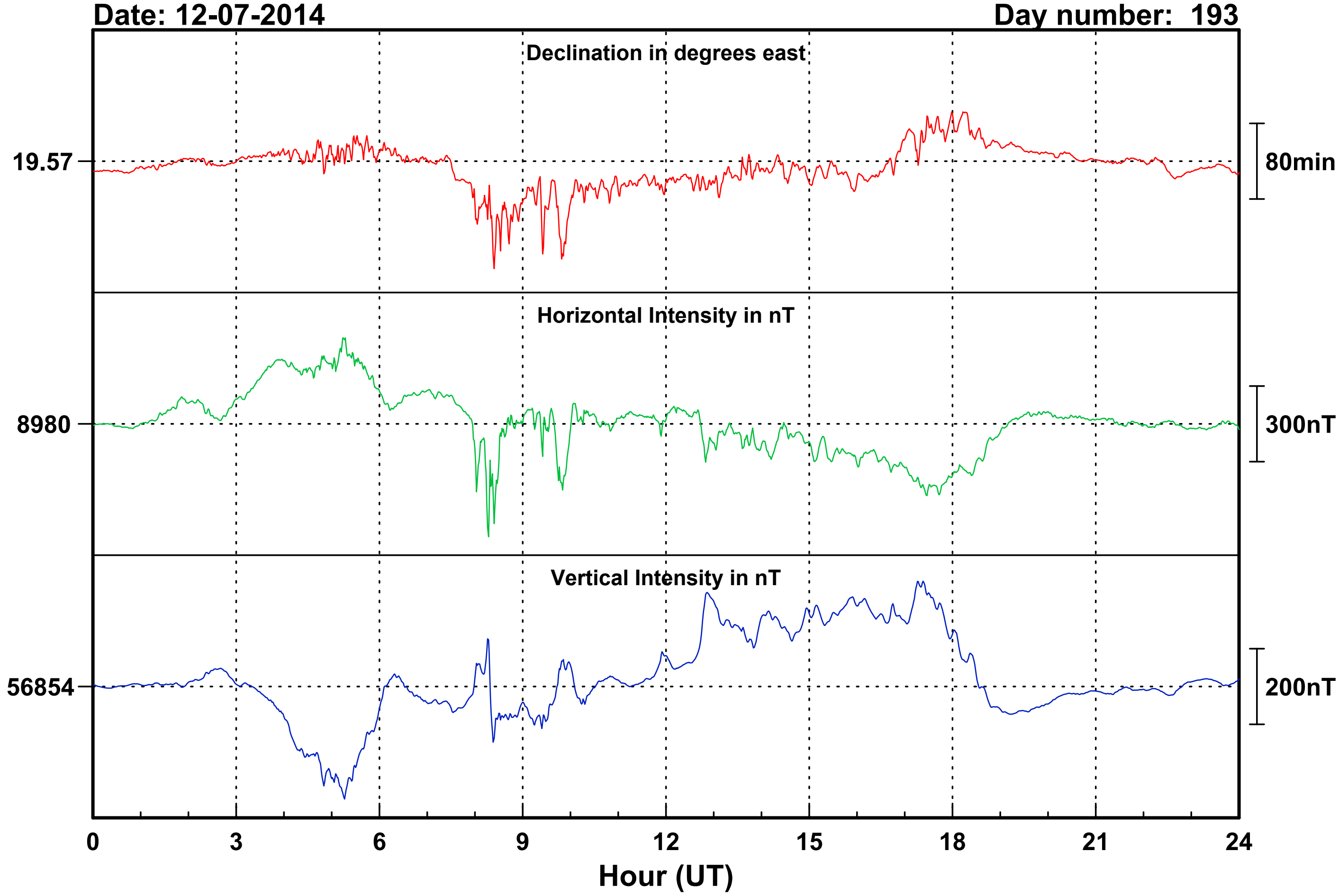
Date: 11-07-2014 Day number: 192



Date: 12-07-2014 Day number: 193



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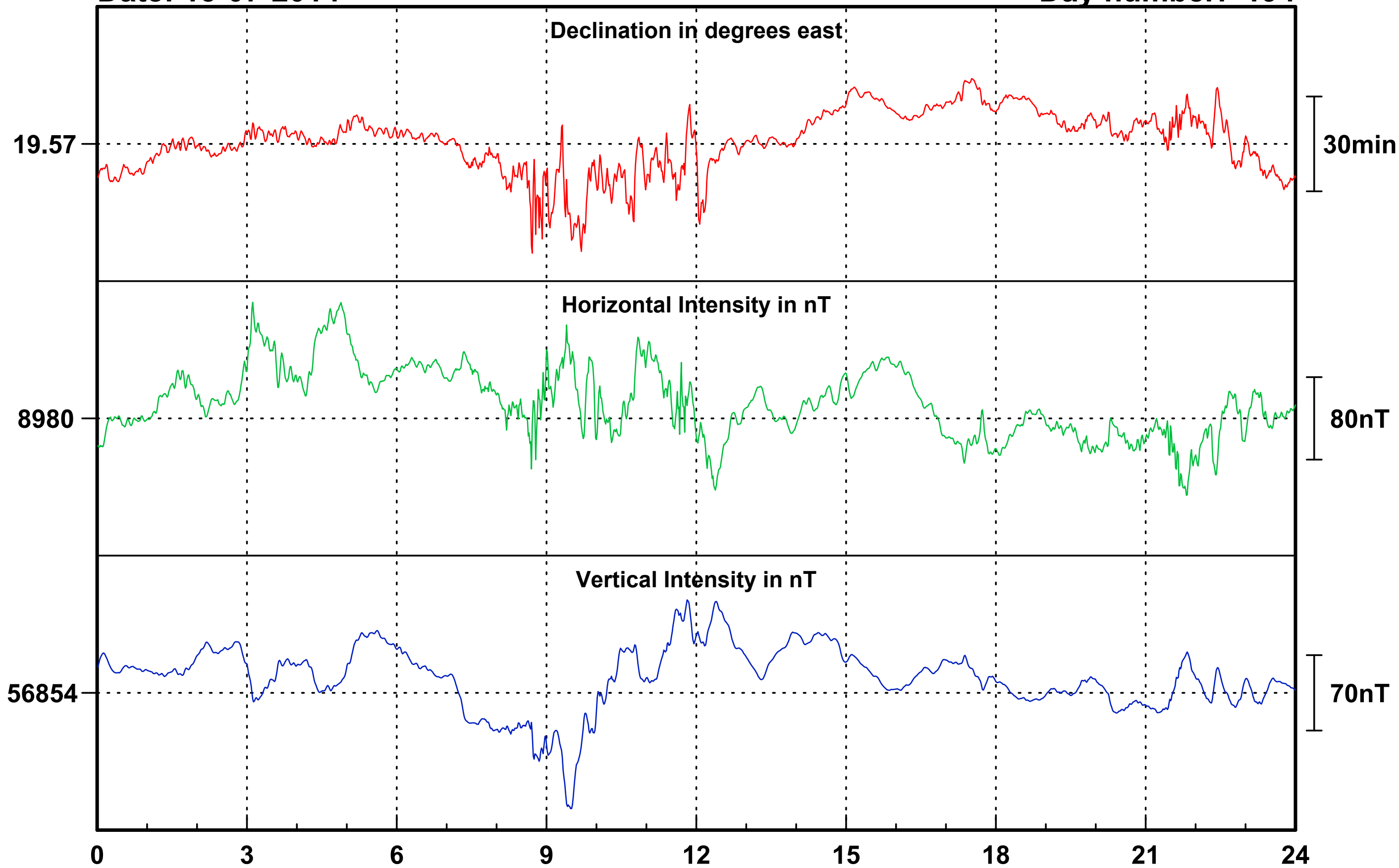
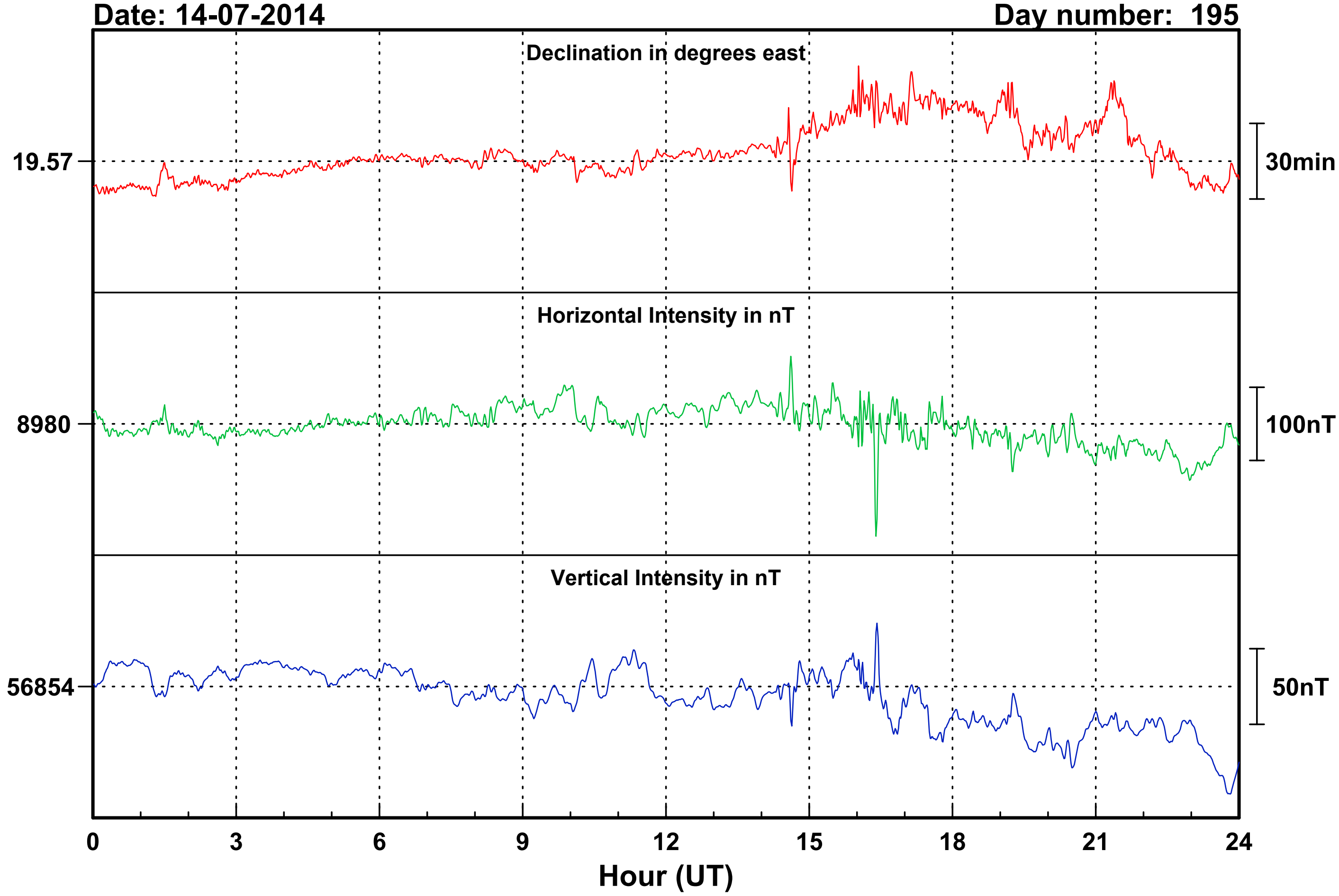
Date: 13-07-2014 **Day number: 194**



