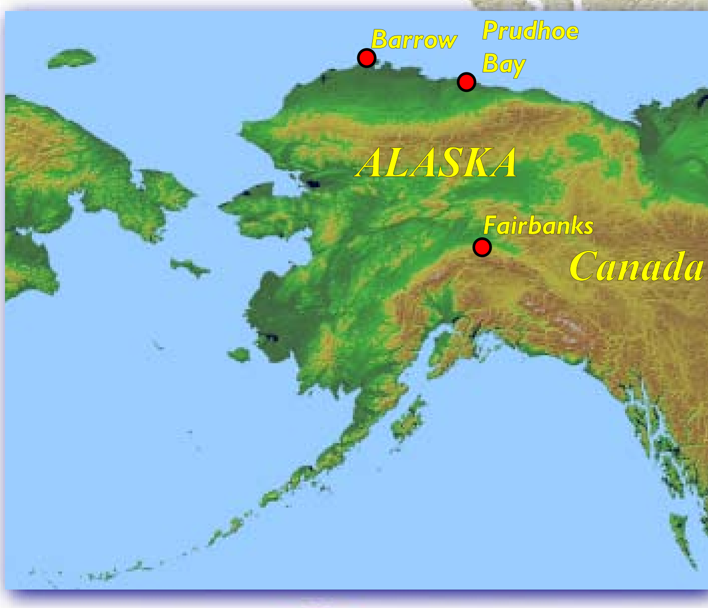
BRITISH GEOLOGICAL SURVEY

Jim Carrigan Observatory Prudhoe Bay Monthly Magnetic Bulletin

November 2010

10/11/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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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:	*70.356 °N*	*211.201 °E*
Geomagnetic:	*70.245 °N*	*255.300 °E*
Height above mean sea level:		*10m (approx)*

The geomagnetic co-ordinates are approximations, calculated using the 11th generation International Geomagnetic Reference Field (IGRF) at epoch 2010.5. On-line access to models (including IGRF), charts and navigational data are available at www.geomag.bgs.ac.uk/navigation.html

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

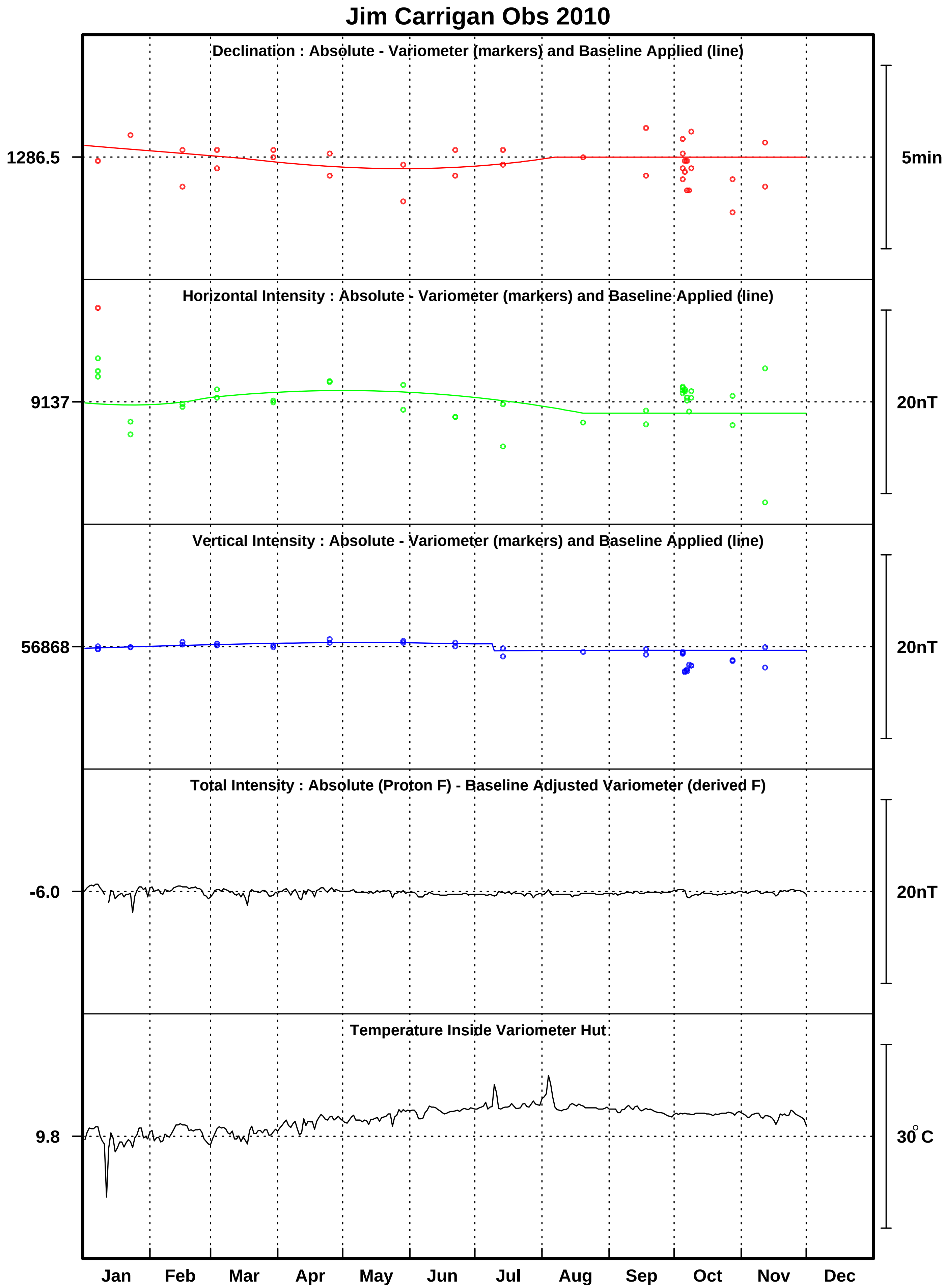
Daily mean values of *D*, *H*, *Z* and *F* are plotted throughout the year. In addition, a table of monthly mean values of all the geomagnetic elements is provided. These values depend on accurate specification of the fluxgate sensor baselines. It is anticipated that these provisional values will not 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

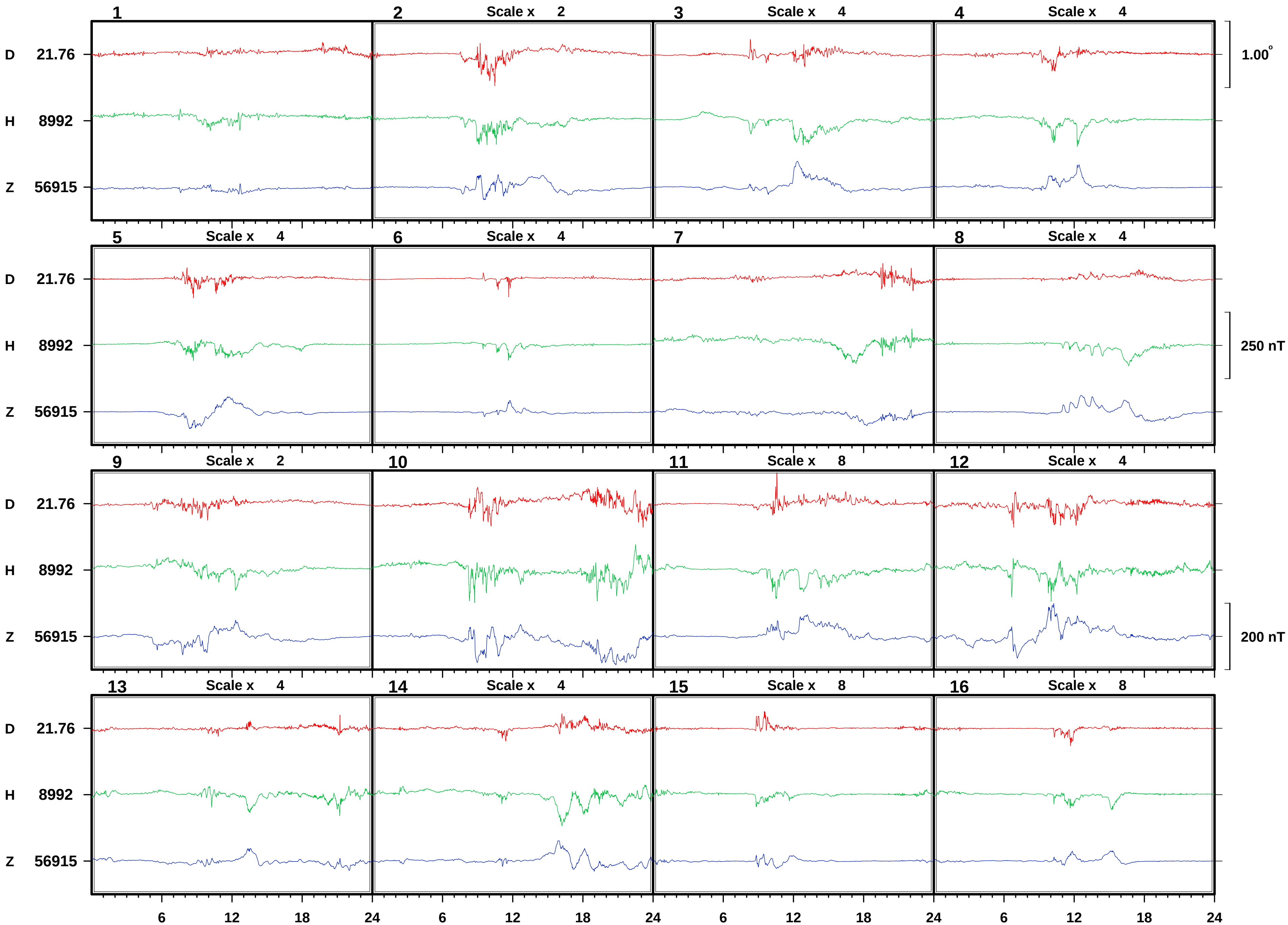
The data presented in this bulletin are provided for personal, academic, educational, non-commercial research or other non-commercial use and are not for sale or distribution to third parties without written permission from BGS.

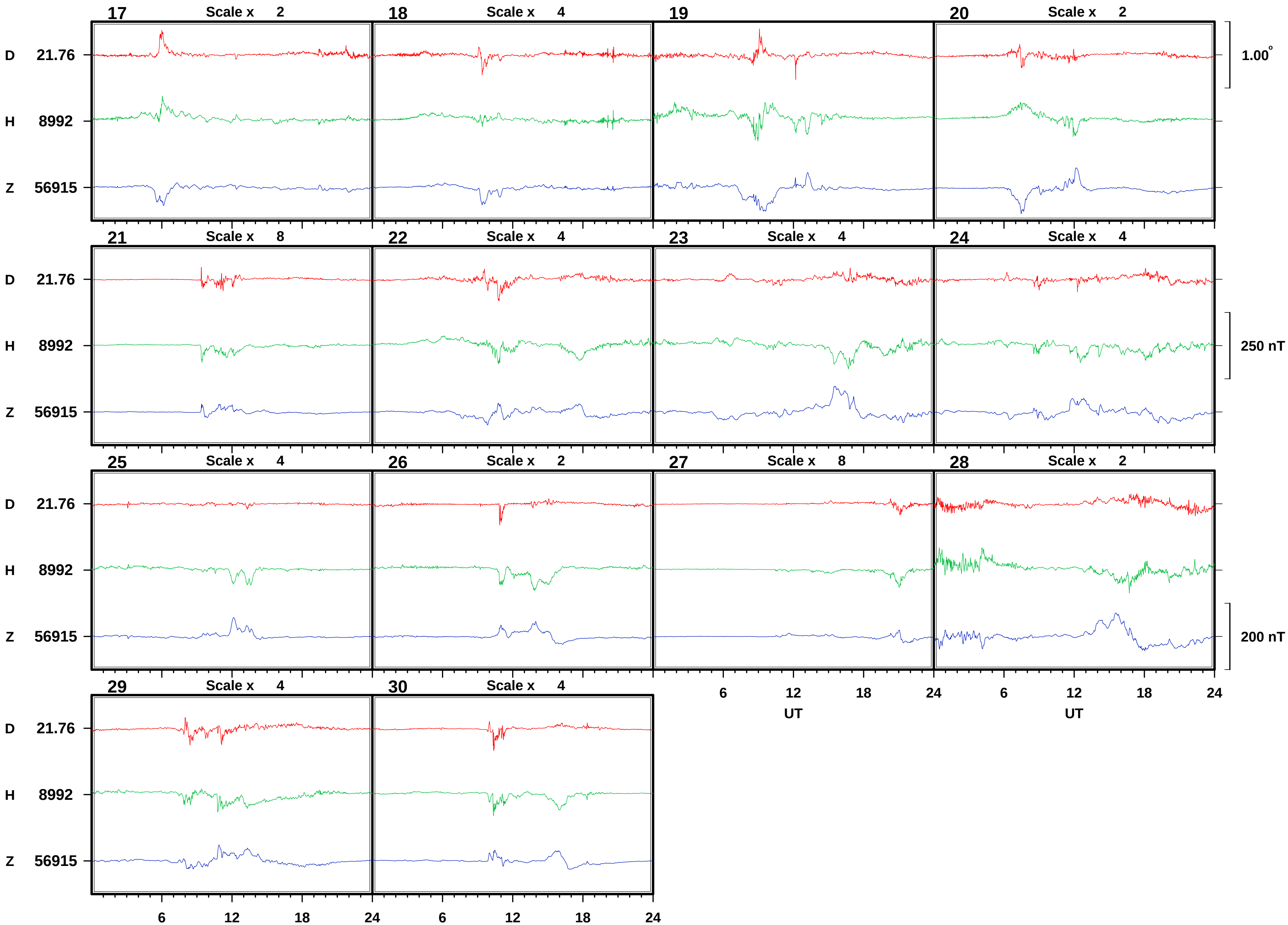
Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: ‘The results presented in this paper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


Jim Carrigan Obs 2010
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
1286.5
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
9137
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
56868
20nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
-6.0
20nT
Temperature Inside Variometer Hut
9.8
30 °C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Jim Carrigan November 2010