Date: 14-07-2014 **Day number: 195**



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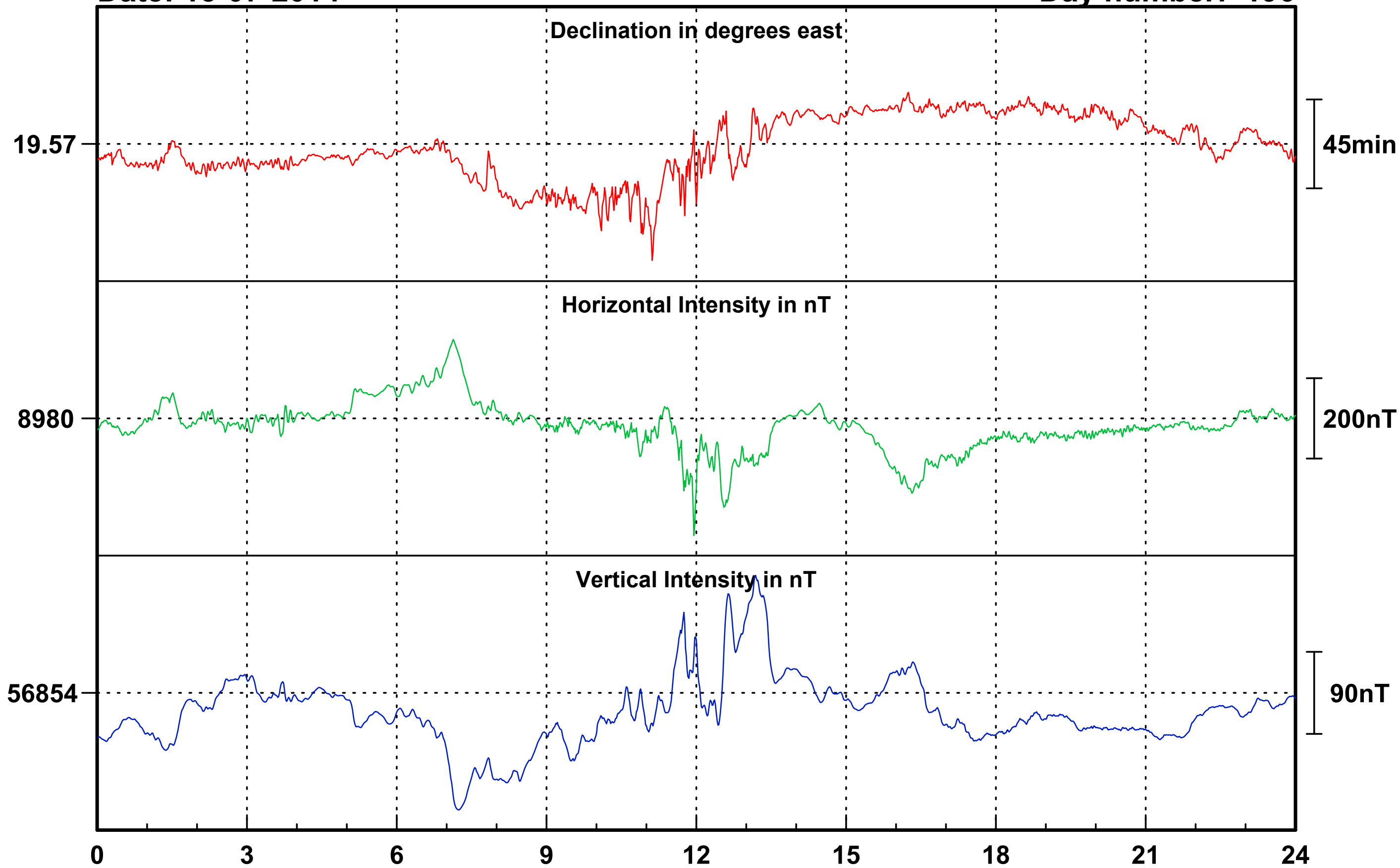
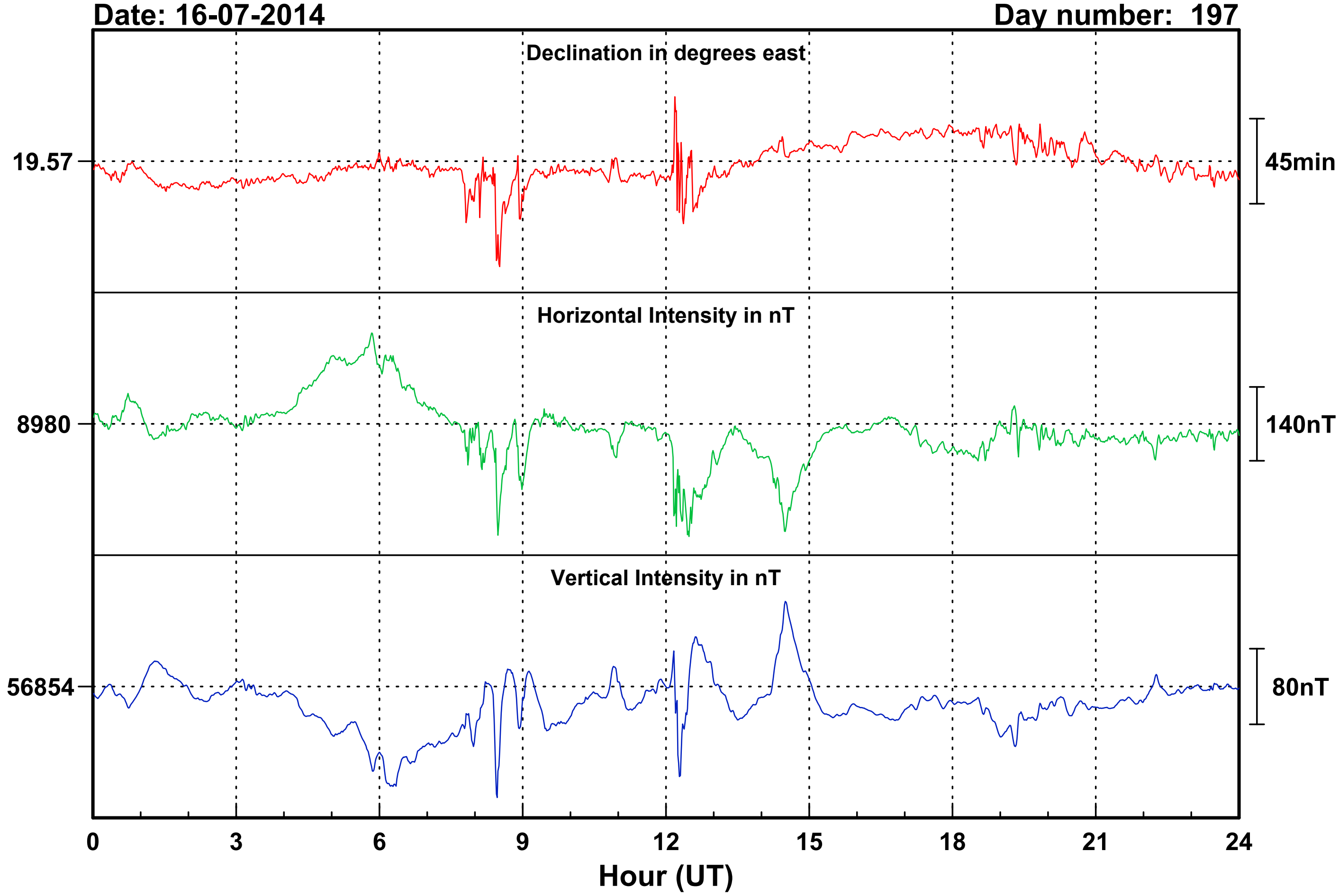
Date: 15-07-2014 **Day number: 196**



Date: 16-07-2014 **Day number: 197**



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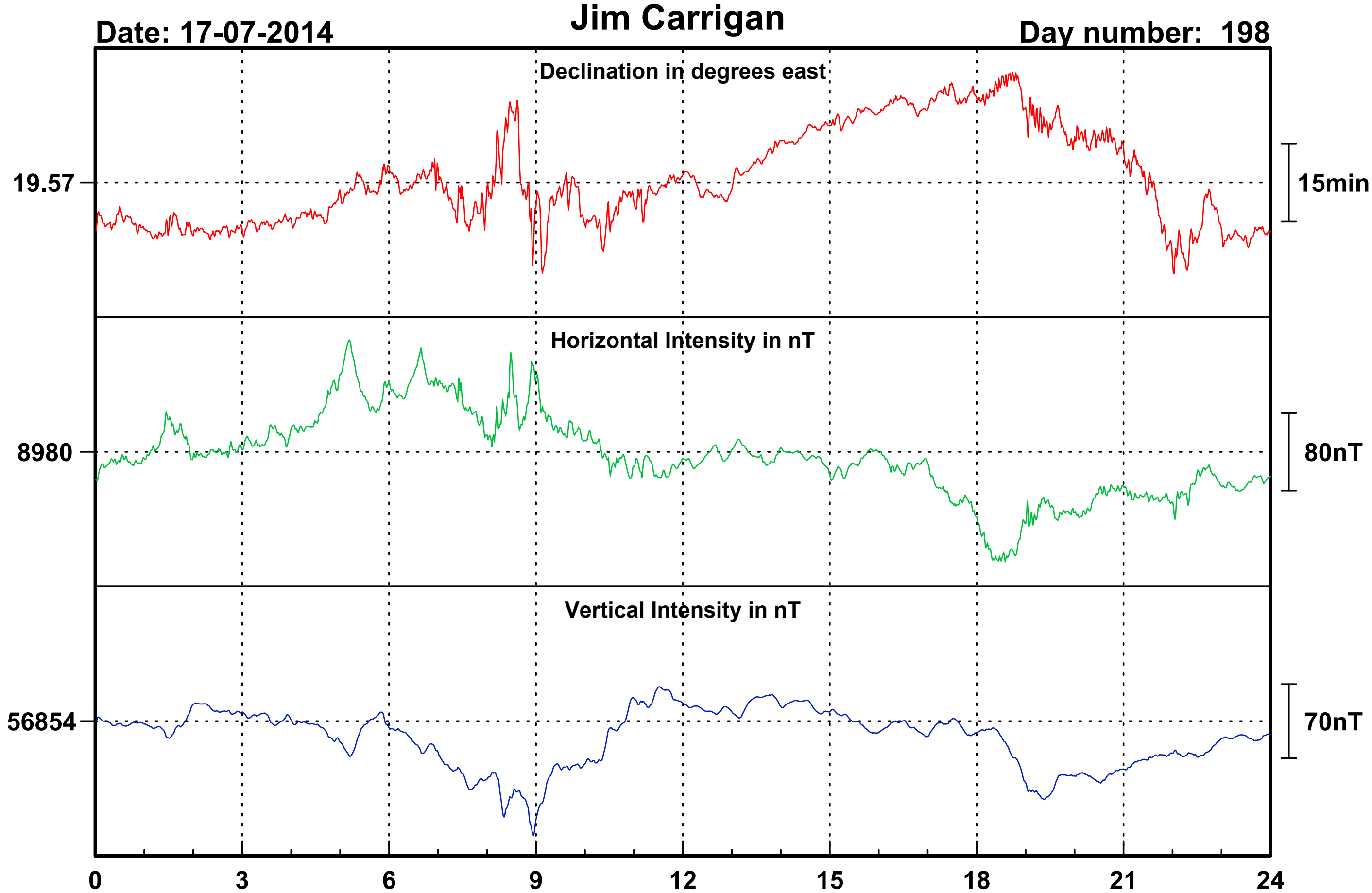