Jim Carrigan November 2010

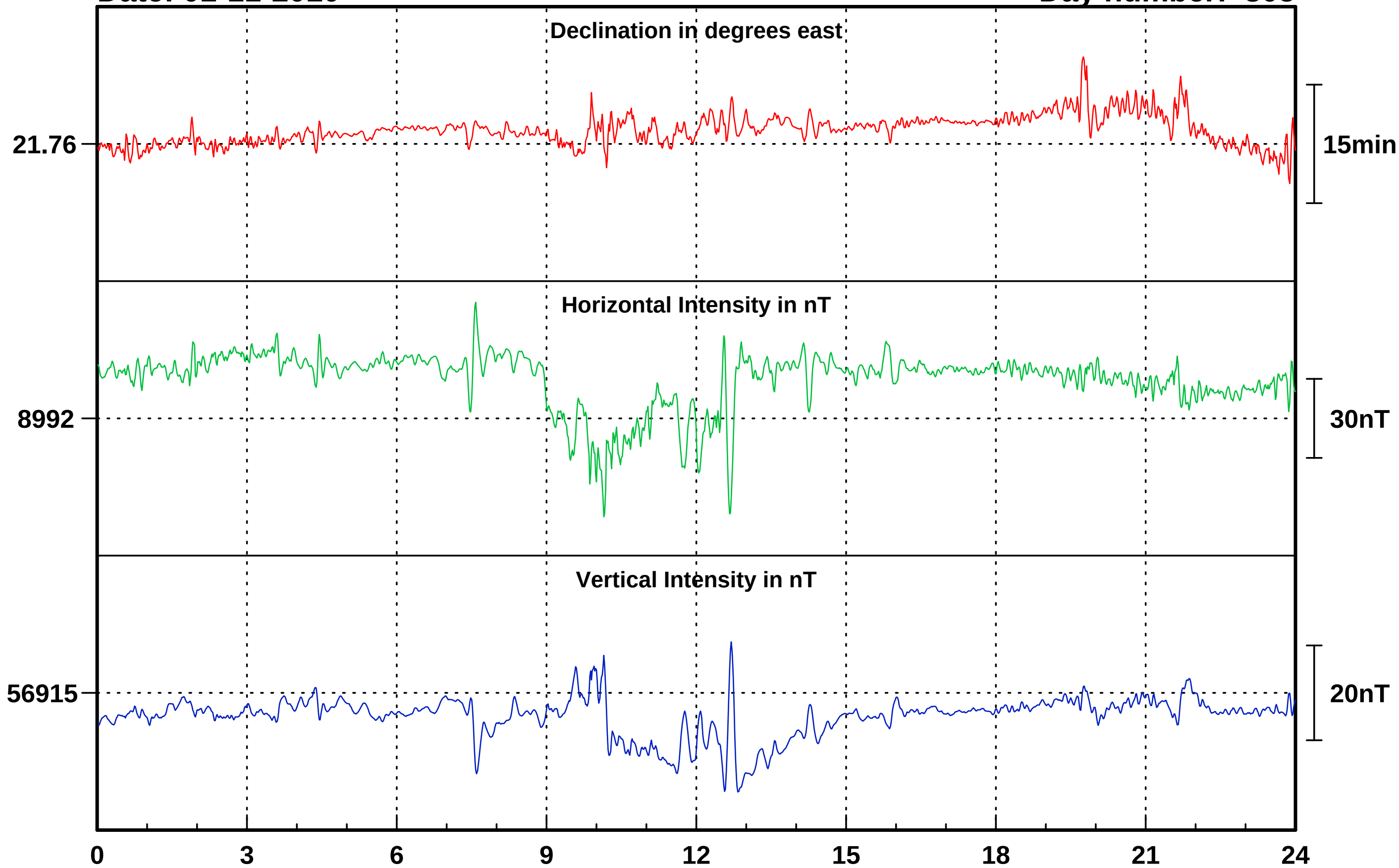
JIM CARRIGAN OBSERVATORY

ABSOLUTE OBSERVATIONS

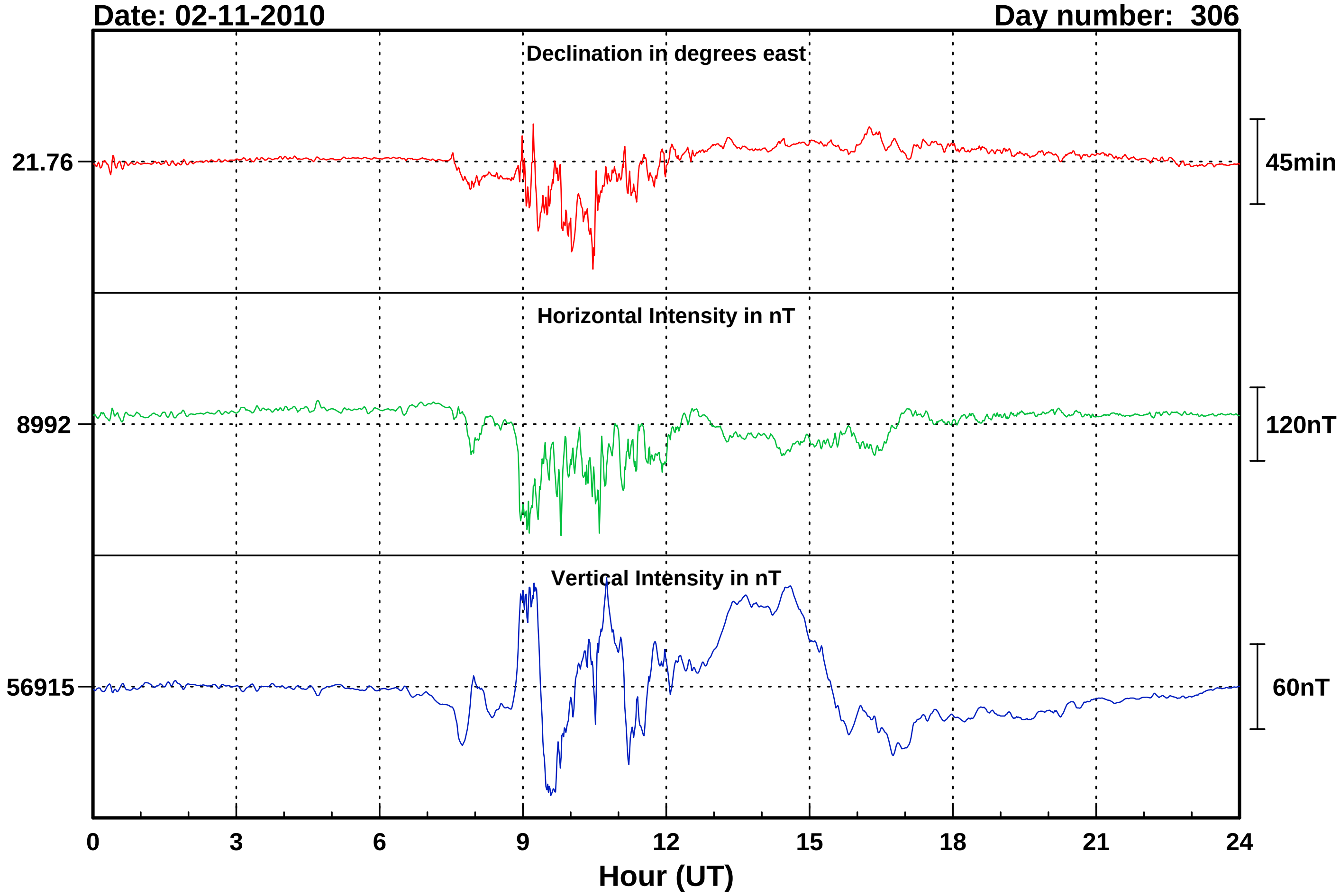
		Declination			Inclination		Total Field		Horizontal Intensity		Vertical Intensity		
Date	**Day Number**	**Time (UT)**	**Absolute (º)**	**Baseline (º)**	**Time (UT)**	**Absolute (º)**	**Site difference (nT)**	**Absolute corrected (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Observer**
11-Nov-10	315	22:41	21.7582	21.4283	22:49	80.9851	5.1	57571.3	9020.9	9140.8	56860.1	56865.4	PS
11-Nov-10	315	22:55	21.8176	21.4483	23:03	81.0160	5.1	57561.7	8988.7	9126.2	56855.5	56867.6	PS

Jim Carrigan

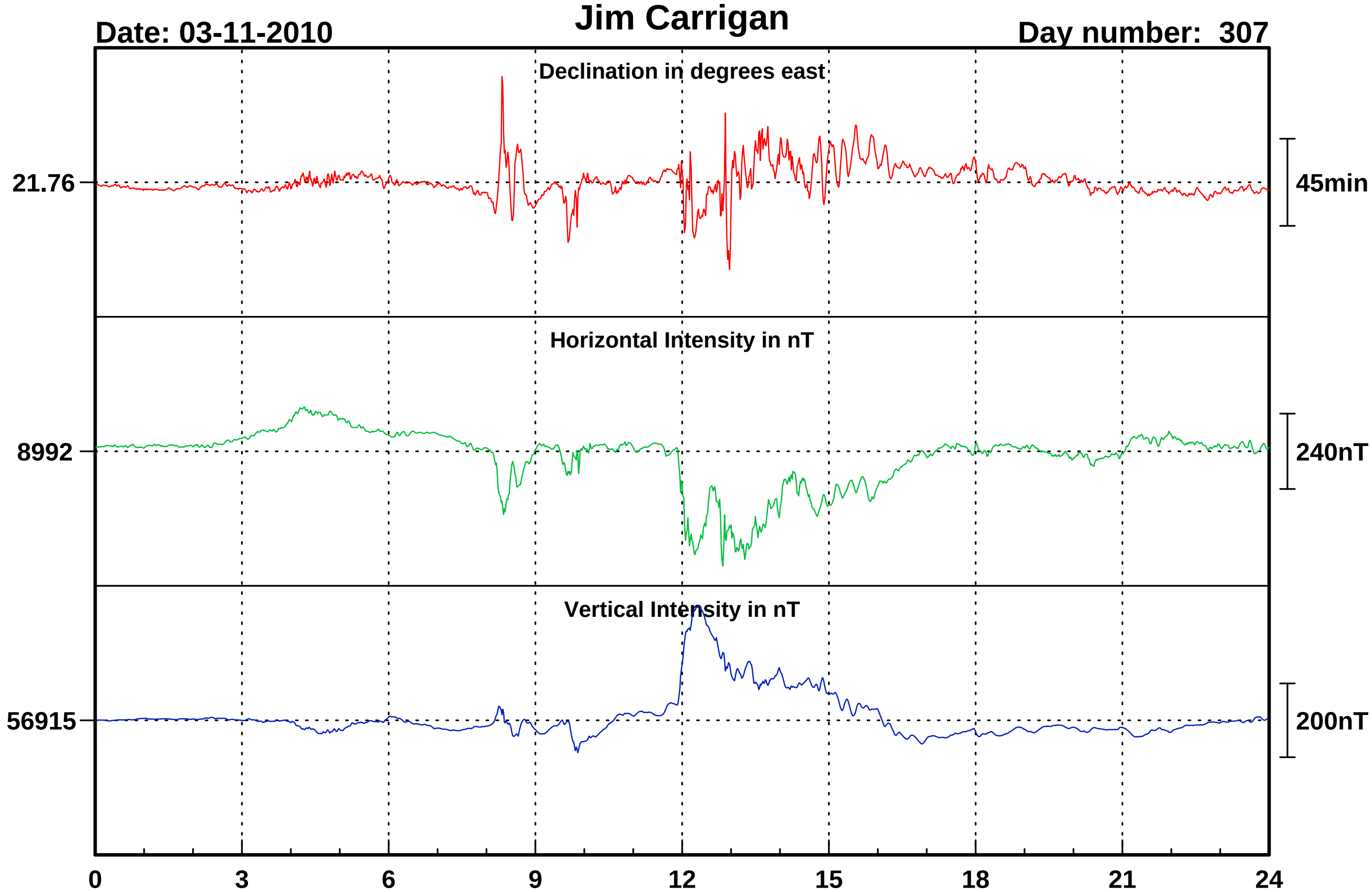
Date: 01-11-2010 **Day number: 305**

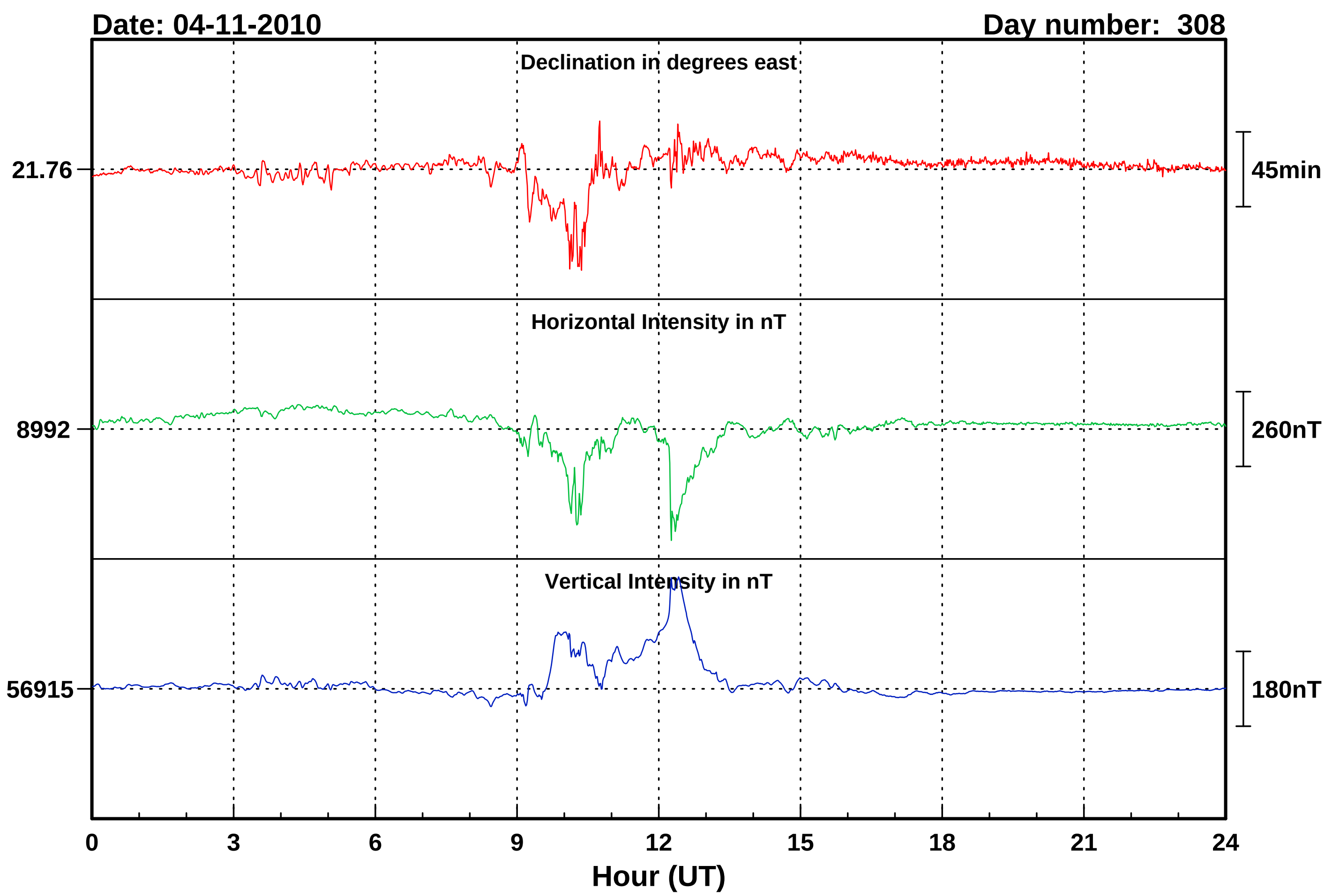


Date: 02-11-2010 **Day number: 306**



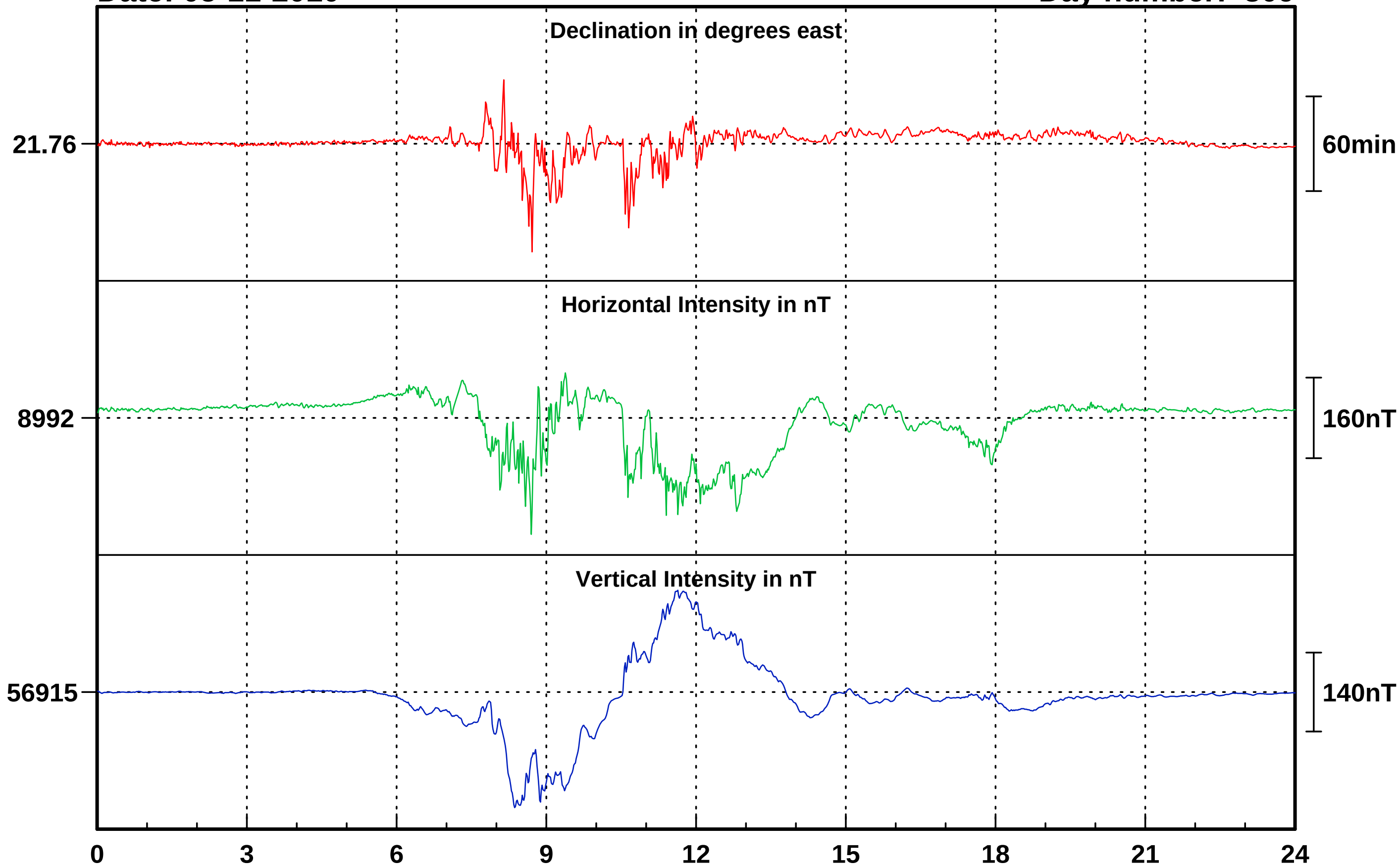
Jim Carrigan



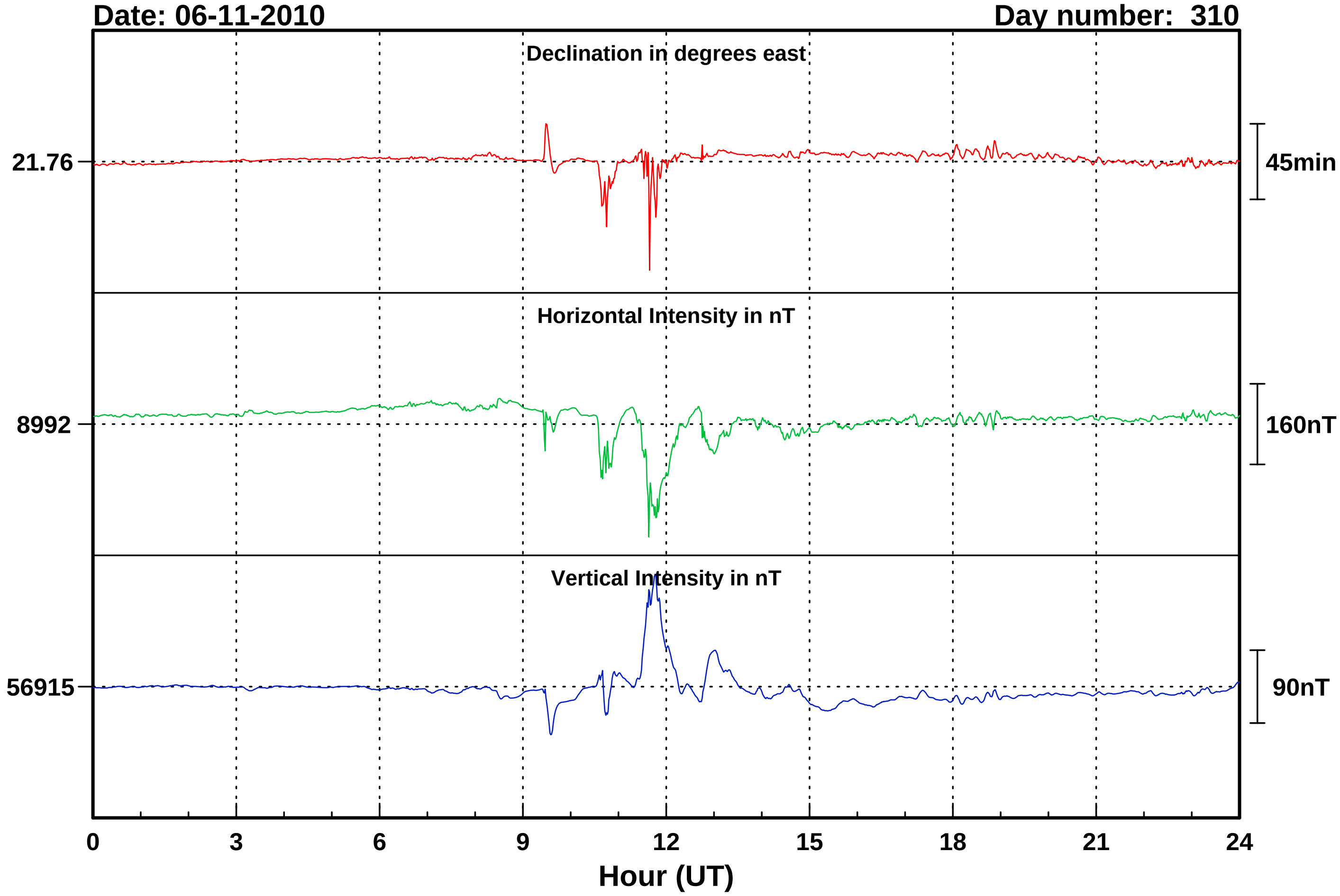


Jim Carrigan

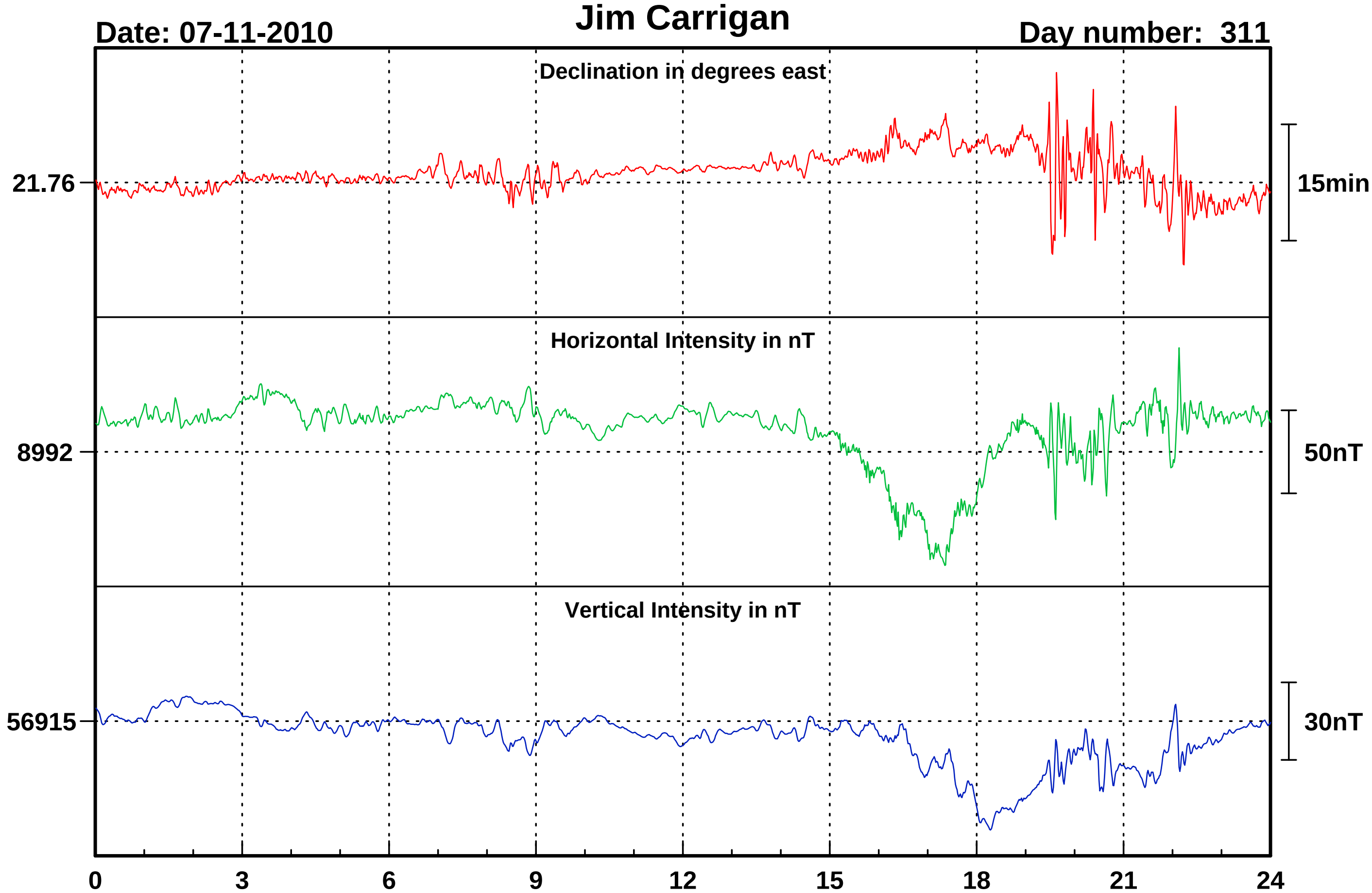
Date: 05-11-2010 Day number: 309

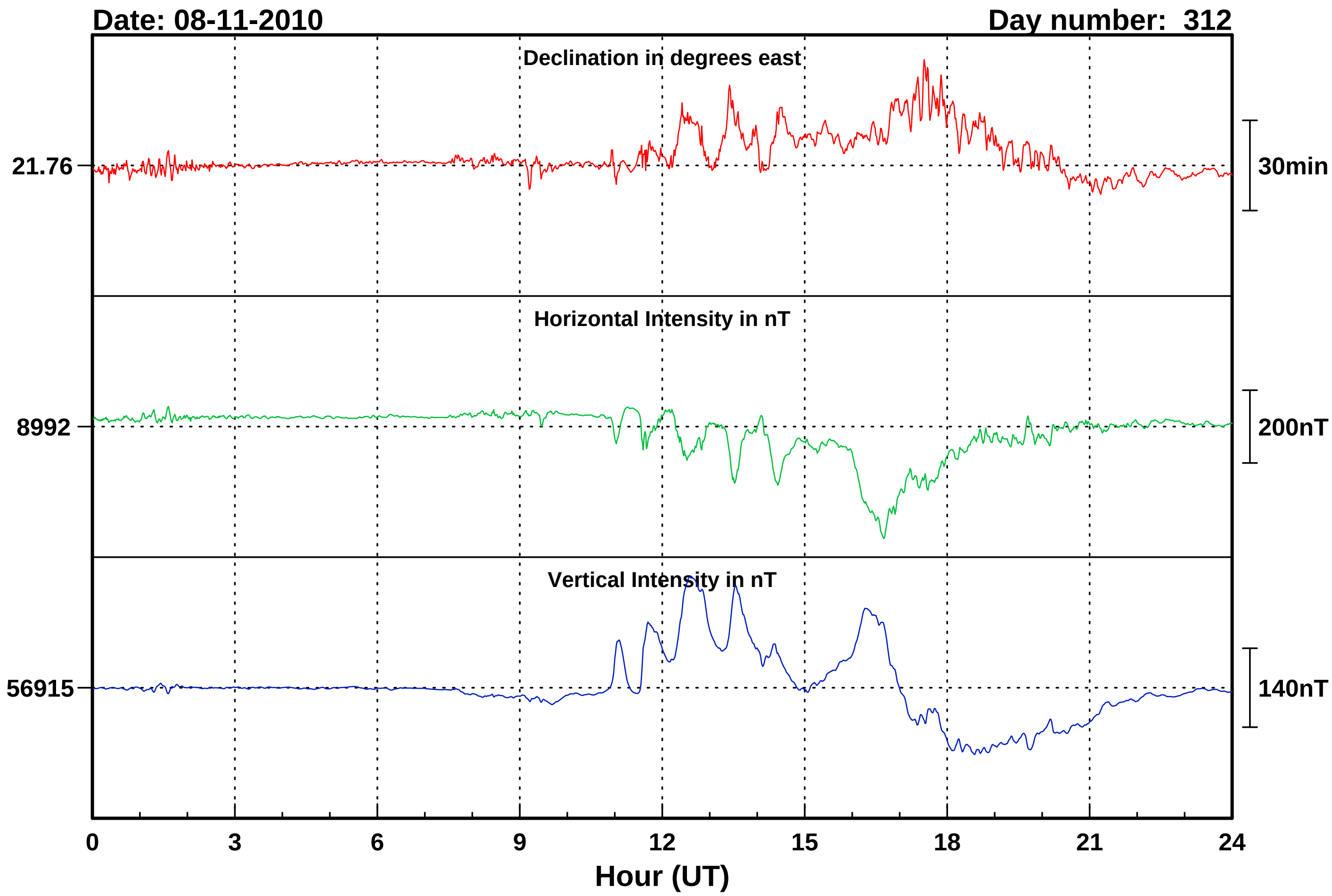


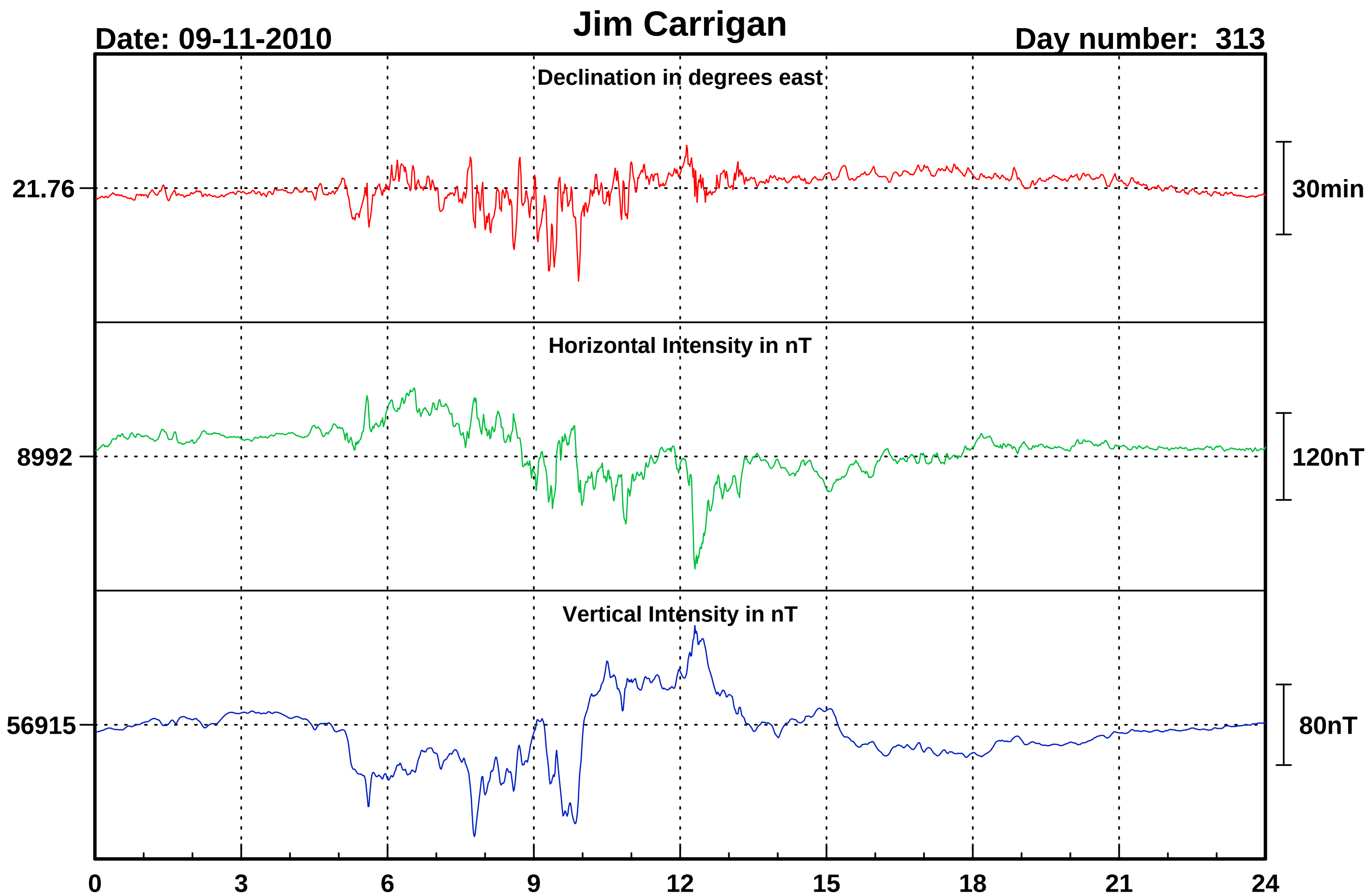
Date: 06-11-2010 Day number: 310

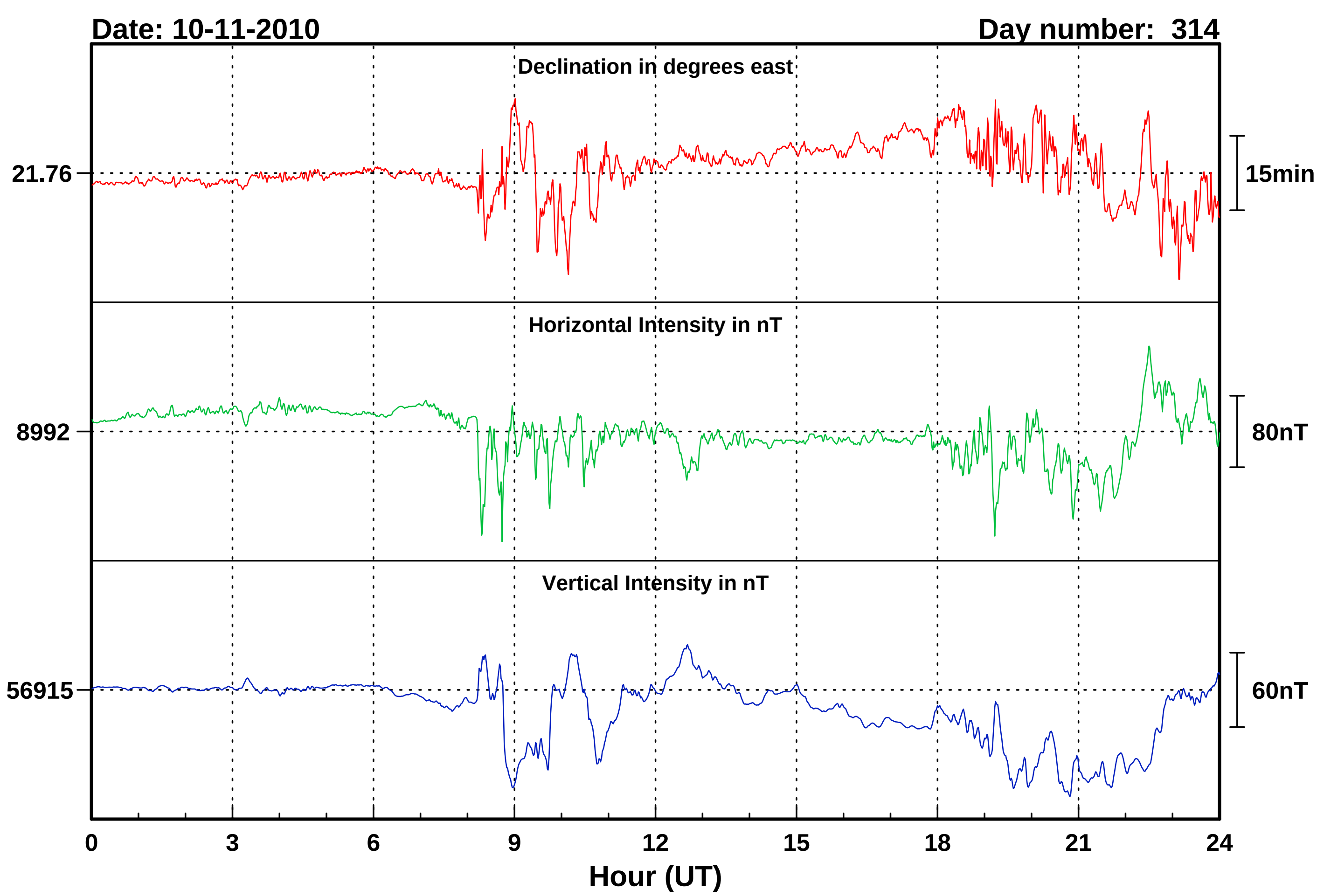