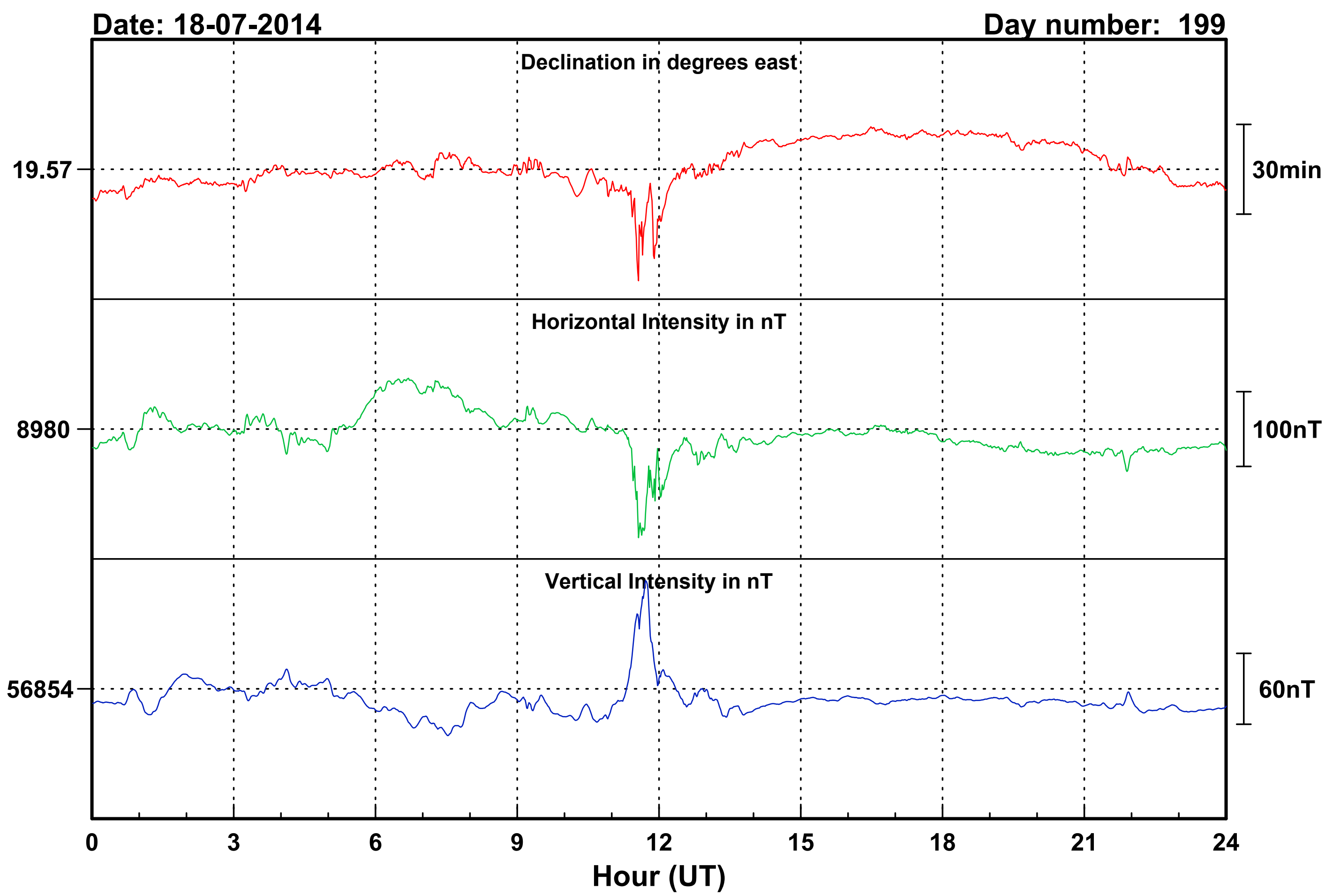

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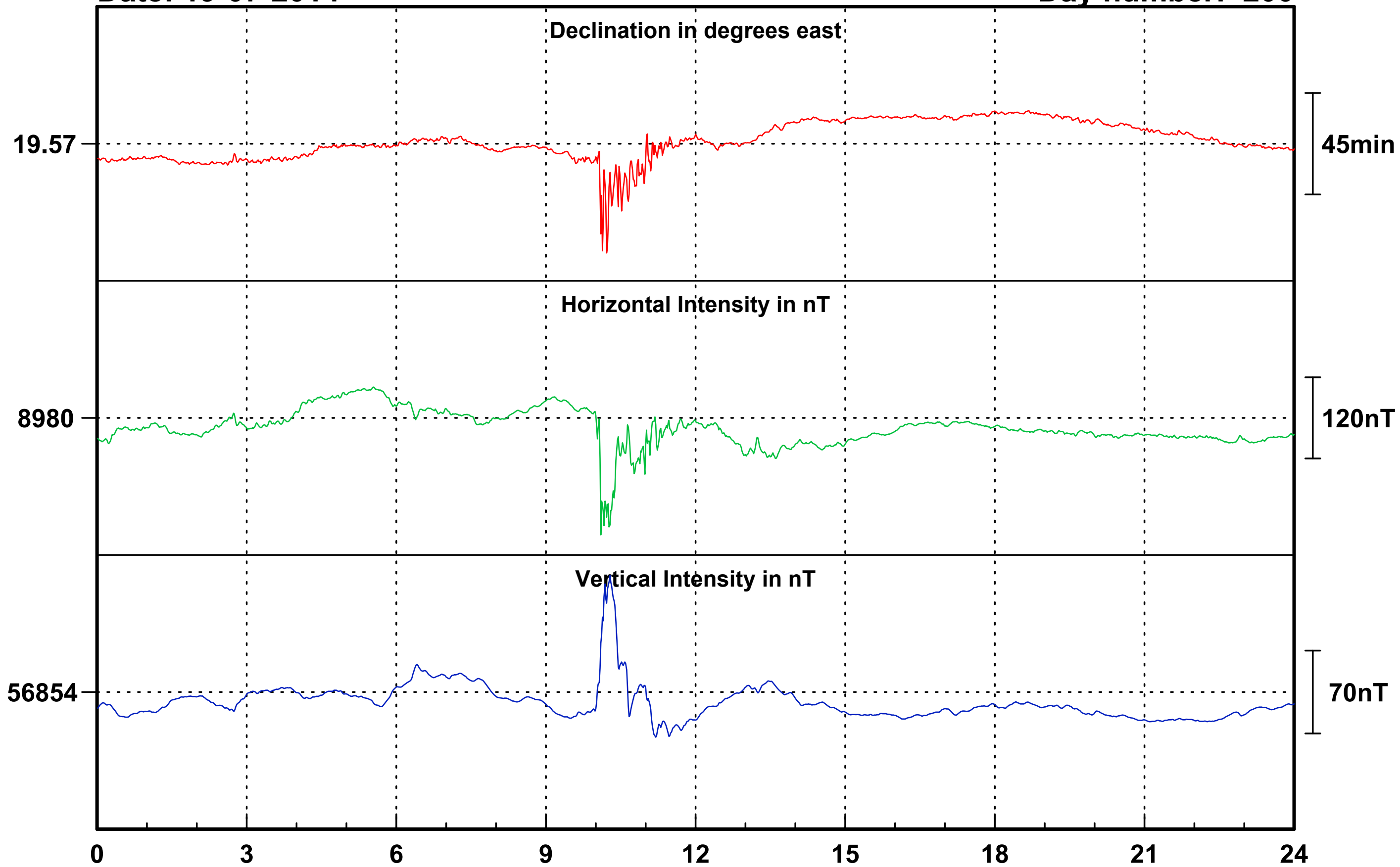
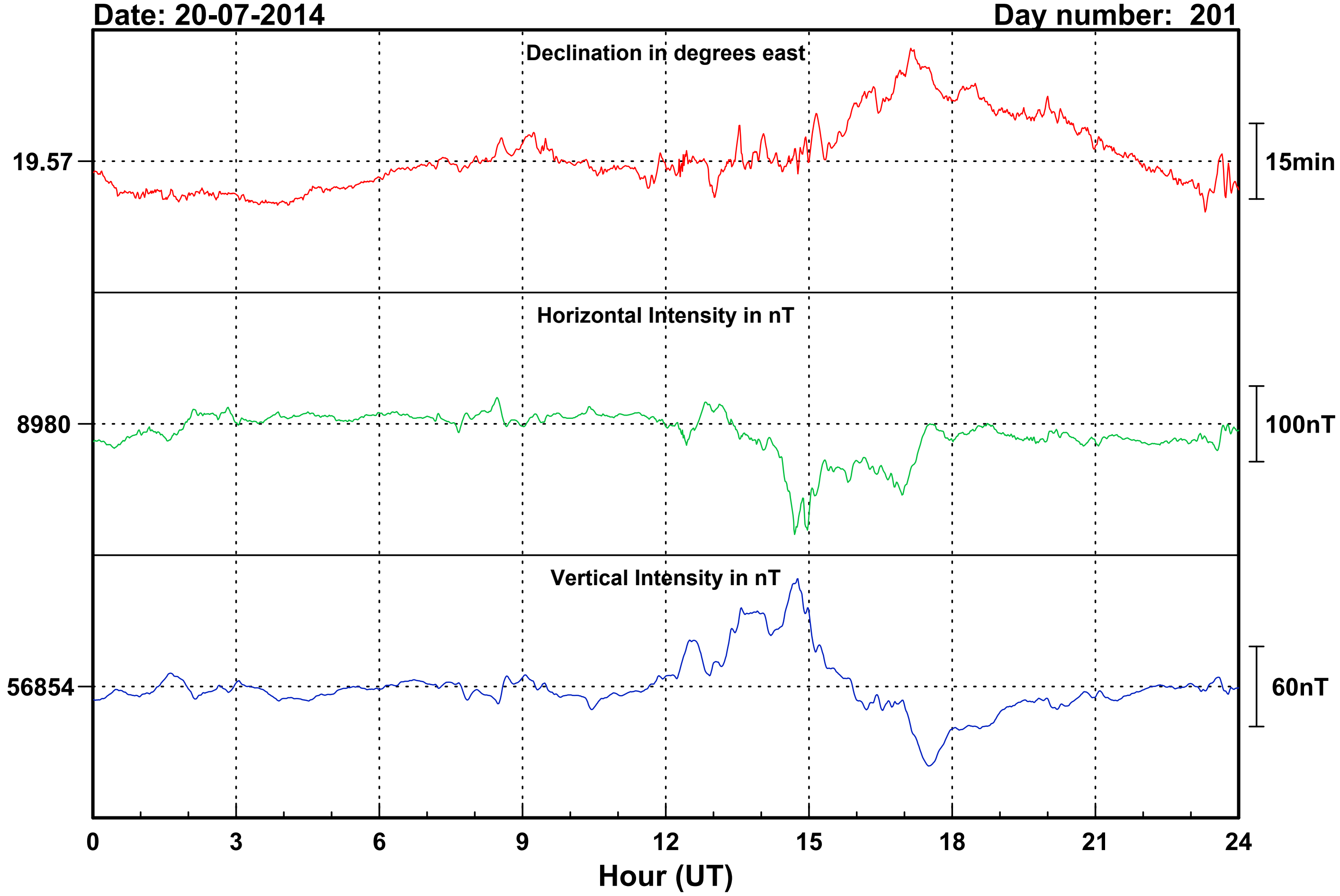
Date: 19-07-2014 Day number: 200