Jim Carrigan



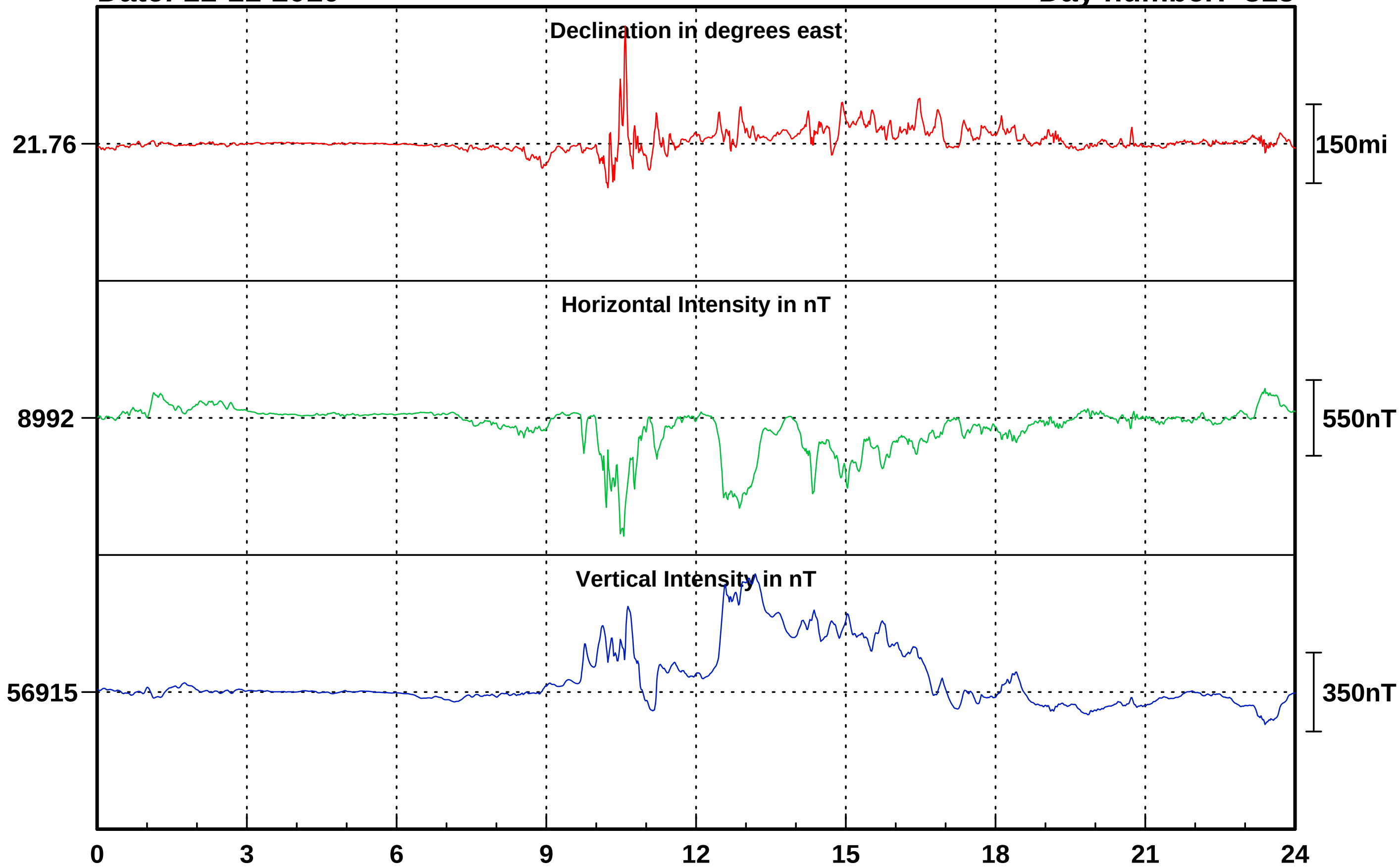



Jim Carrigan
Date: 09-11-2010
Day number: 313
Declination in degrees east
21.76
30min
Horizontal Intensity in nT
8992
120nT
Vertical Intensity in nT
56915
80nT
0
3
6
9
12
15
18
21
24

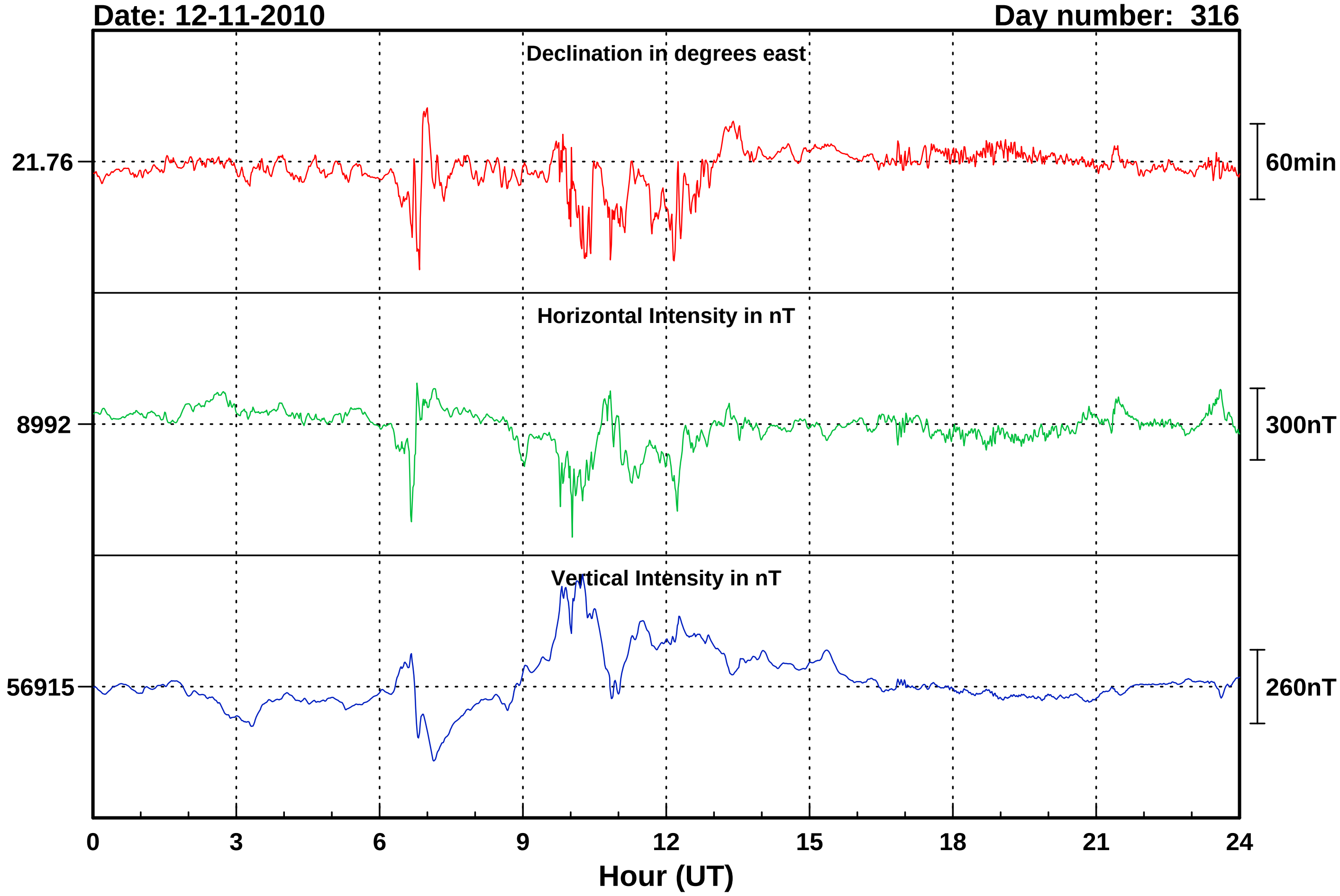

Date: 10-11-2010
Day number: 314
Declination in degrees east
21.76
15min
Horizontal Intensity in nT
8992
80nT
Vertical Intensity in nT
56915
60nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Jim Carrigan