Date: 20-07-2014 Day number: 201



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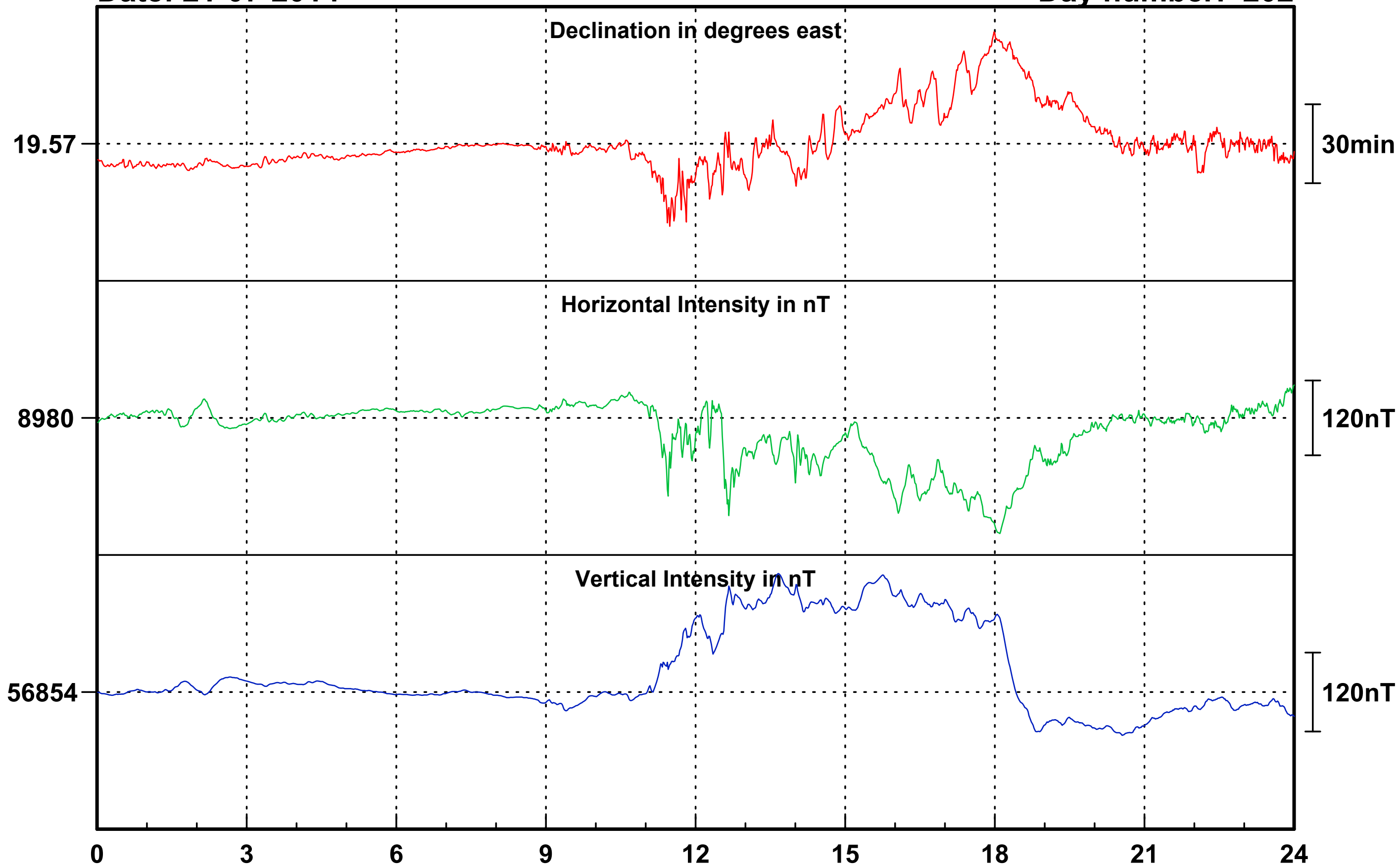
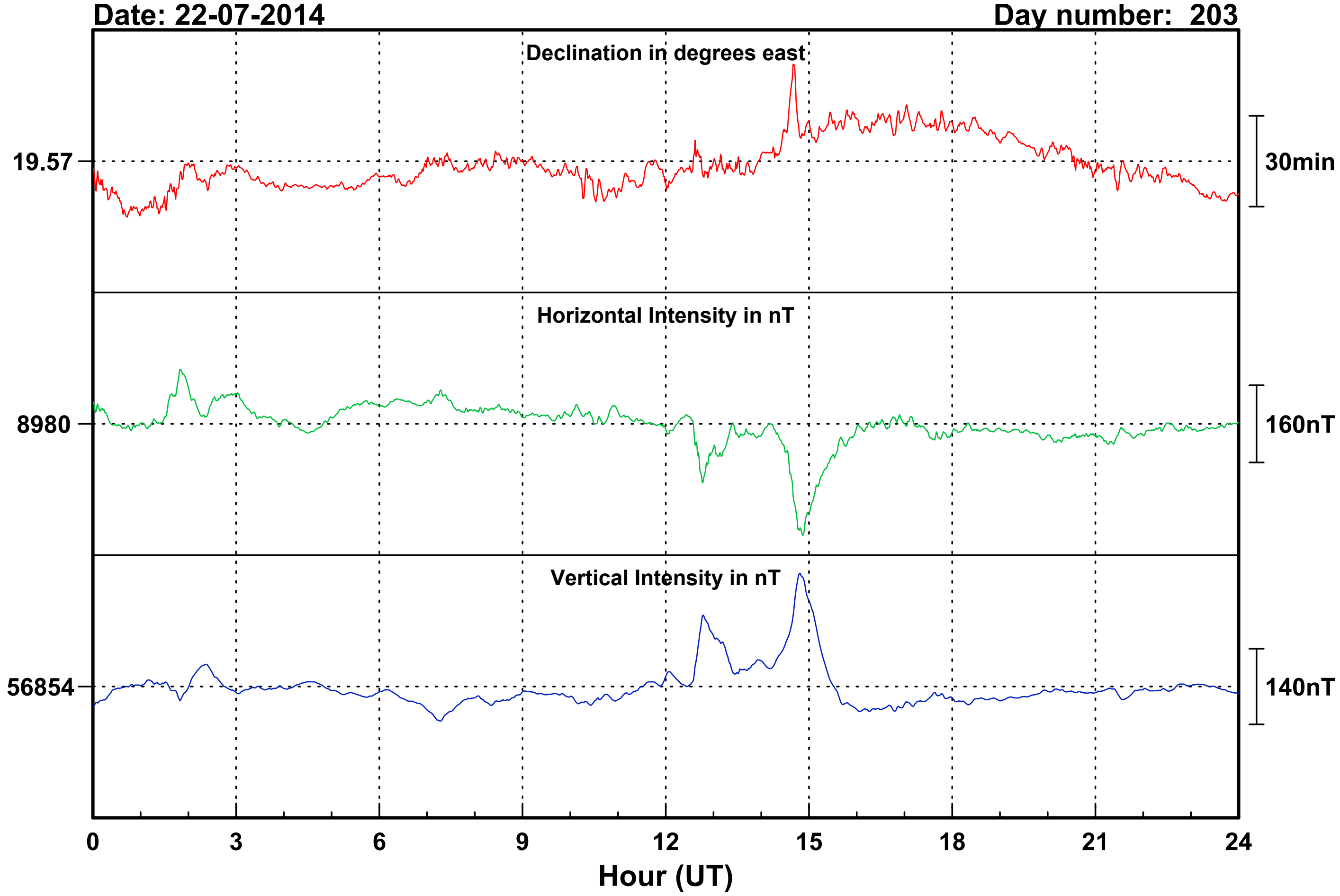
Date: 21-07-2014 Day number: 202



Date: 22-07-2014 Day number: 203



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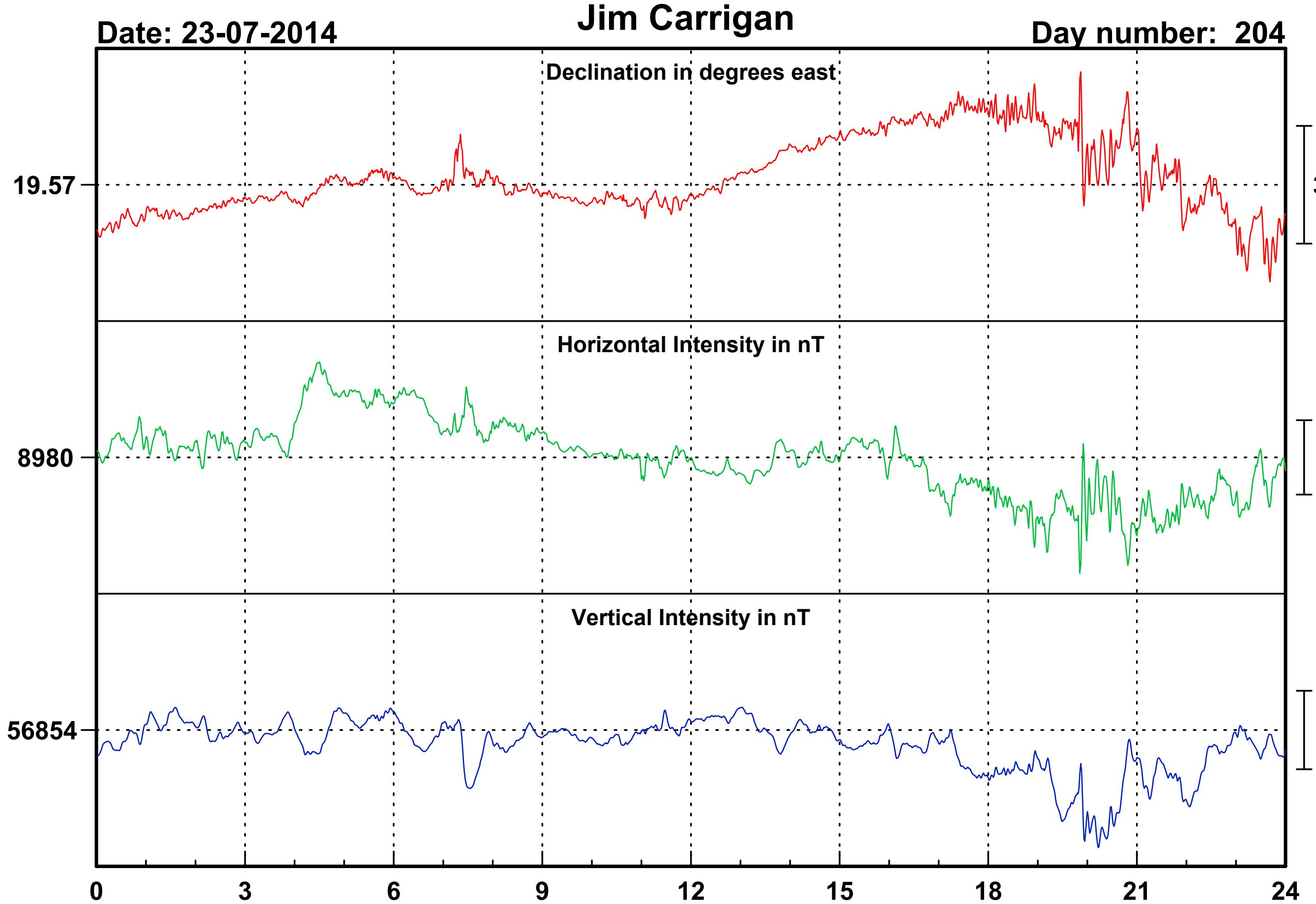

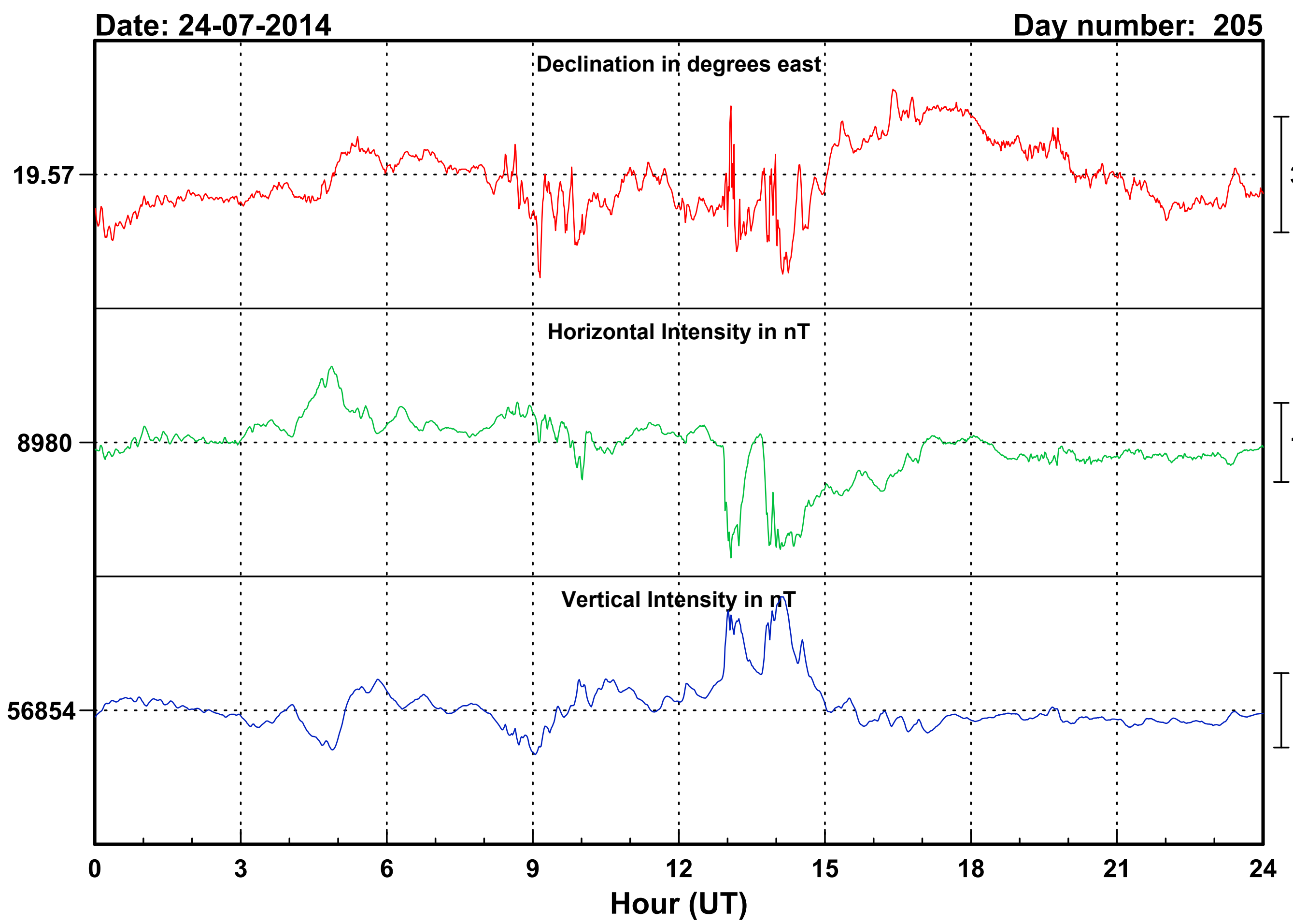

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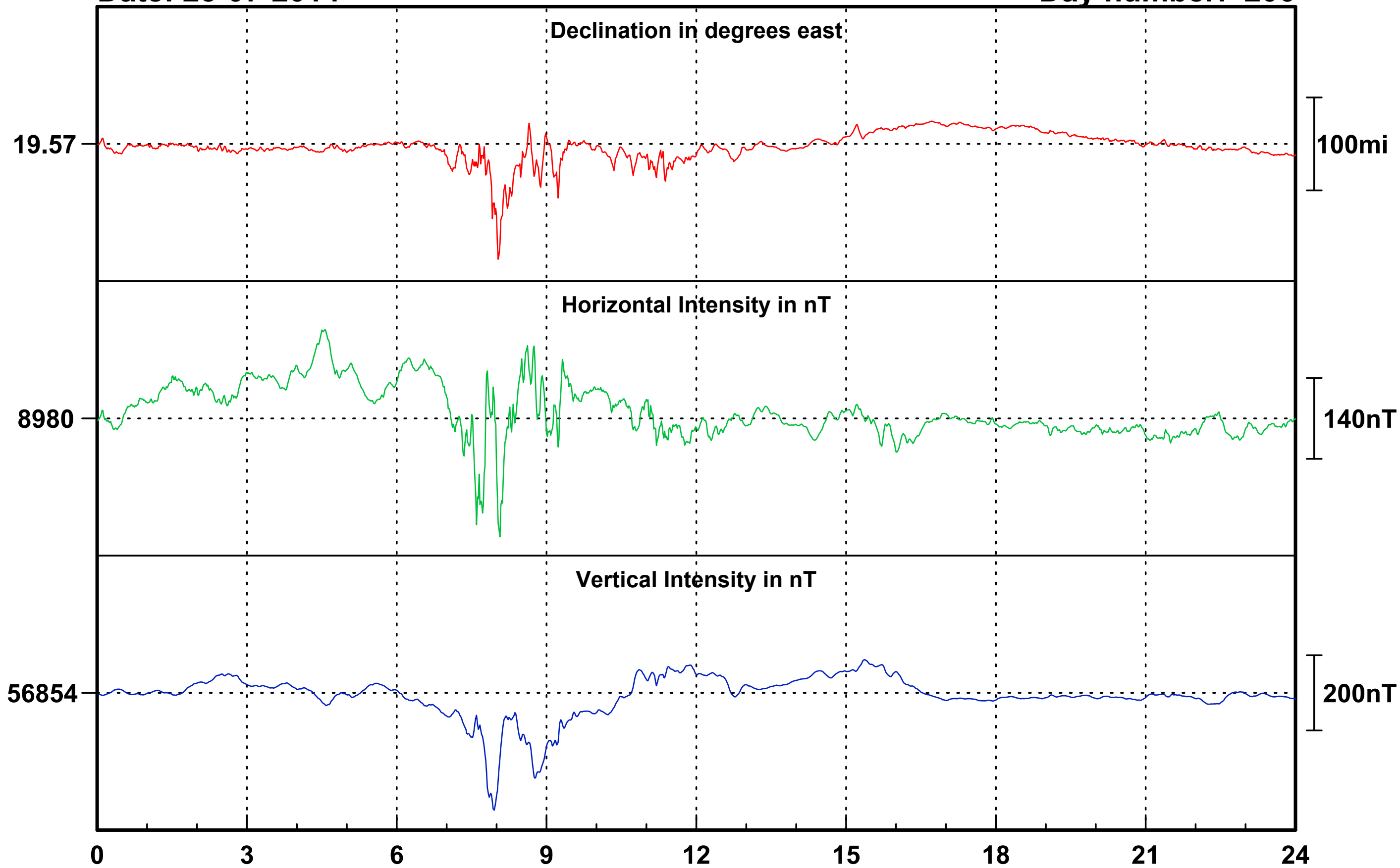
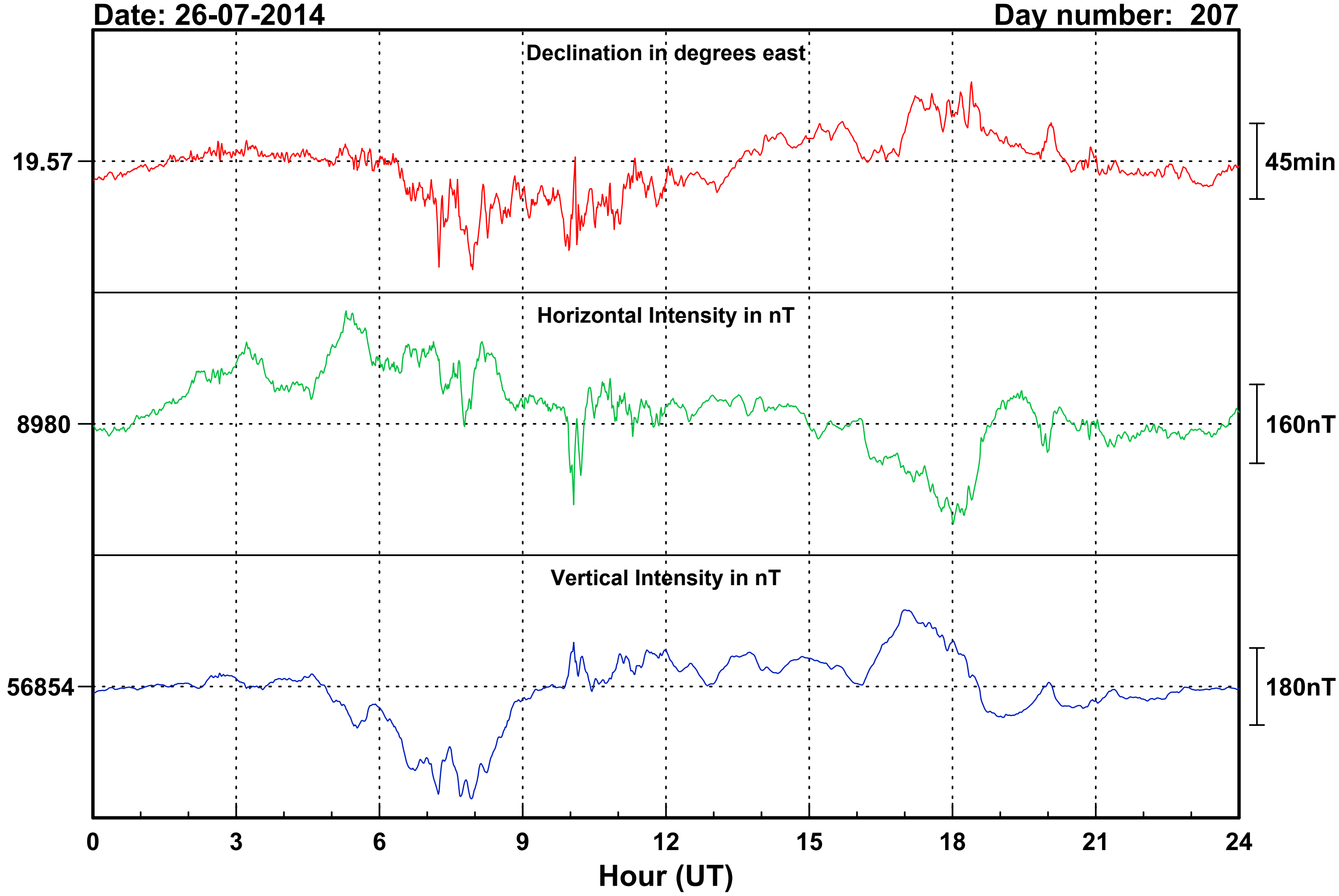
Date: 25-07-2014 Day number: 206