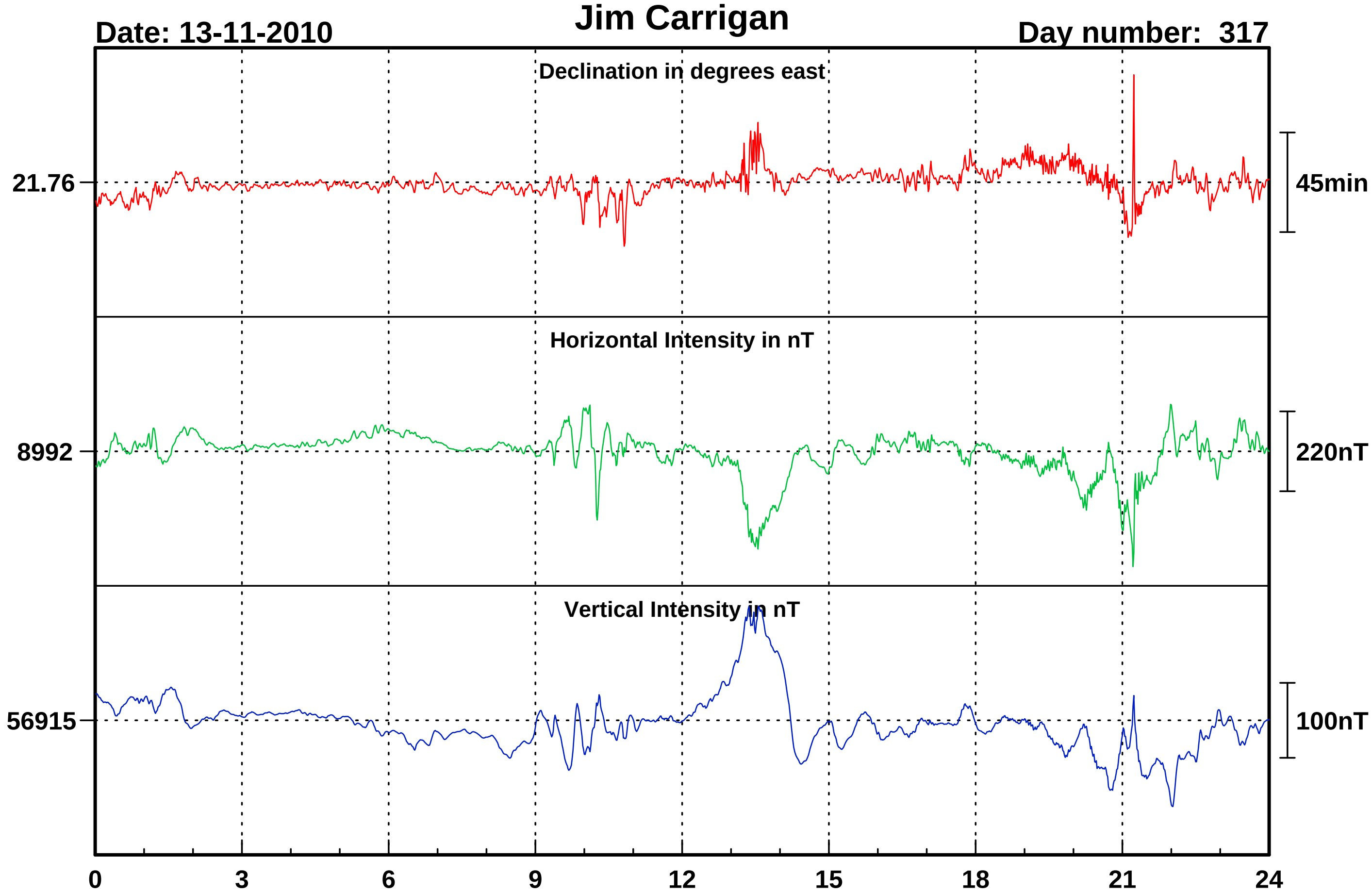
Date: 11-11-2010 Day number: 315

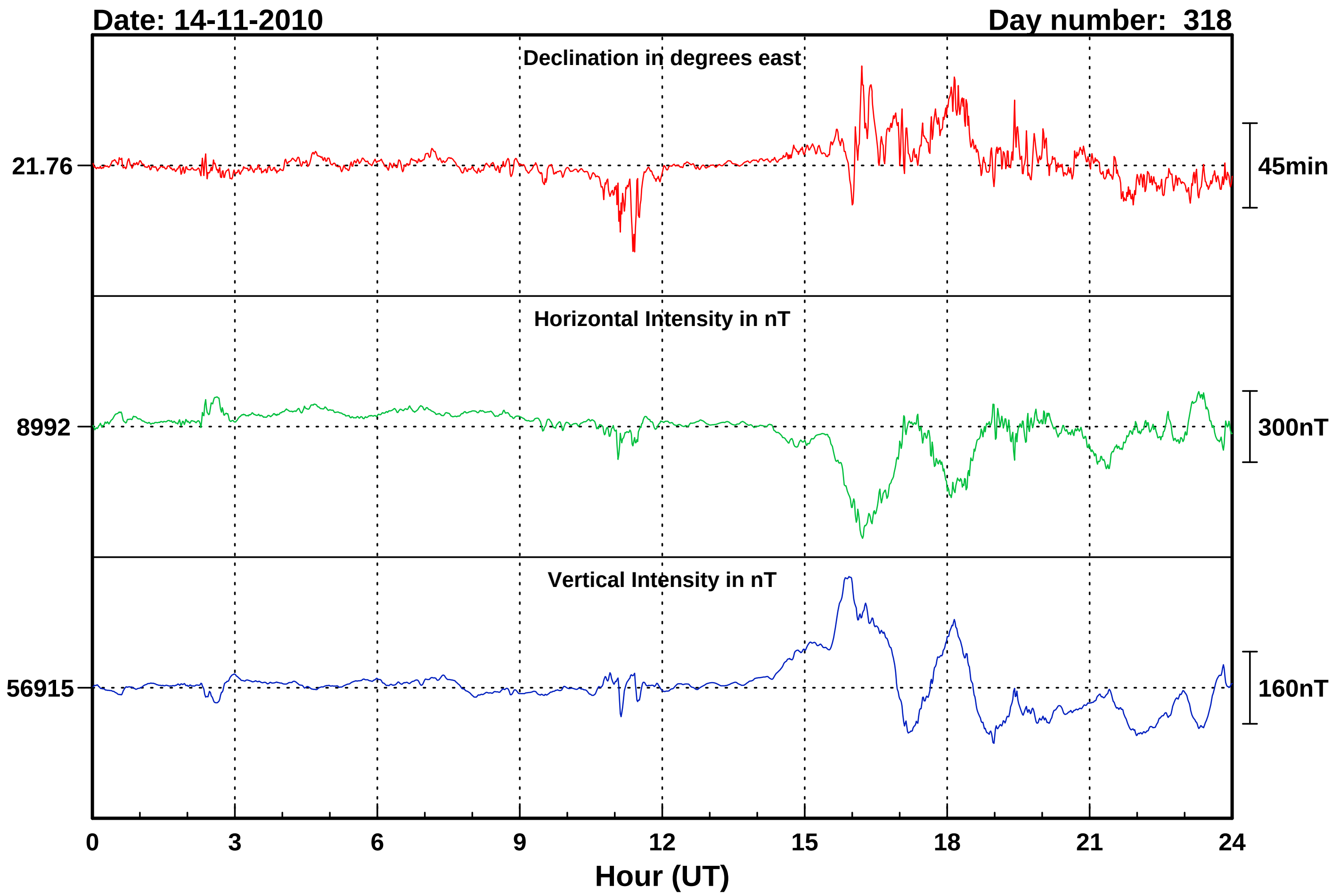


Date: 12-11-2010 Day number: 316

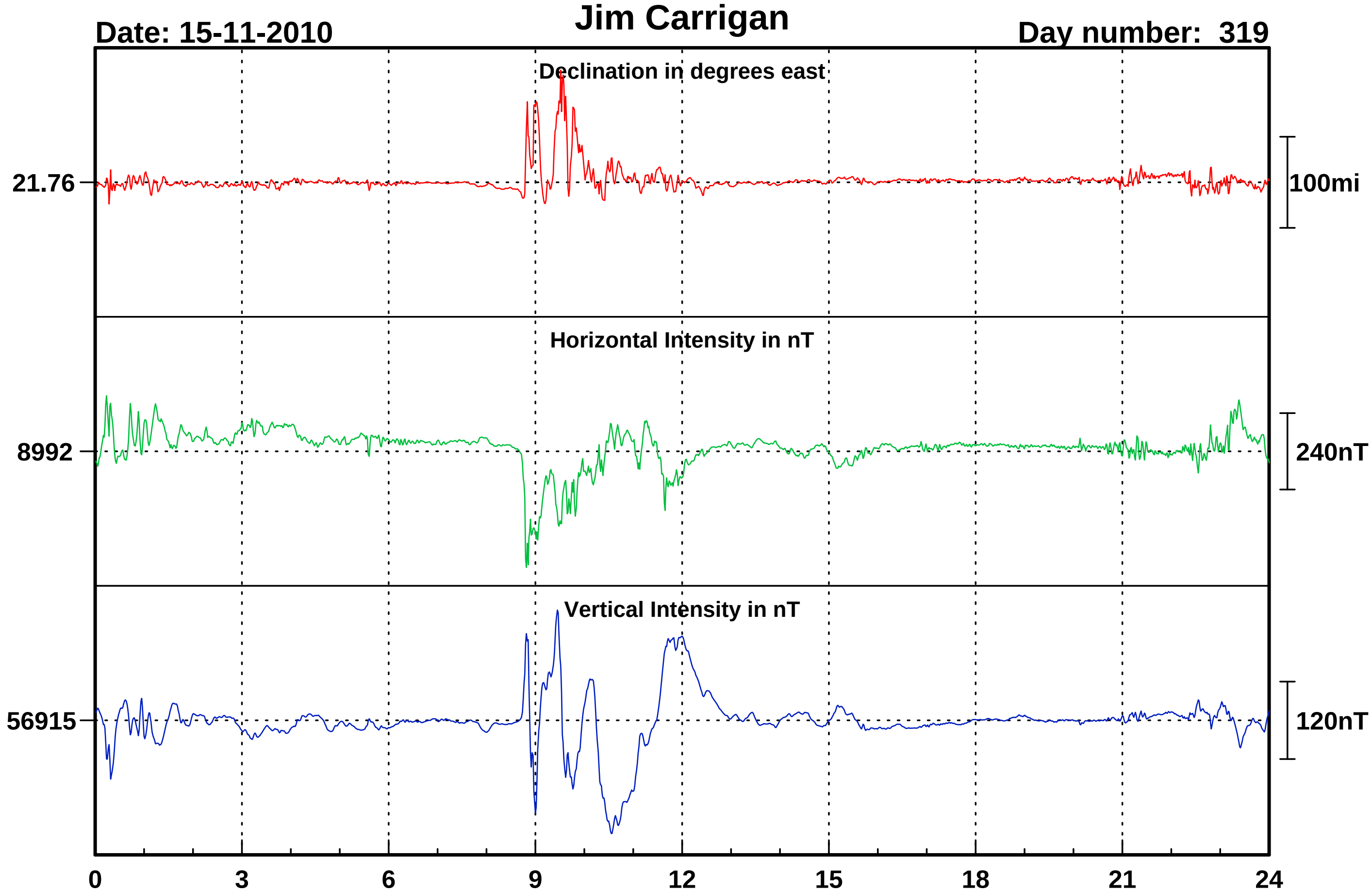


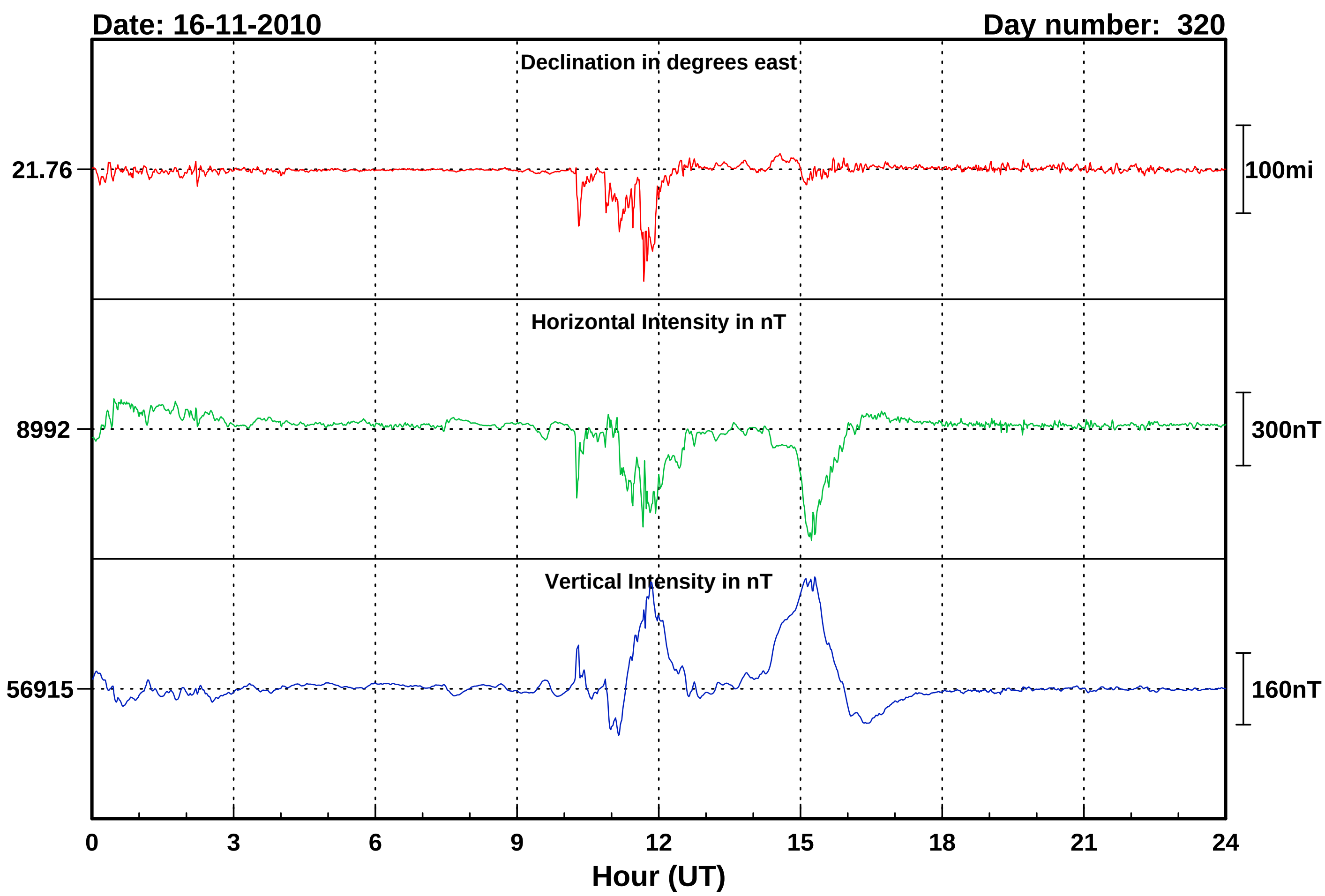
Jim Carrigan



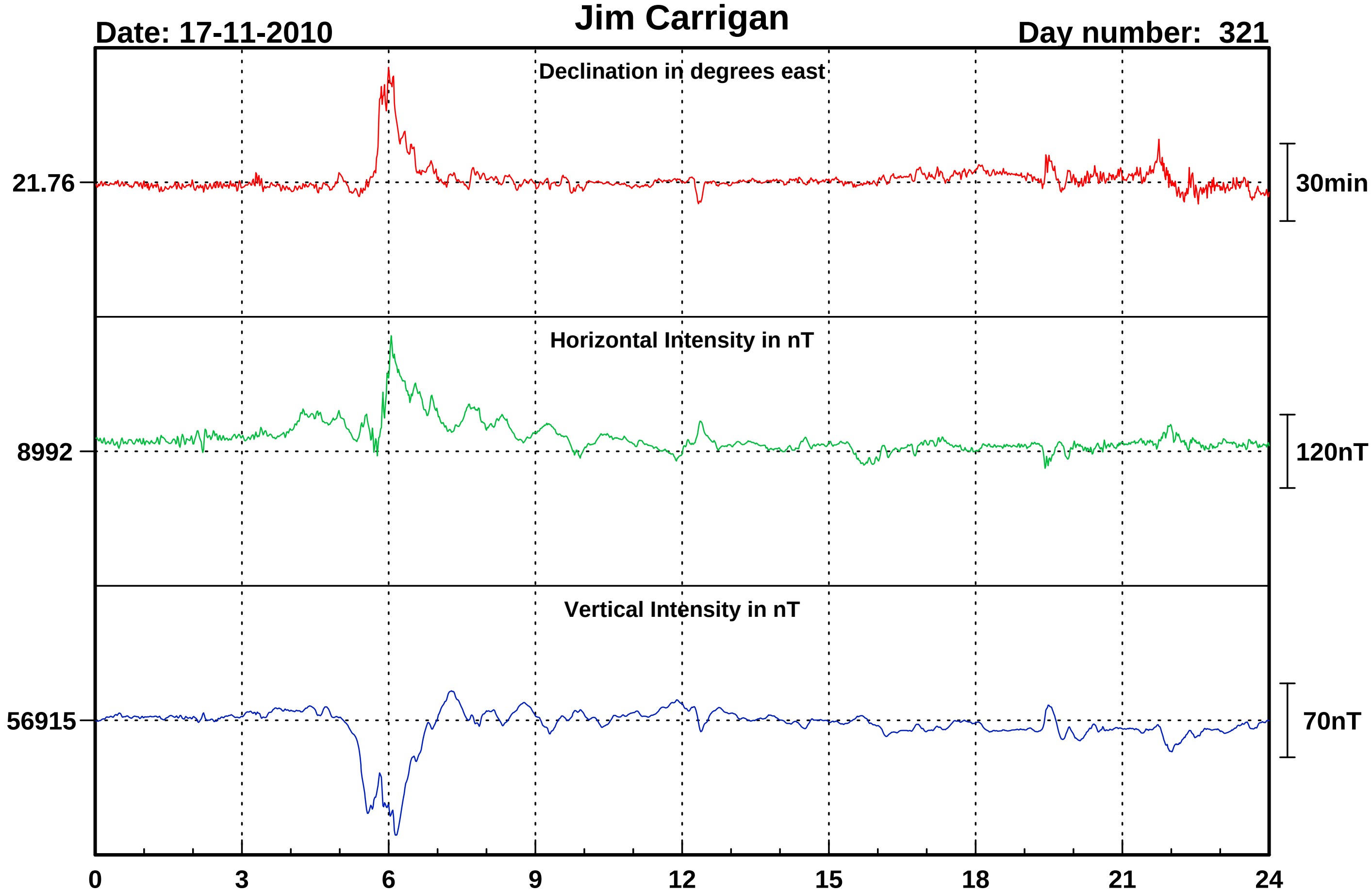


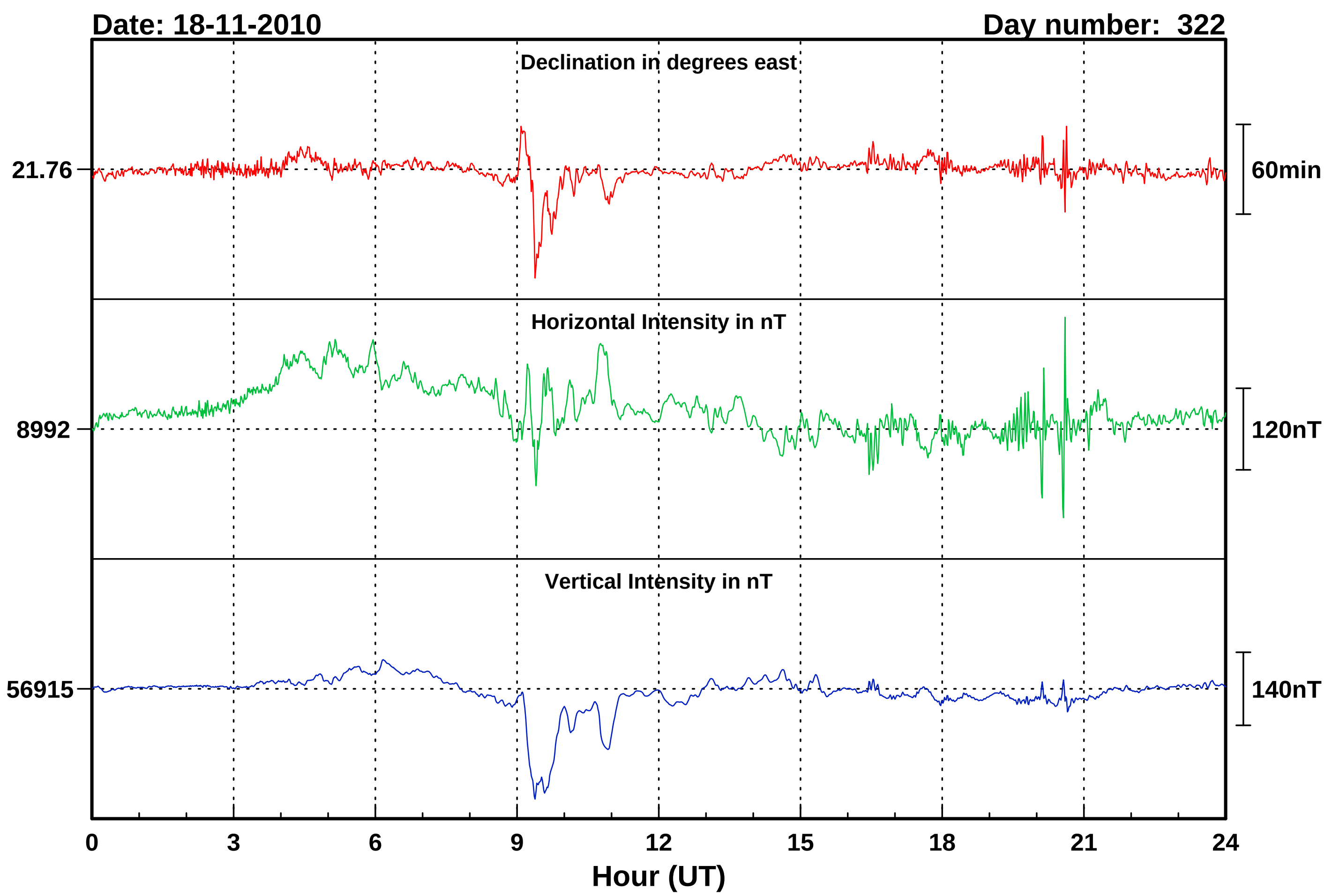