Date: 26-07-2014 Day number: 207



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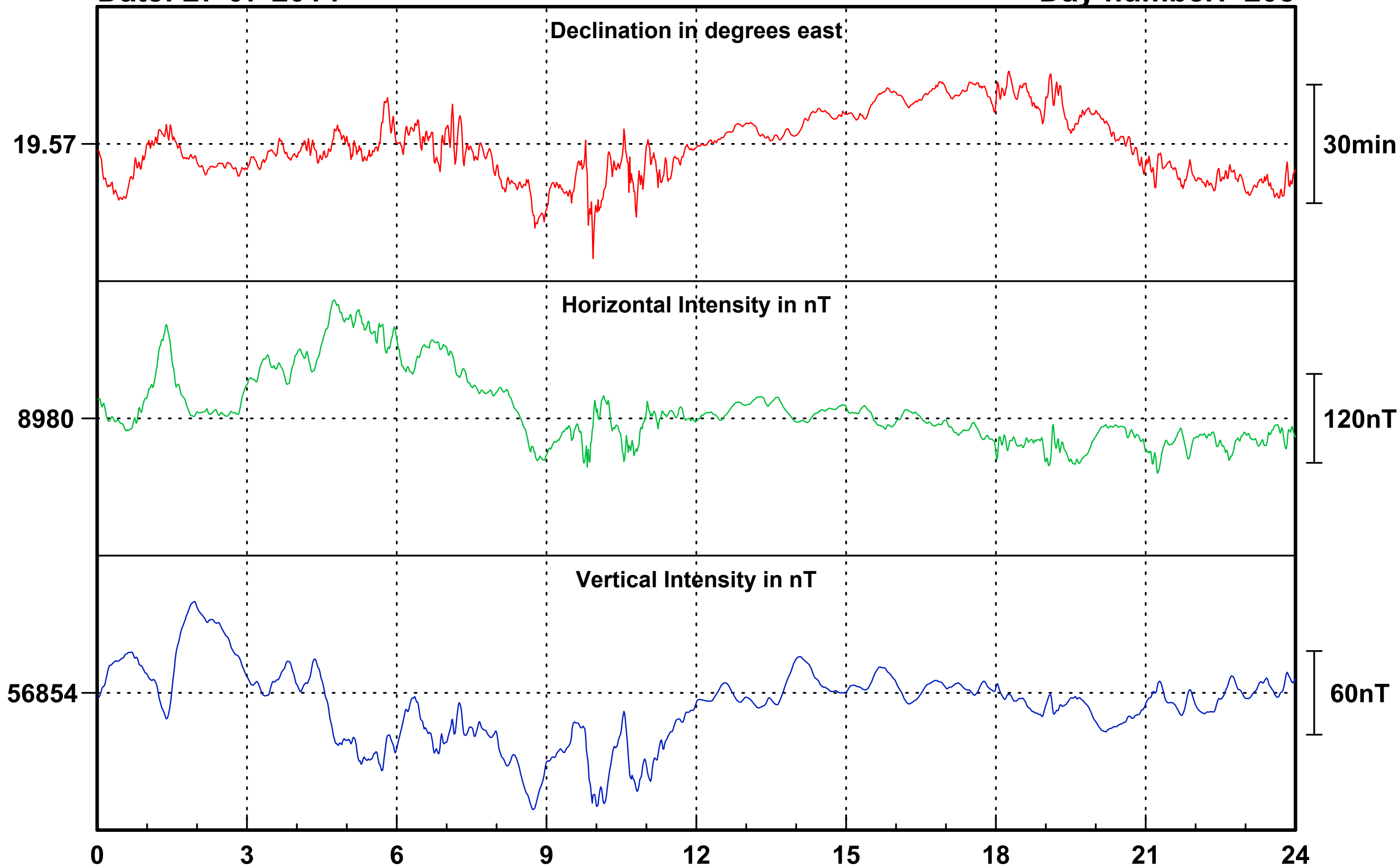
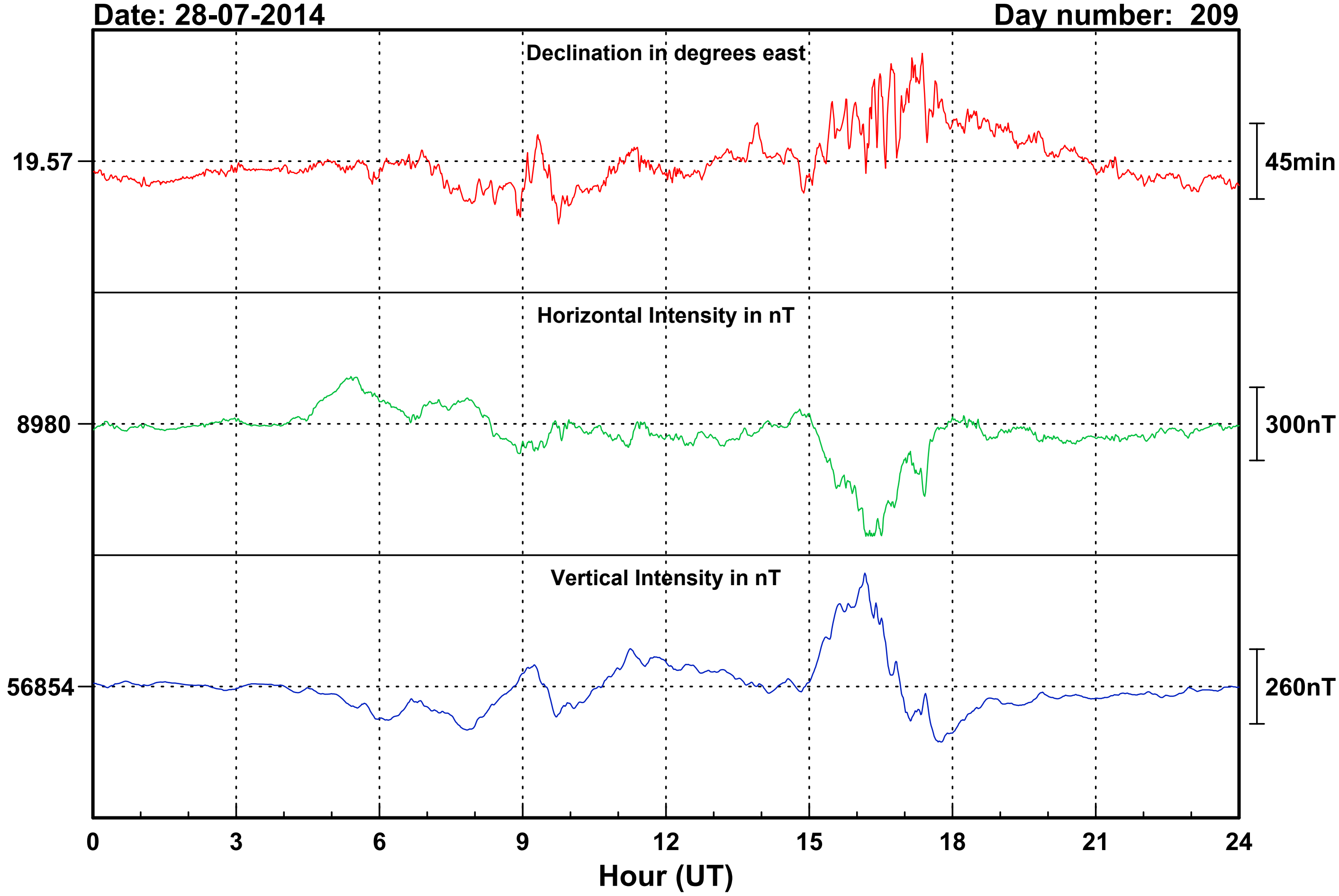
Date: 27-07-2014 Day number: 208



Date: 28-07-2014 Day number: 209



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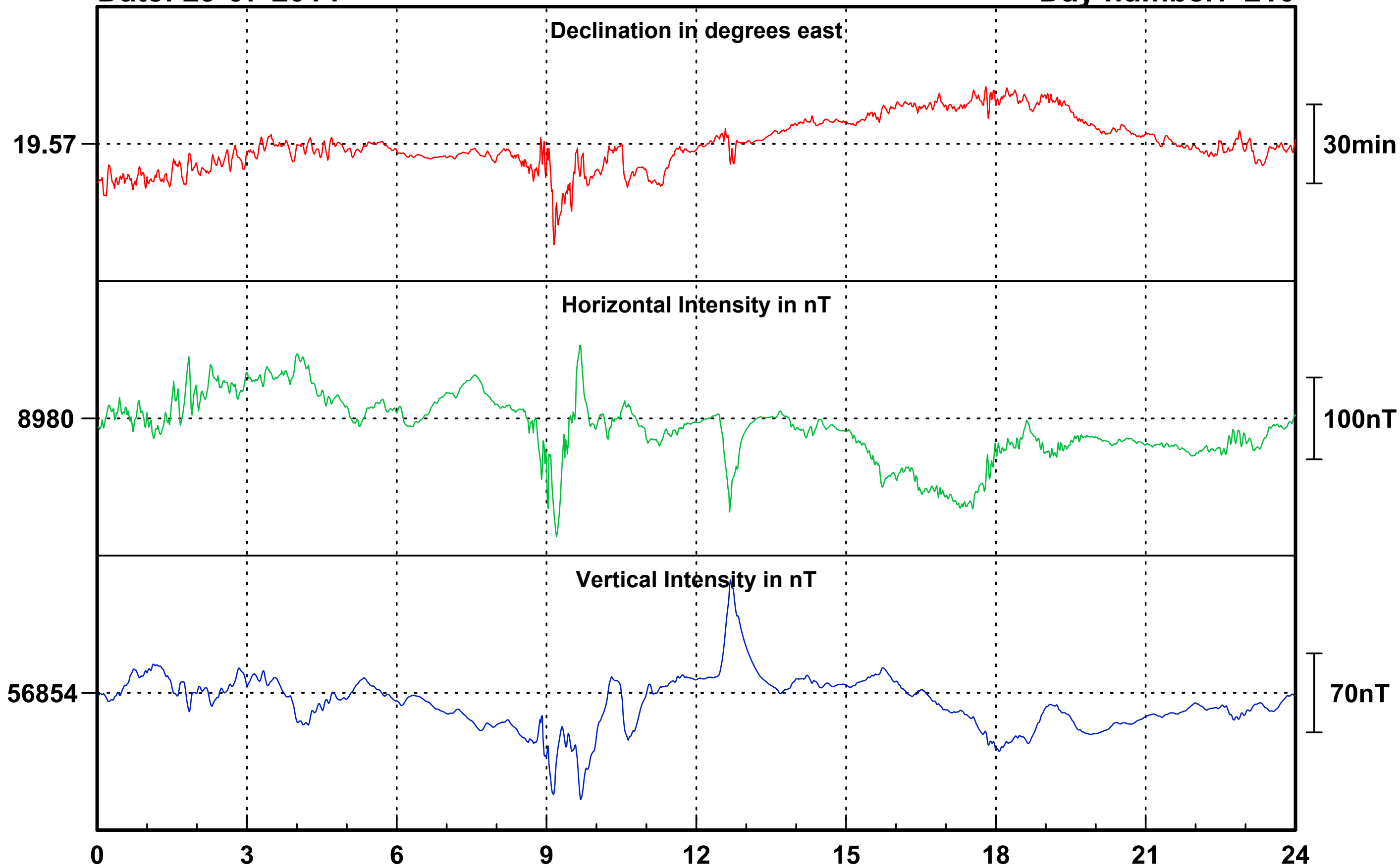
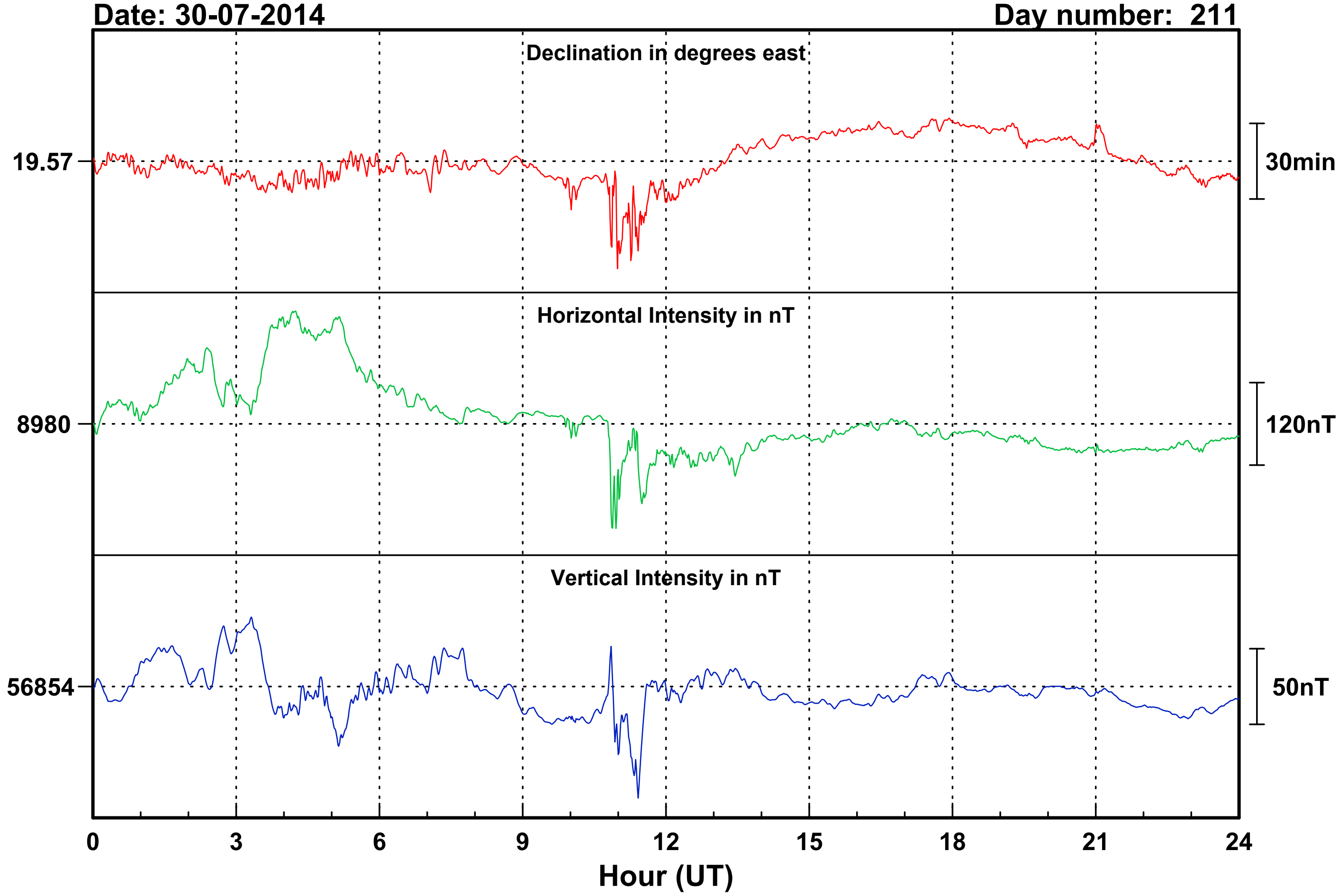
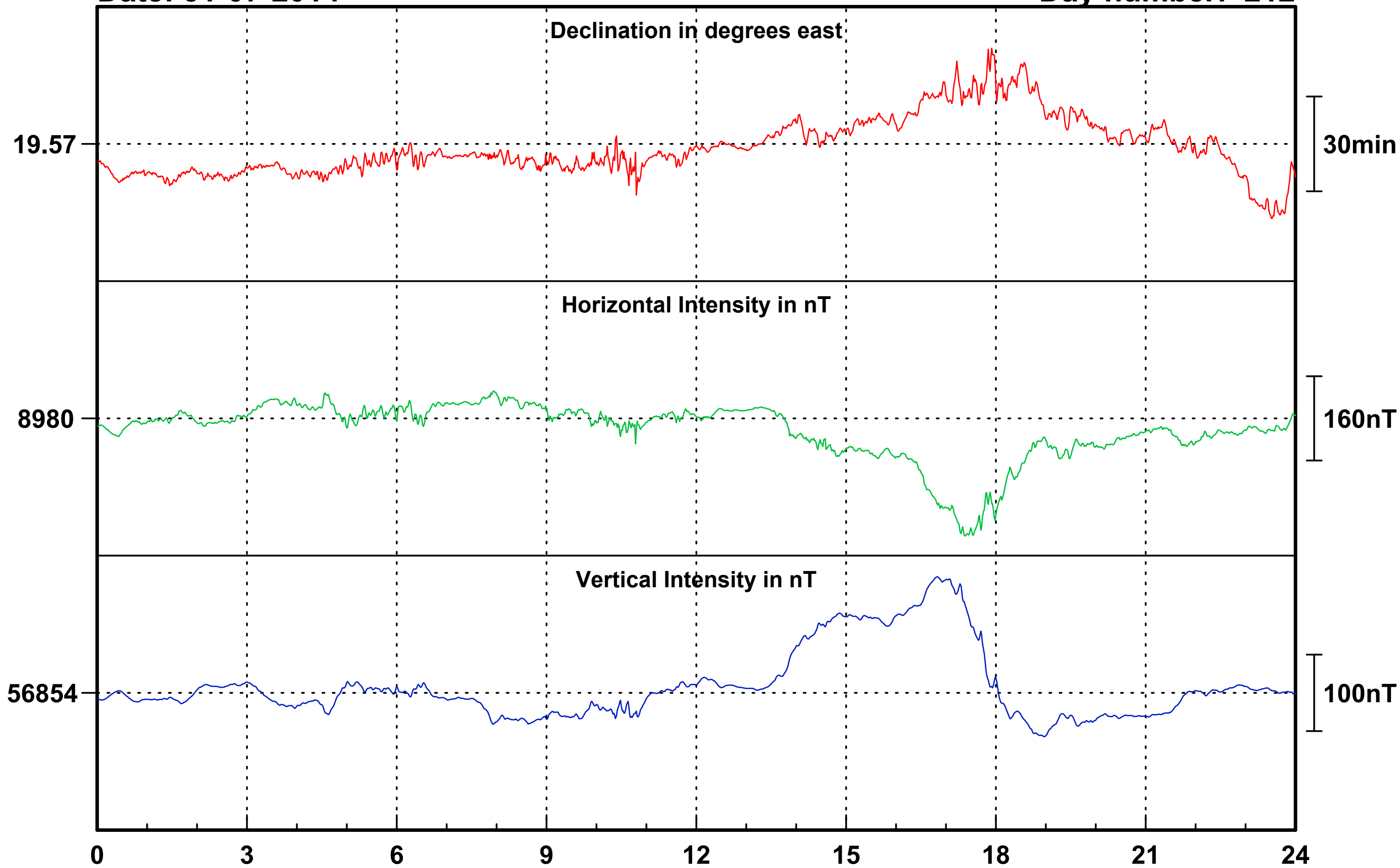
Date: 29-07-2014 Day number: 210