Jim Carrigan





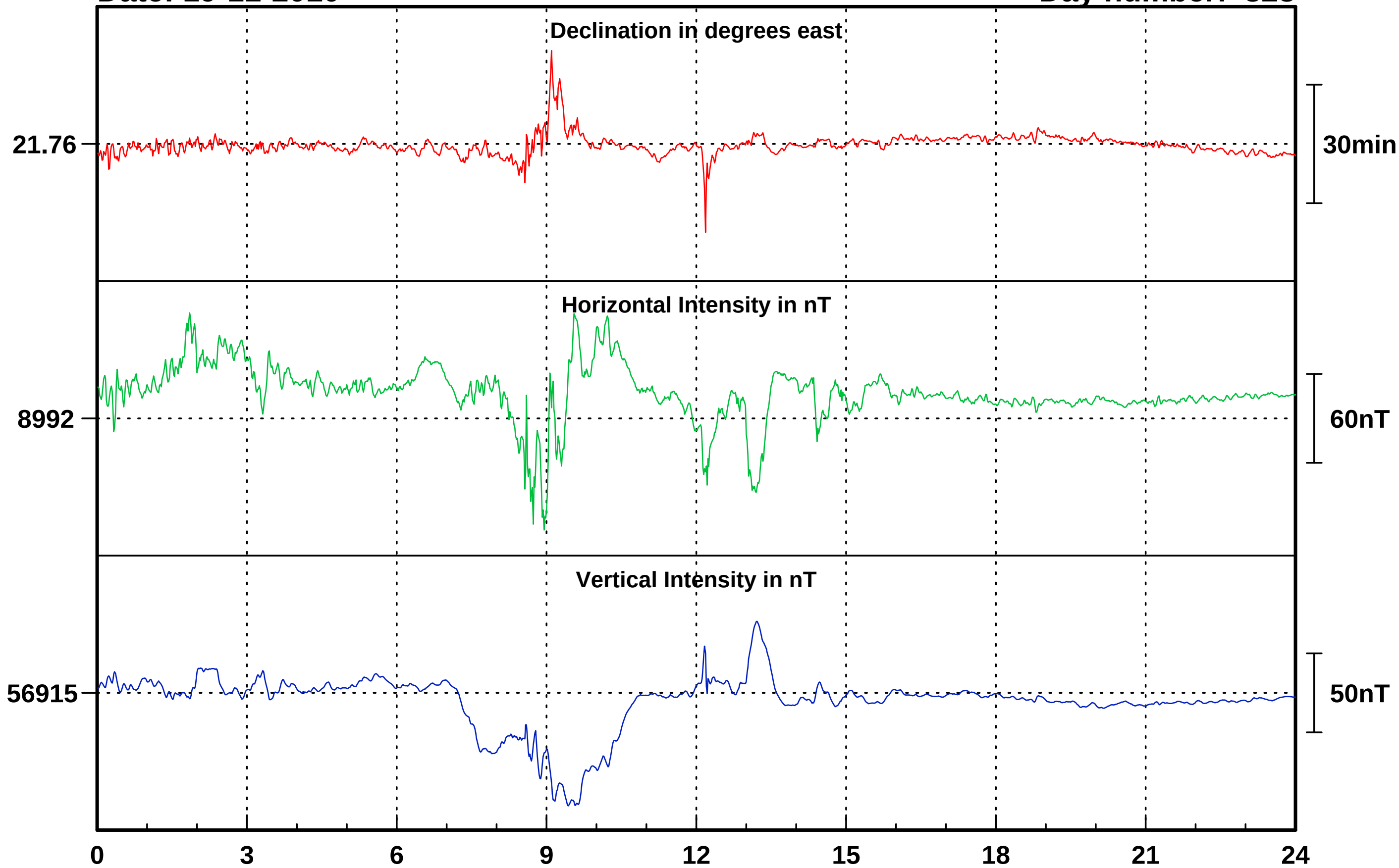
Jim Carrigan



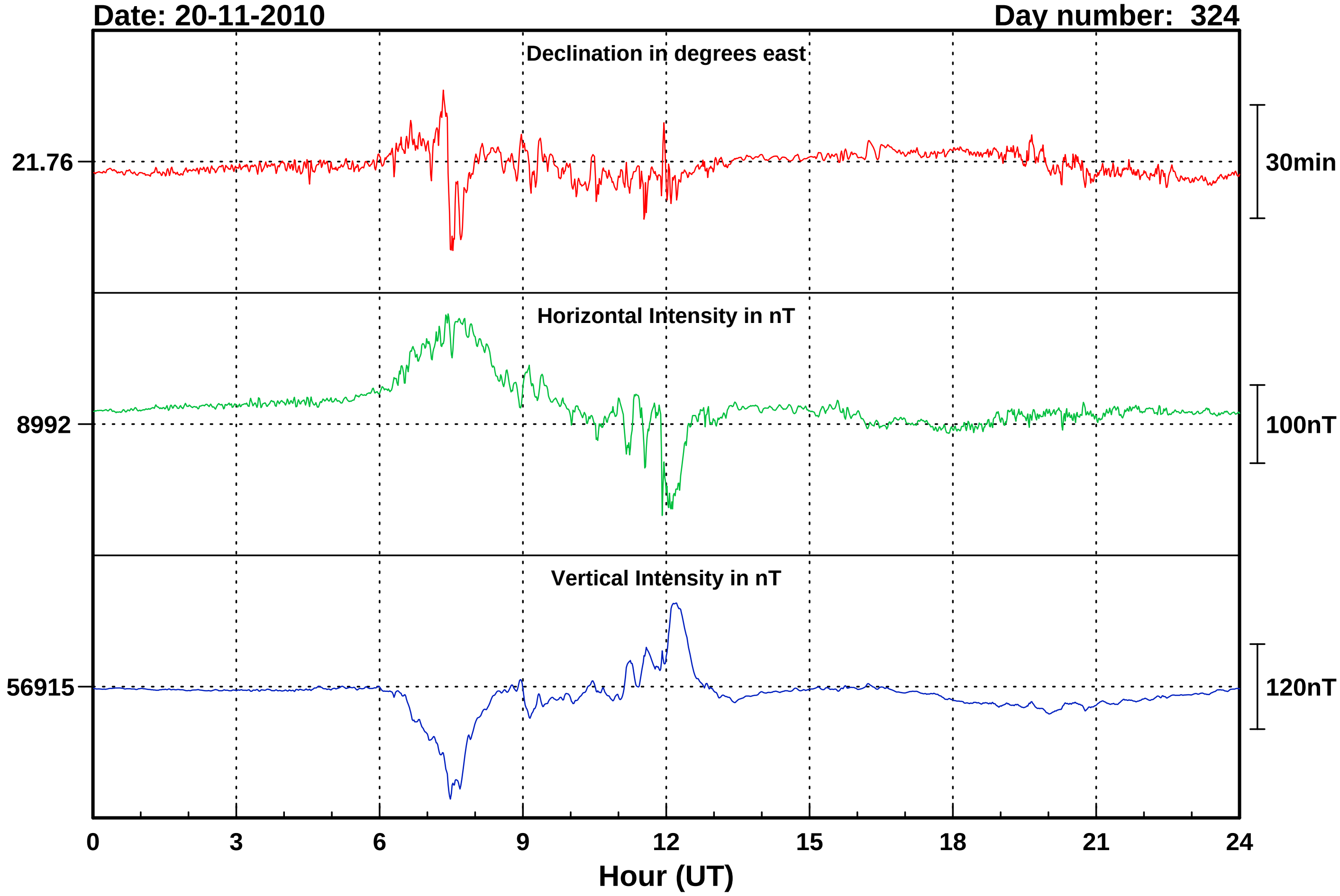


Jim Carrigan

Date: 19-11-2010 Day number: 323

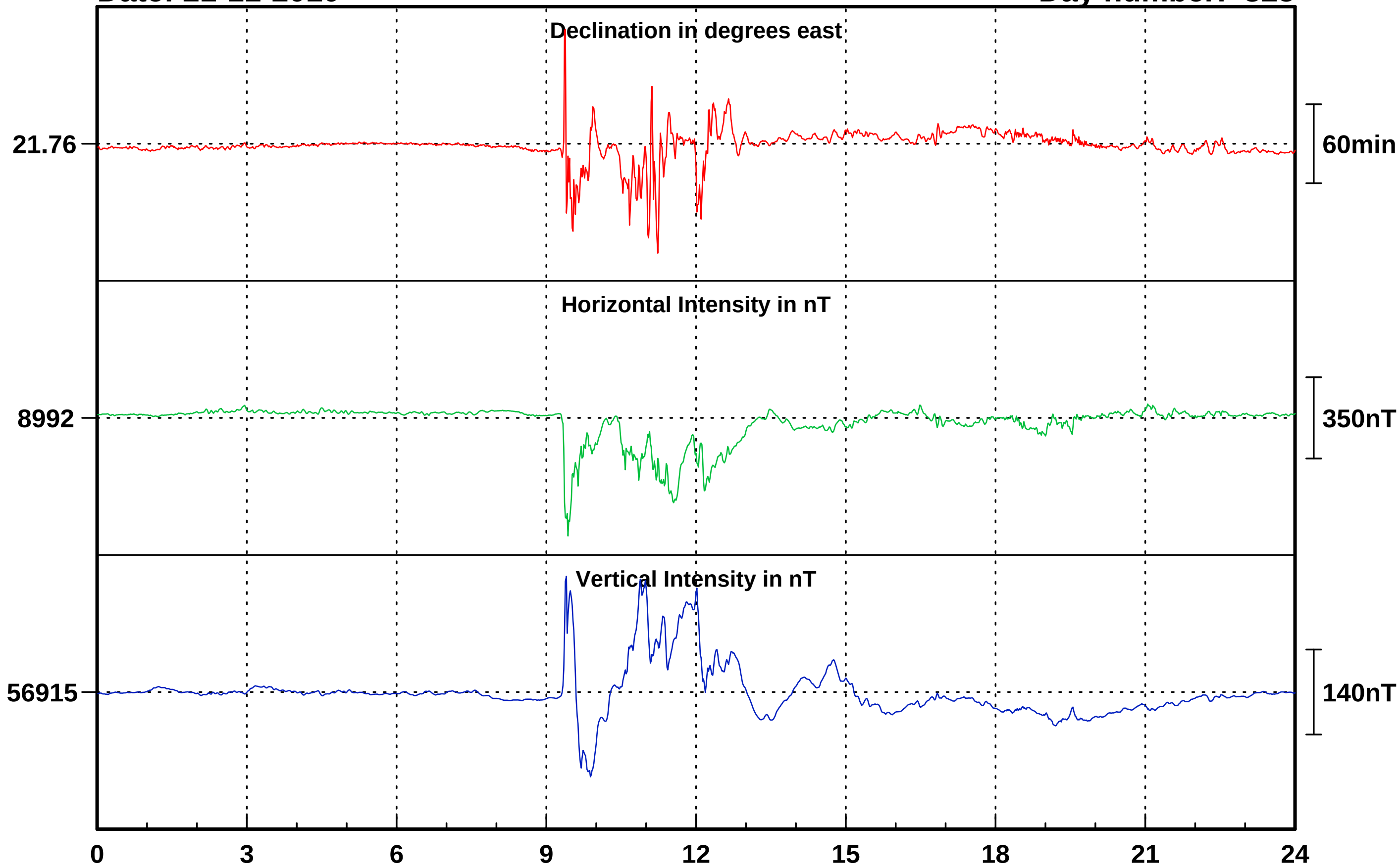


Date: 20-11-2010 Day number: 324

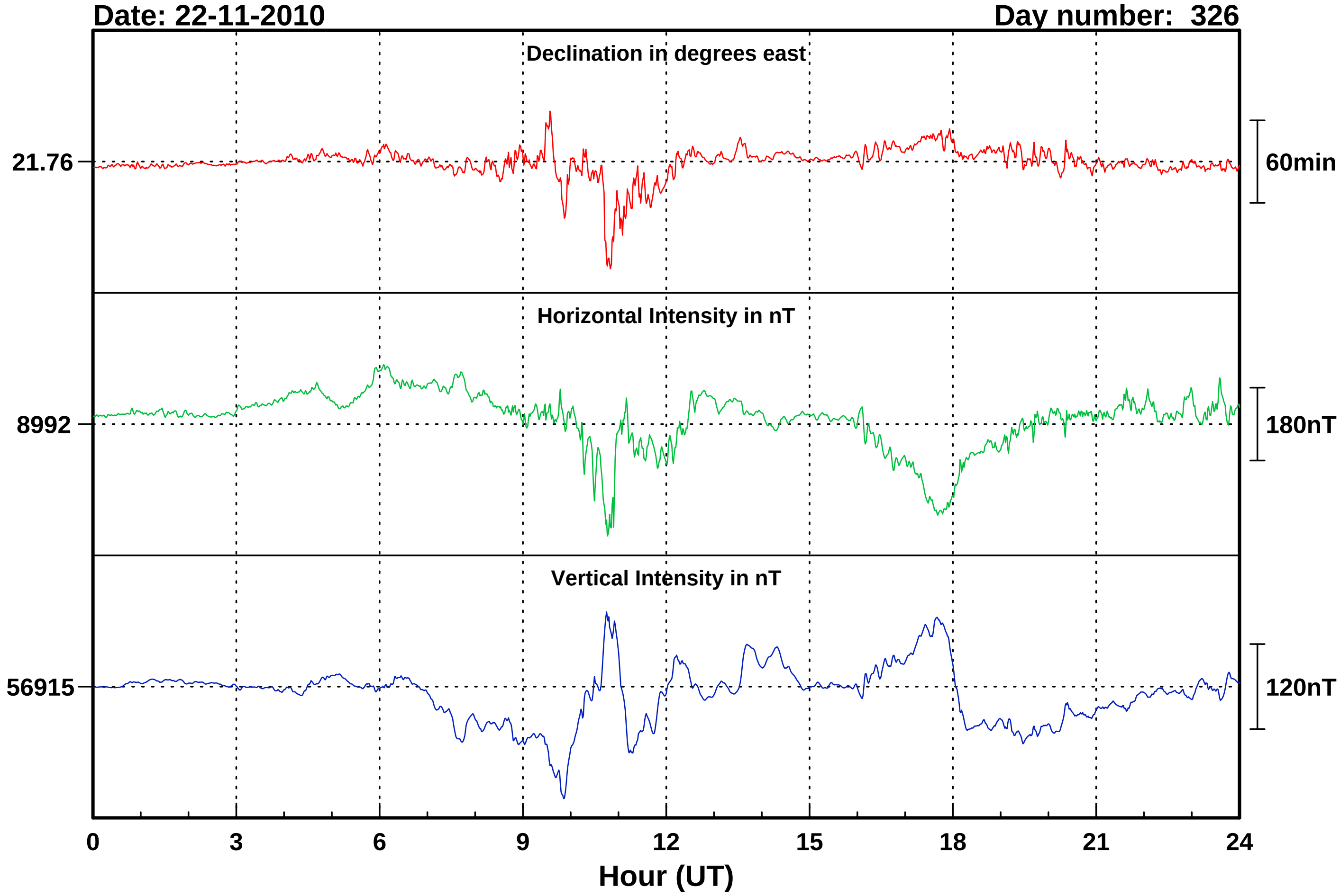


Jim Carrigan

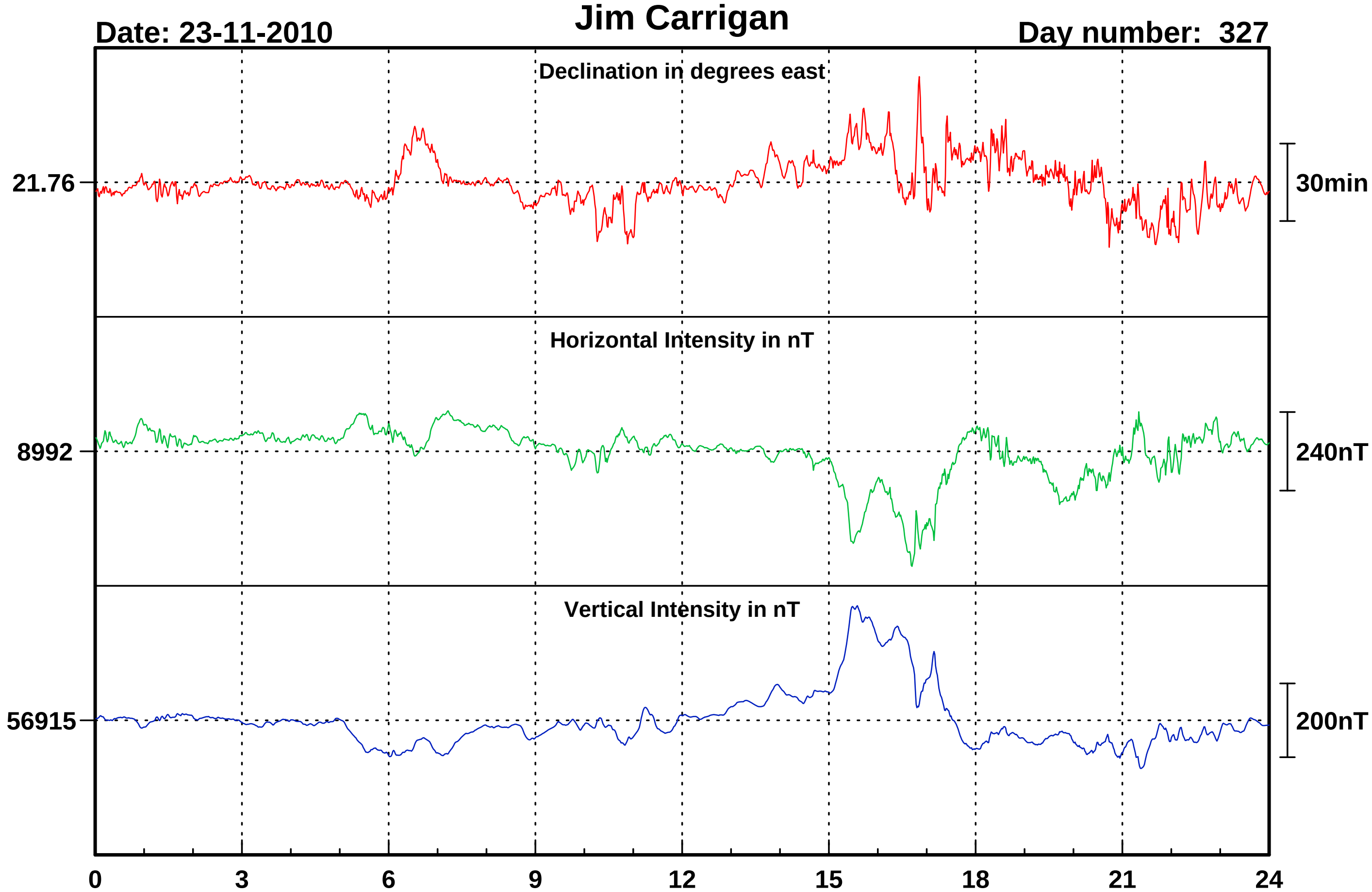
Date: 21-11-2010 Day number: 325

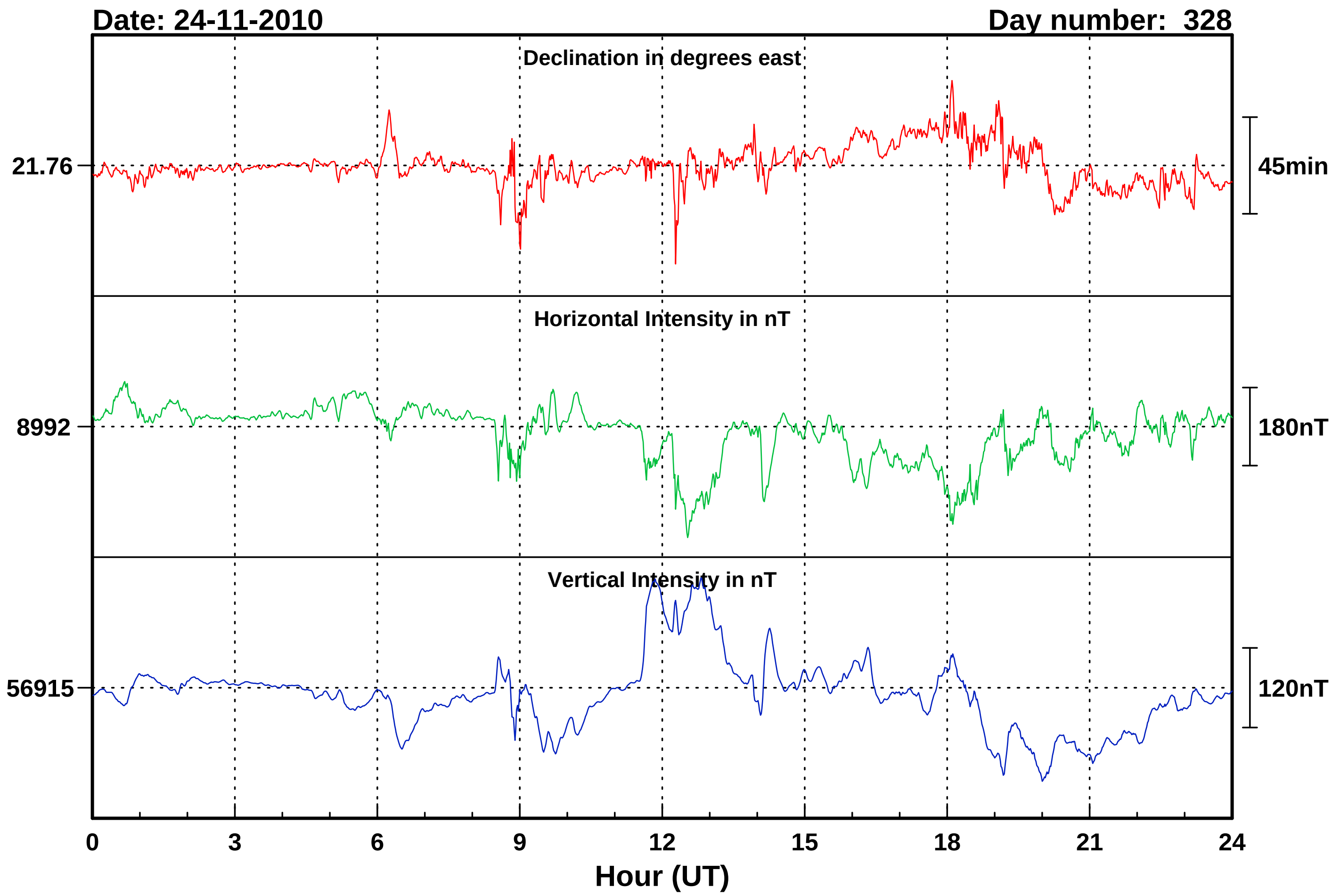


Date: 22-11-2010 Day number: 326

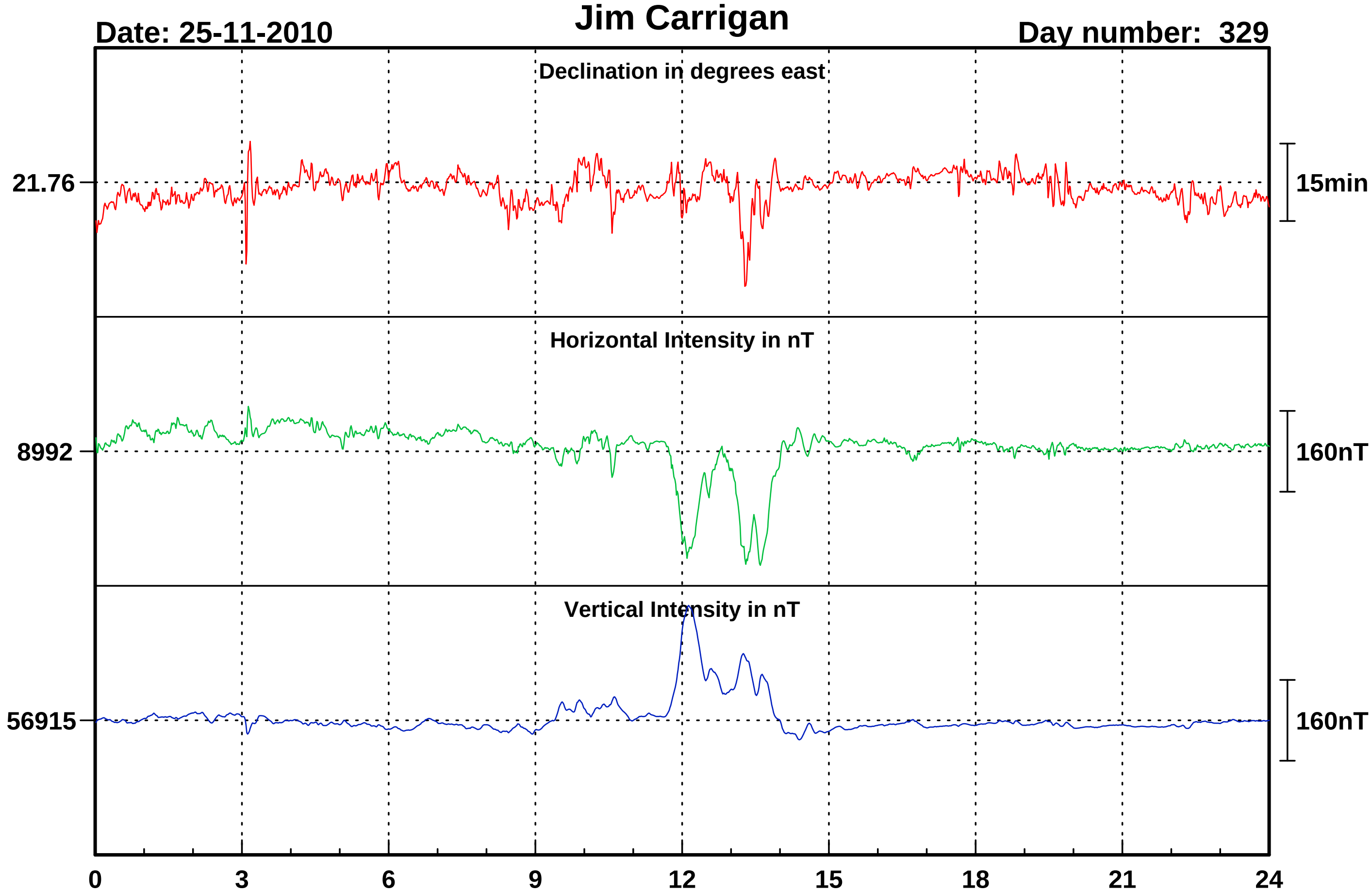


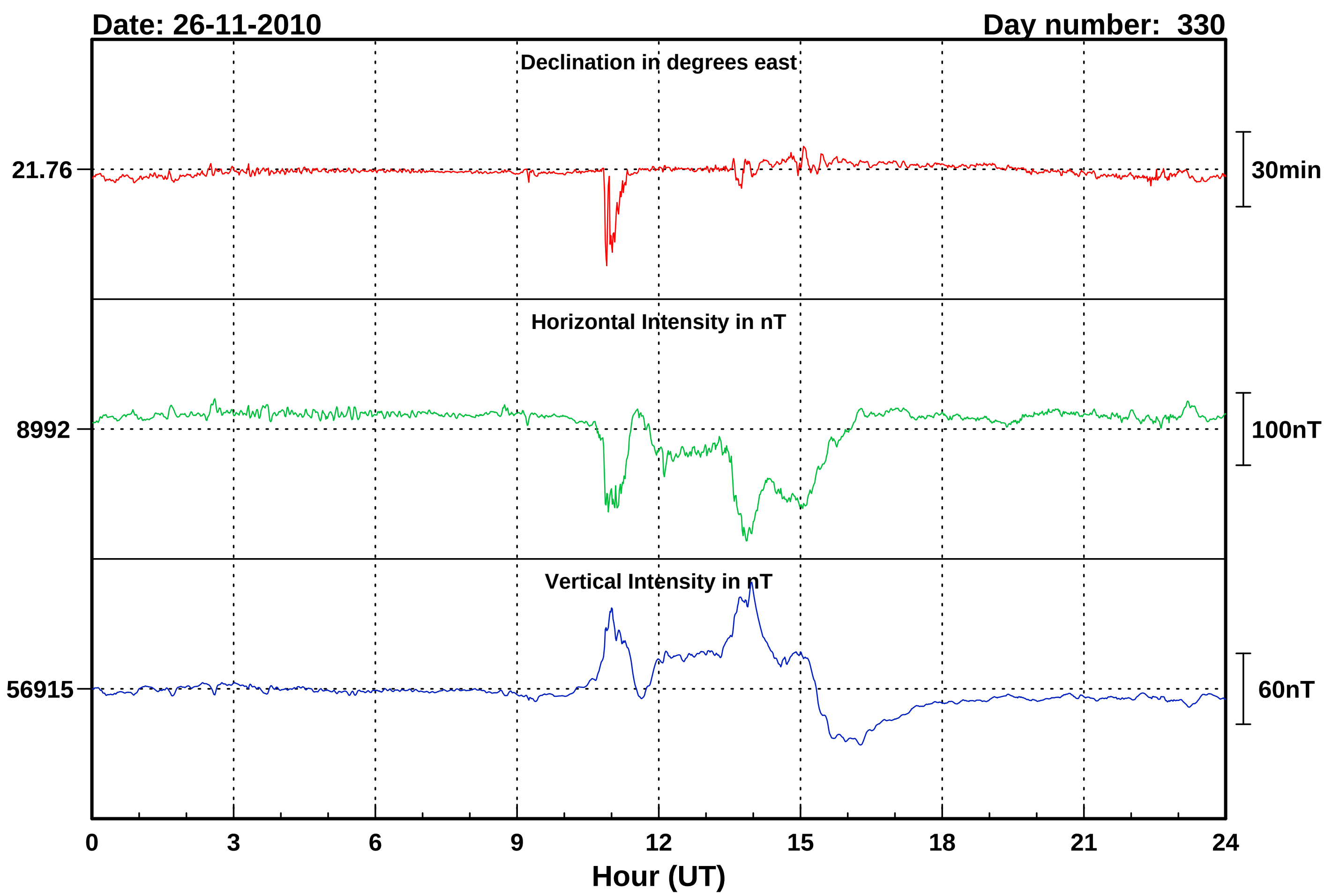
Jim Carrigan



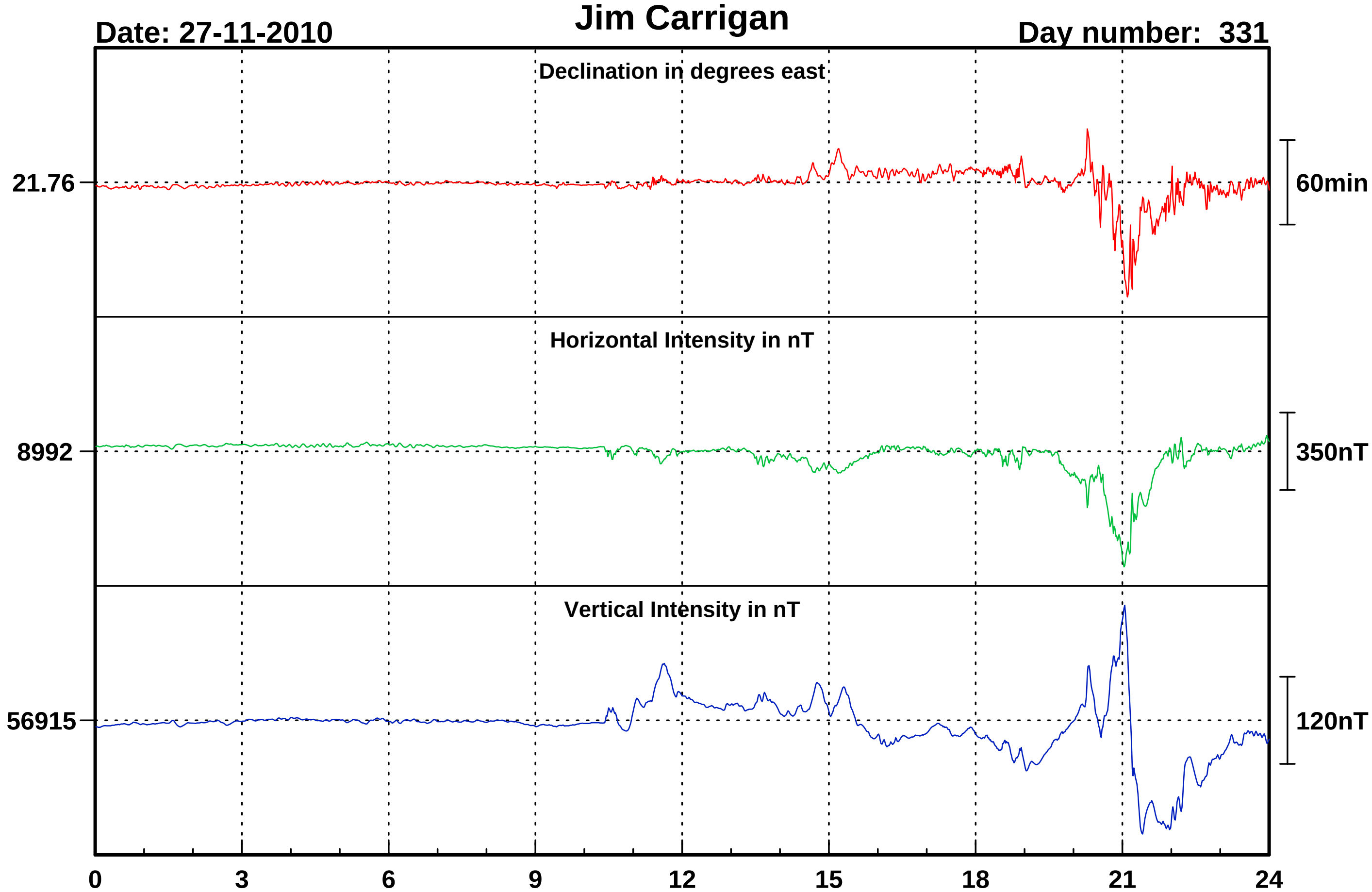


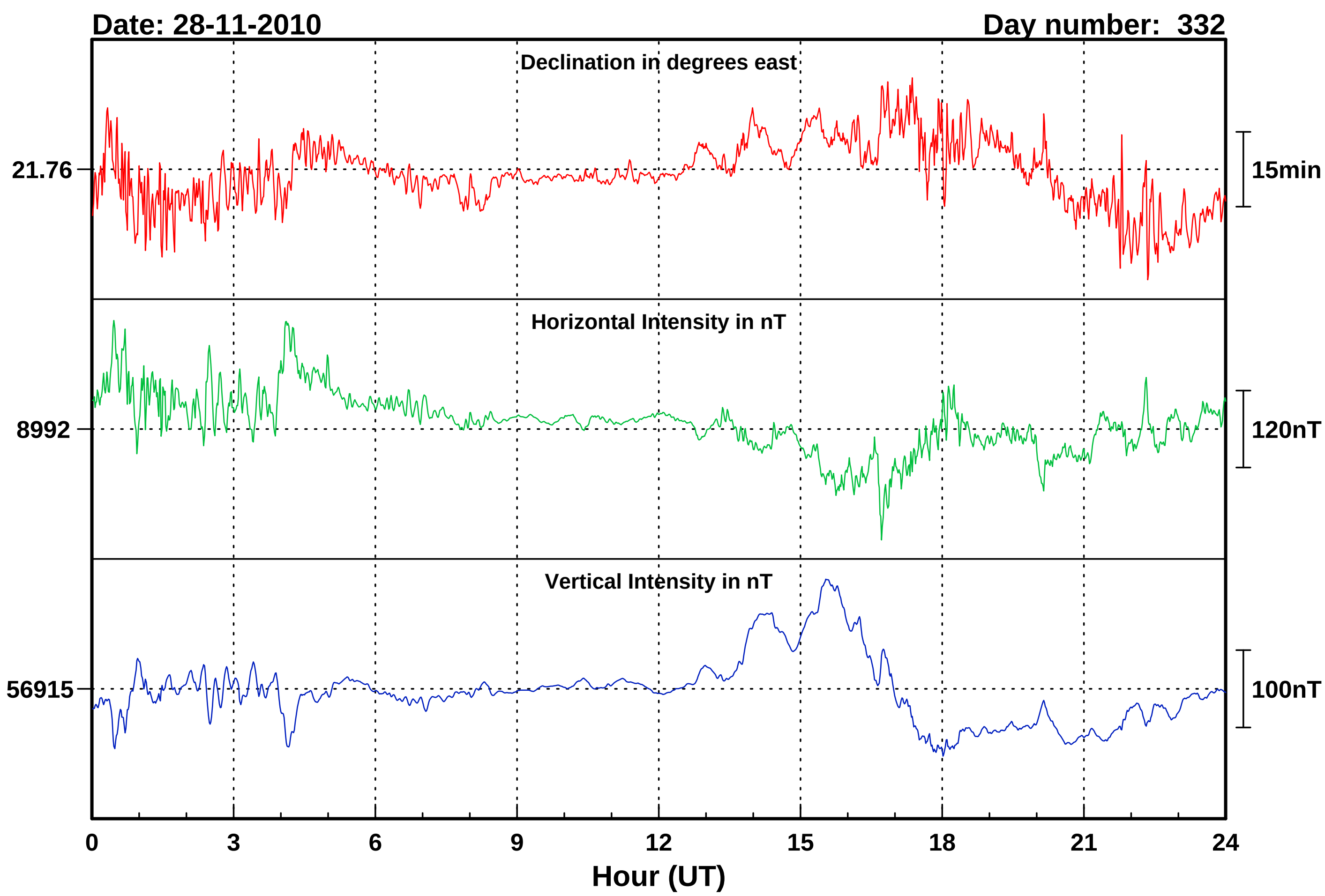
Jim Carrigan





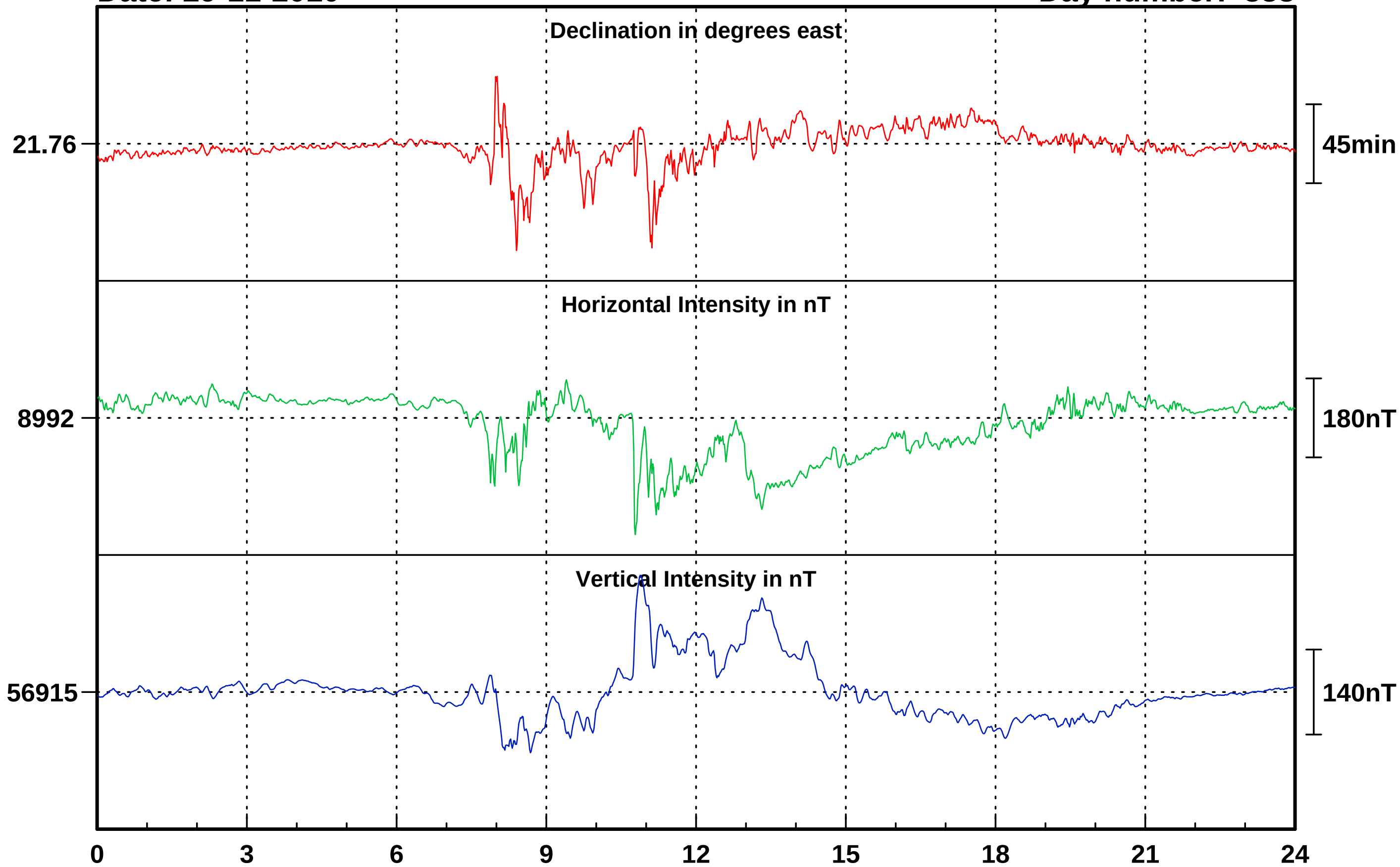