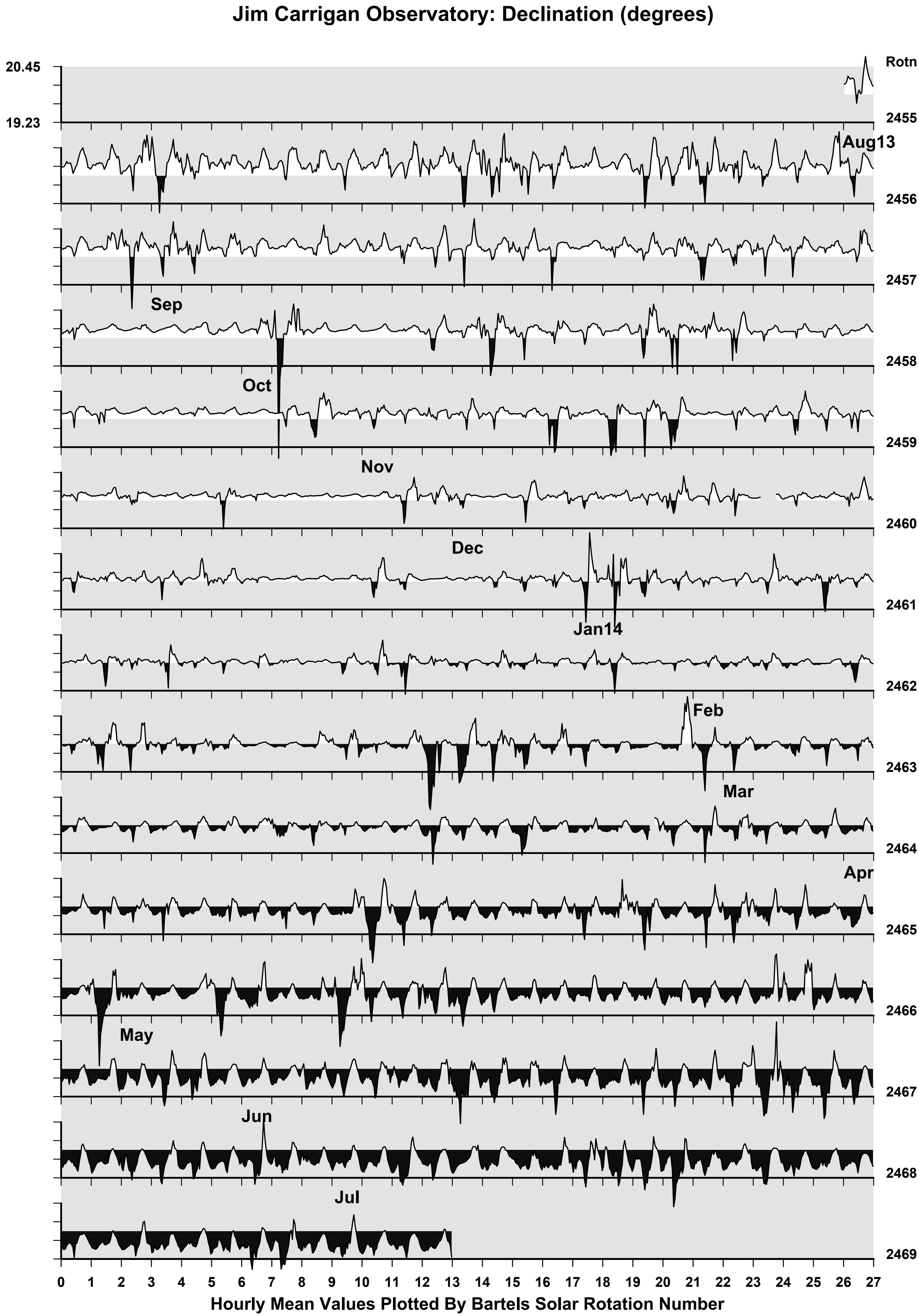


Date: 30-07-2014 Day number: 211

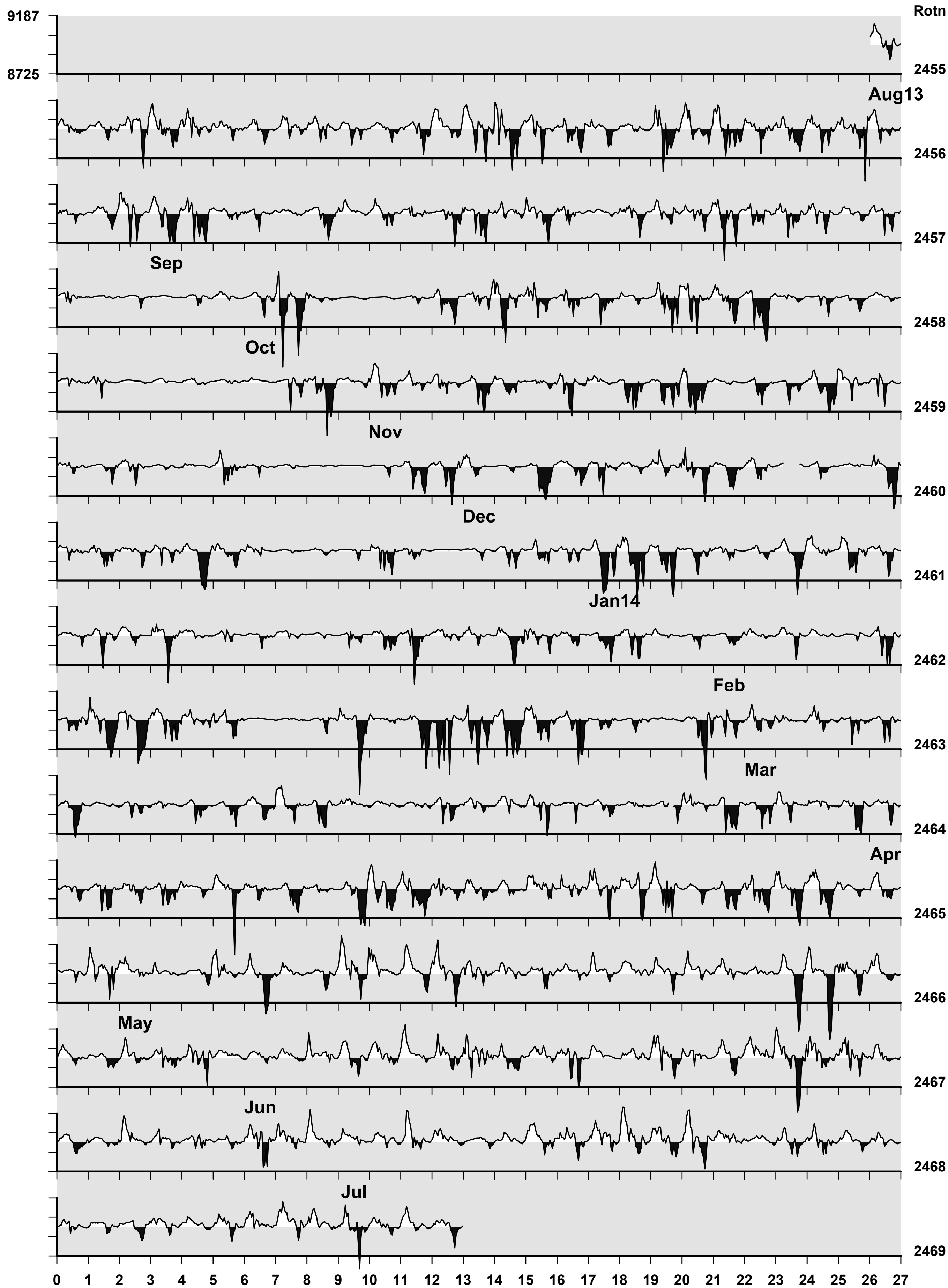


Date: 31-07-2014 **Jim Carrigan** Day number: 212



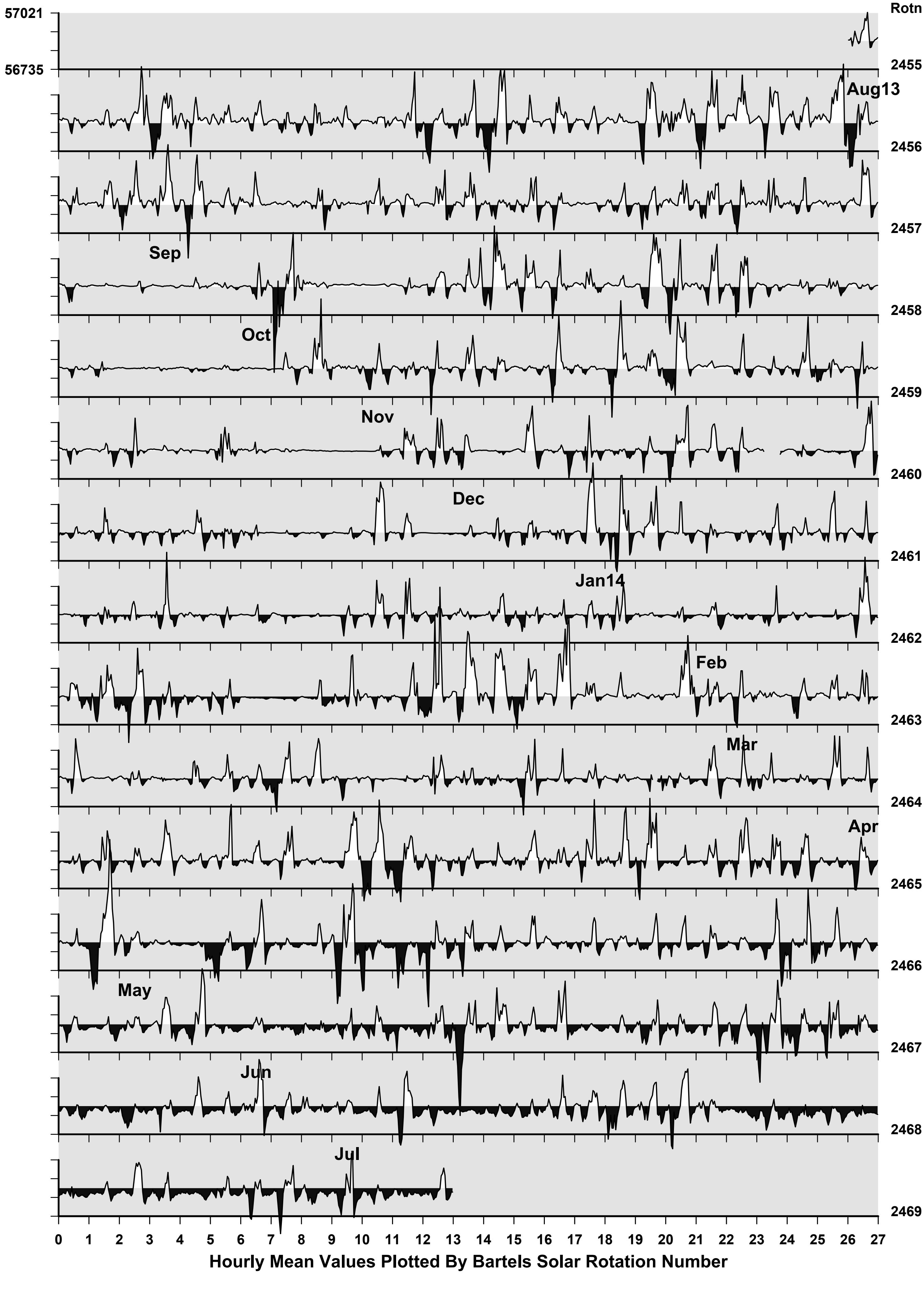

Jim Carrigan Observatory: Declination (degrees)
20.45
19.23
Rotn
2455
Aug13
2456
2457
Sep
2458
Oct
2459
Nov
2460
Dec
2461
Jan14
2462
Feb
2463
Mar
2464
Apr
2465
2466
May
2467
Jun
2468
Jul
2469
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Hourly Mean Values Plotted By Bartels Solar Rotation Number

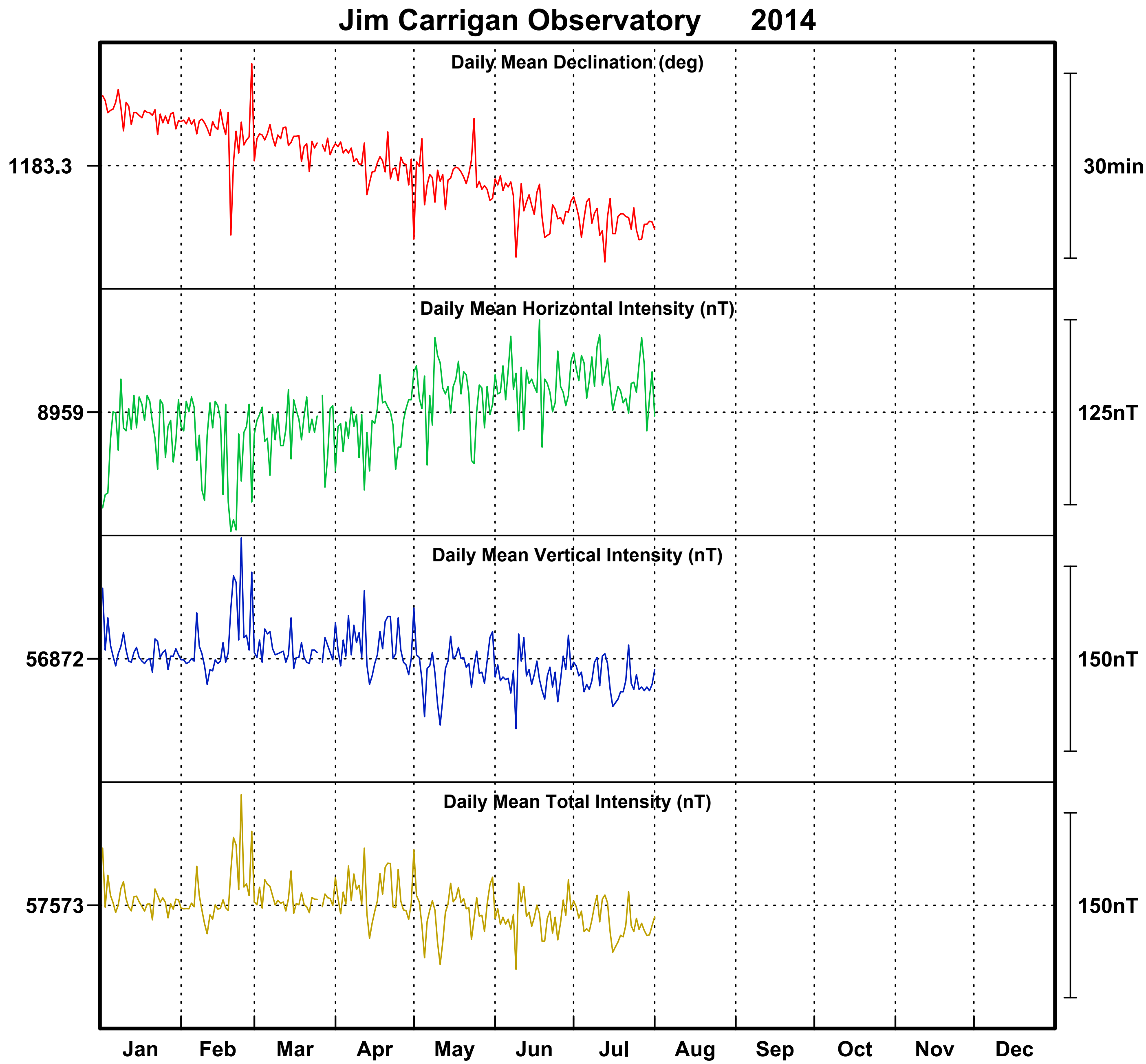
Jim Carrigan Observatory: Horizontal Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

Jim Carrigan Observatory: Vertical Intensity (nT)




Jim Carrigan Observatory 2014
Daily Mean Declination (deg)
1183.3
30min
Daily Mean Horizontal Intensity (nT)
8959
125nT
Daily Mean Vertical Intensity (nT)
56872
150nT
Daily Mean Total Intensity (nT)
57573
150nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Jim Carrigan Observatory 2014

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	19° 51.8´	8947 nT	81° 3.6´	8415 nT	3040 nT	56878 nT	57578 nT
February	19° 48.9´	8935 nT	81° 4.4´	8406 nT	3029 nT	56886 nT	57584 nT
March	19° 47.2´	8948 nT	81° 3.6´	8420 nT	3029 nT	56879 nT	57579 nT
April	19° 43.4´	8951 nT	81° 3.5´	8426 nT	3021 nT	56883 nT	57583 nT
May	19° 41.4´	8970 nT	81° 2.1´	8446 nT	3022 nT	56864 nT	57567 nT
June	19° 36.8´	8977 nT	81° 1.7´	8456 nT	3013 nT	56860 nT	57564 nT
July	19° 34.2´	8980 nT	81° 1.5´	8461 nT	3008 nT	56854 nT	57559 nT

Note

i. The values shown here are provisional.