Jim Carrigan



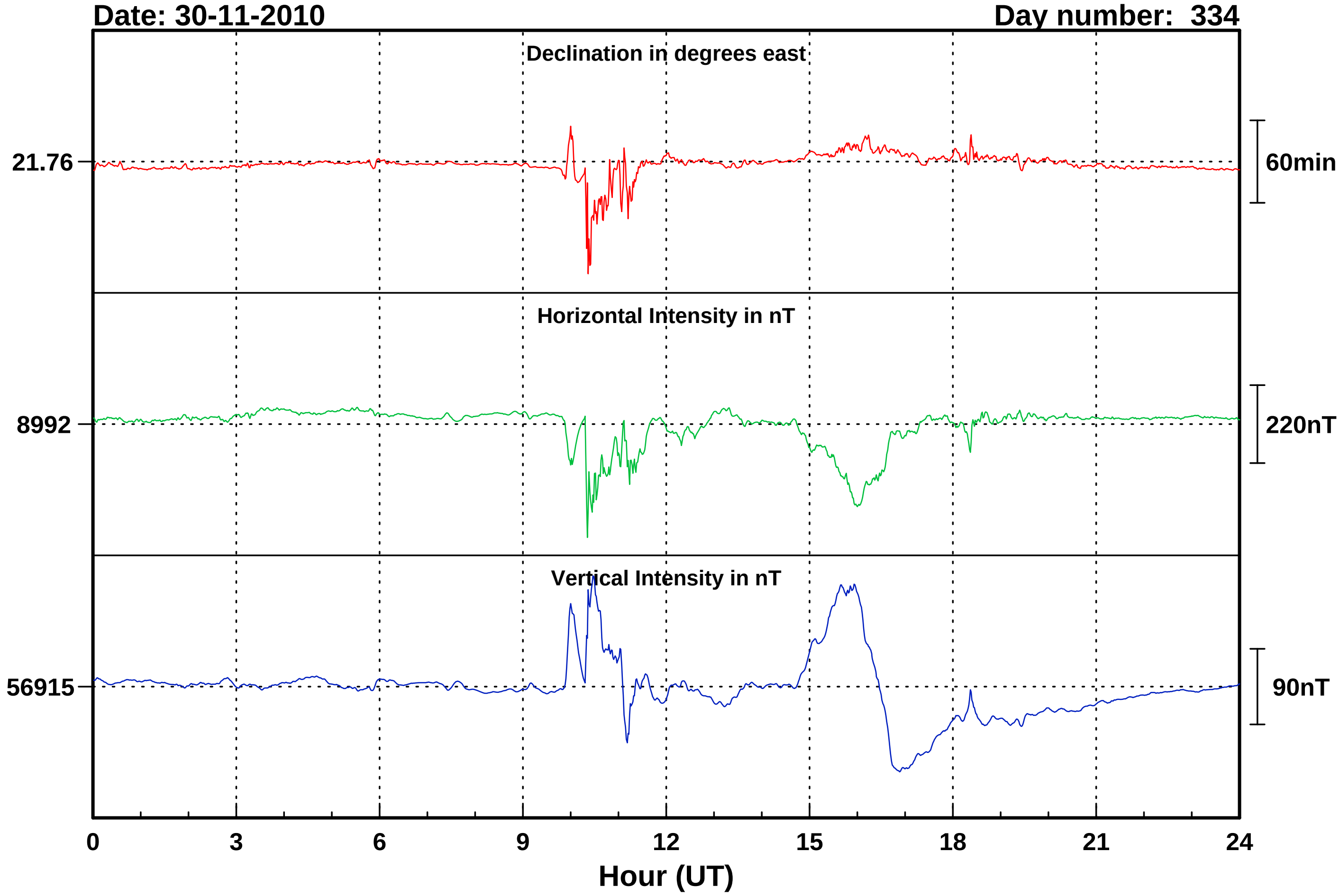


Jim Carrigan

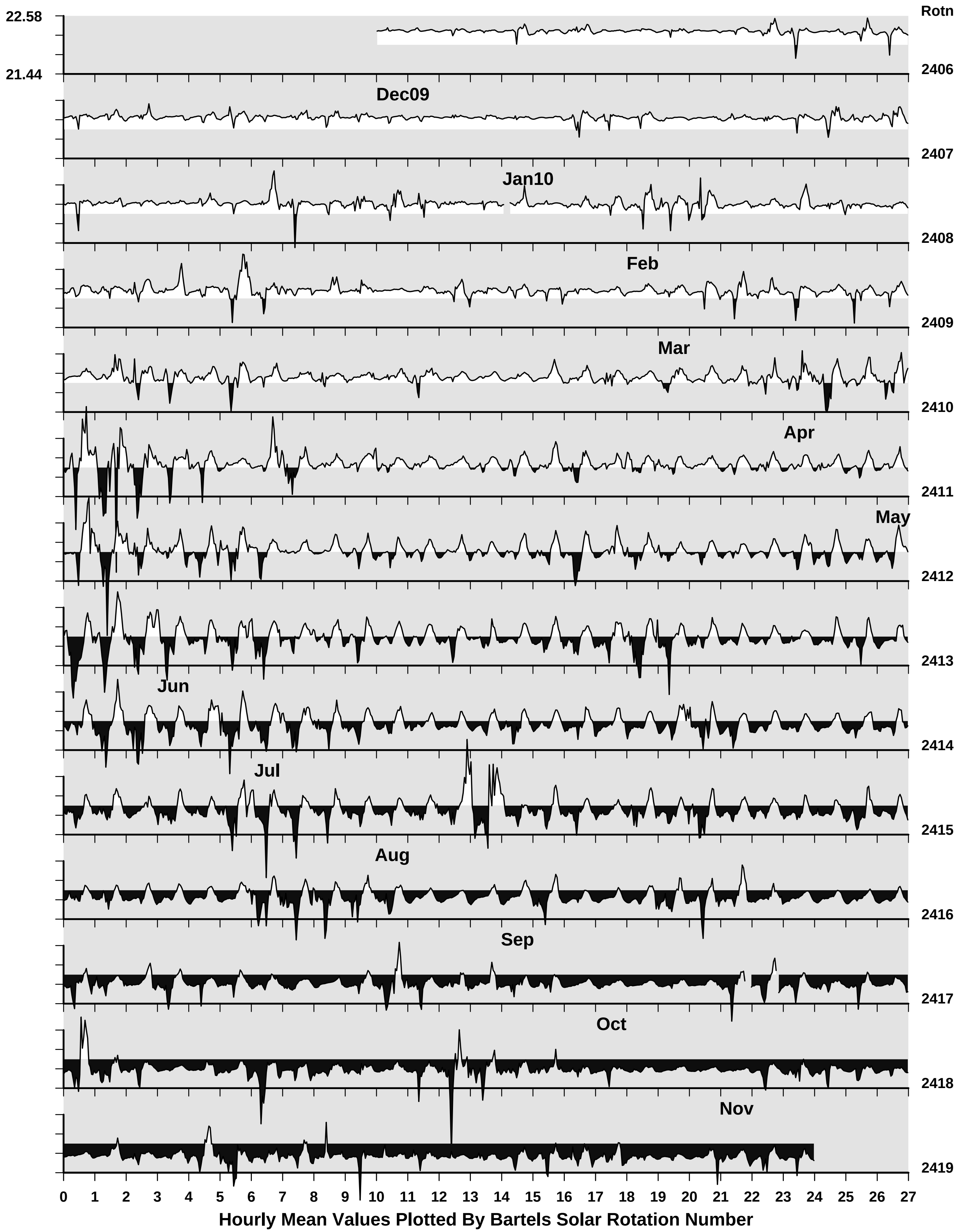
Date: 29-11-2010 | Day number: 333



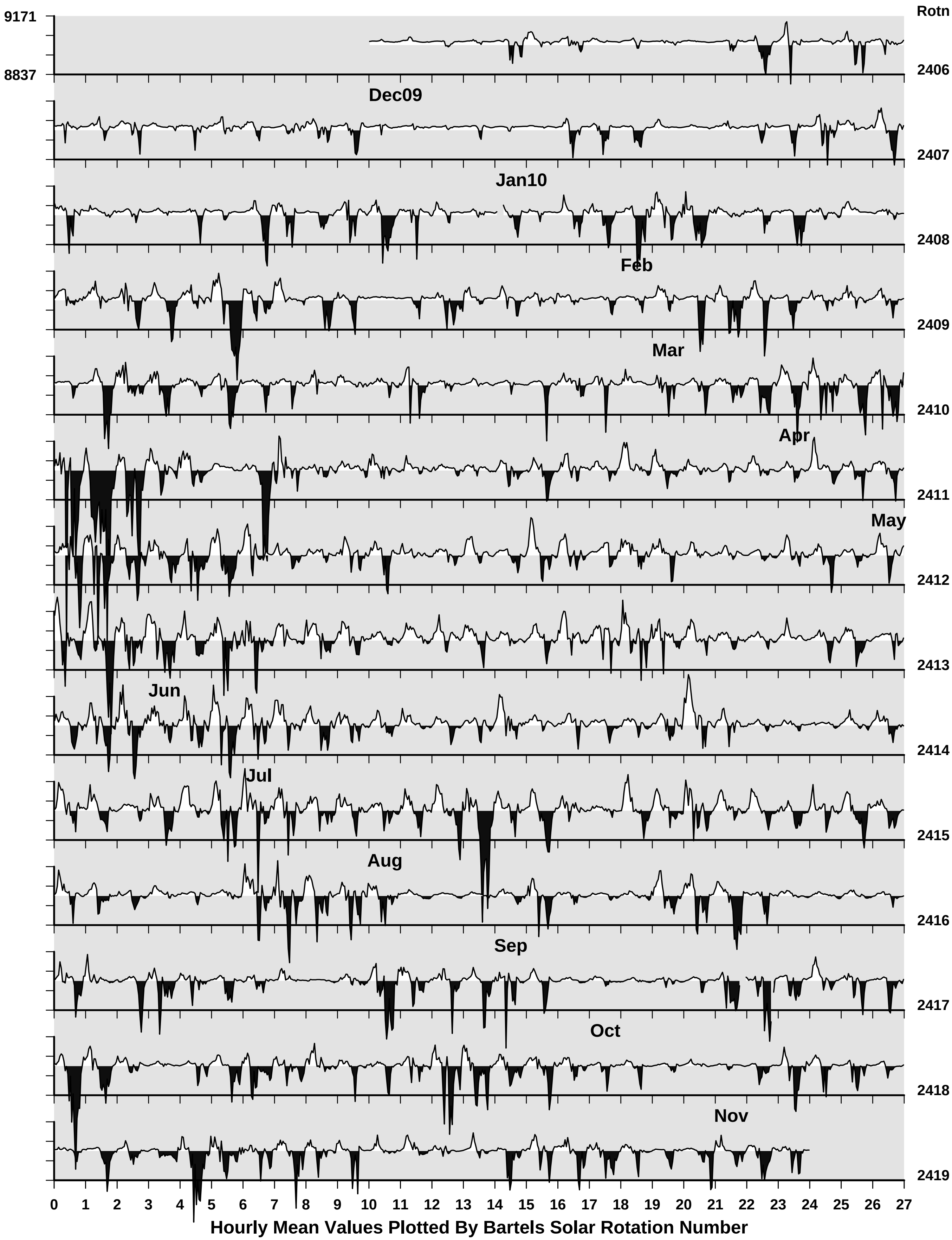
Date: 30-11-2010 | Day number: 334



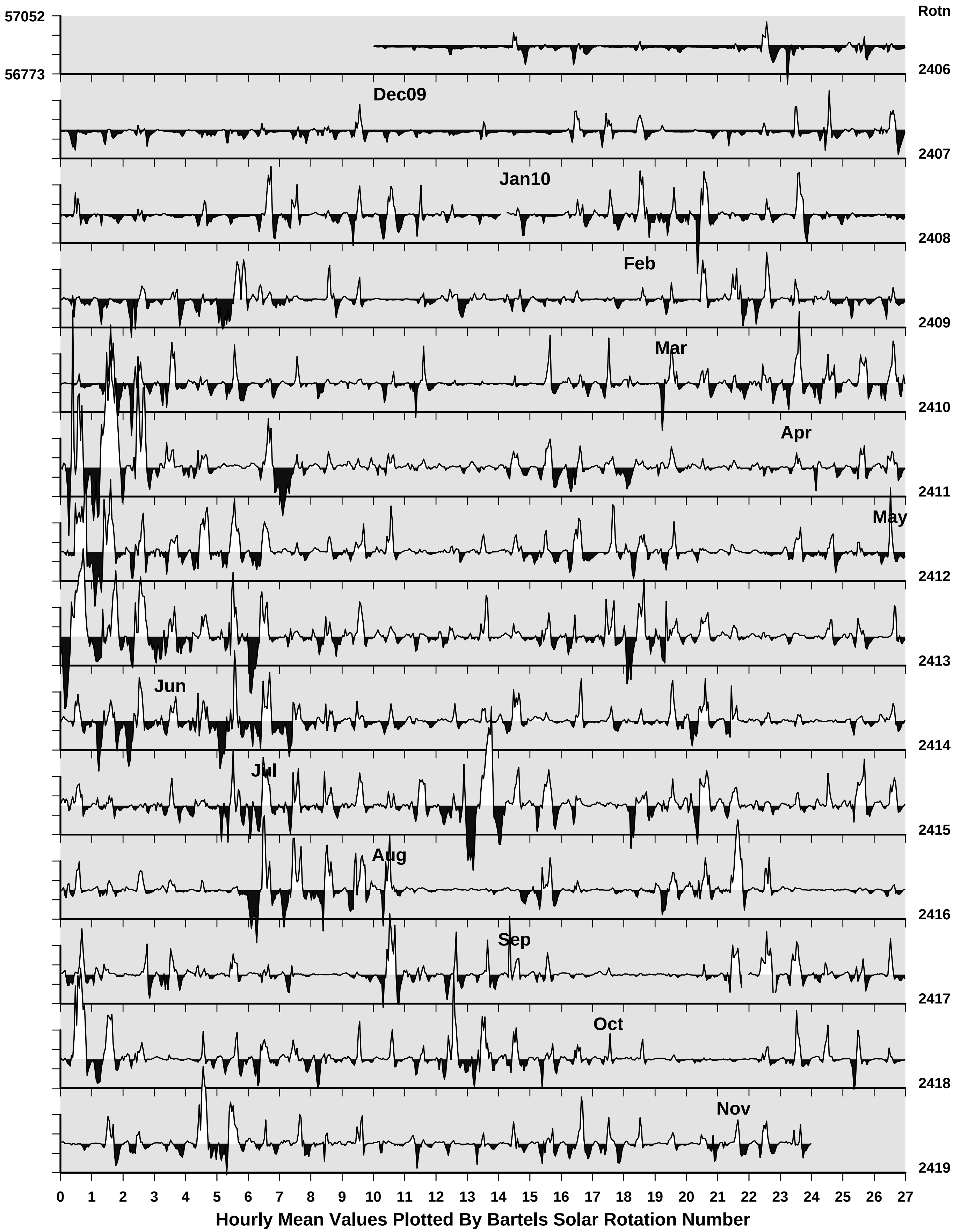
Jim Carrigan Observatory: Declination (degrees)

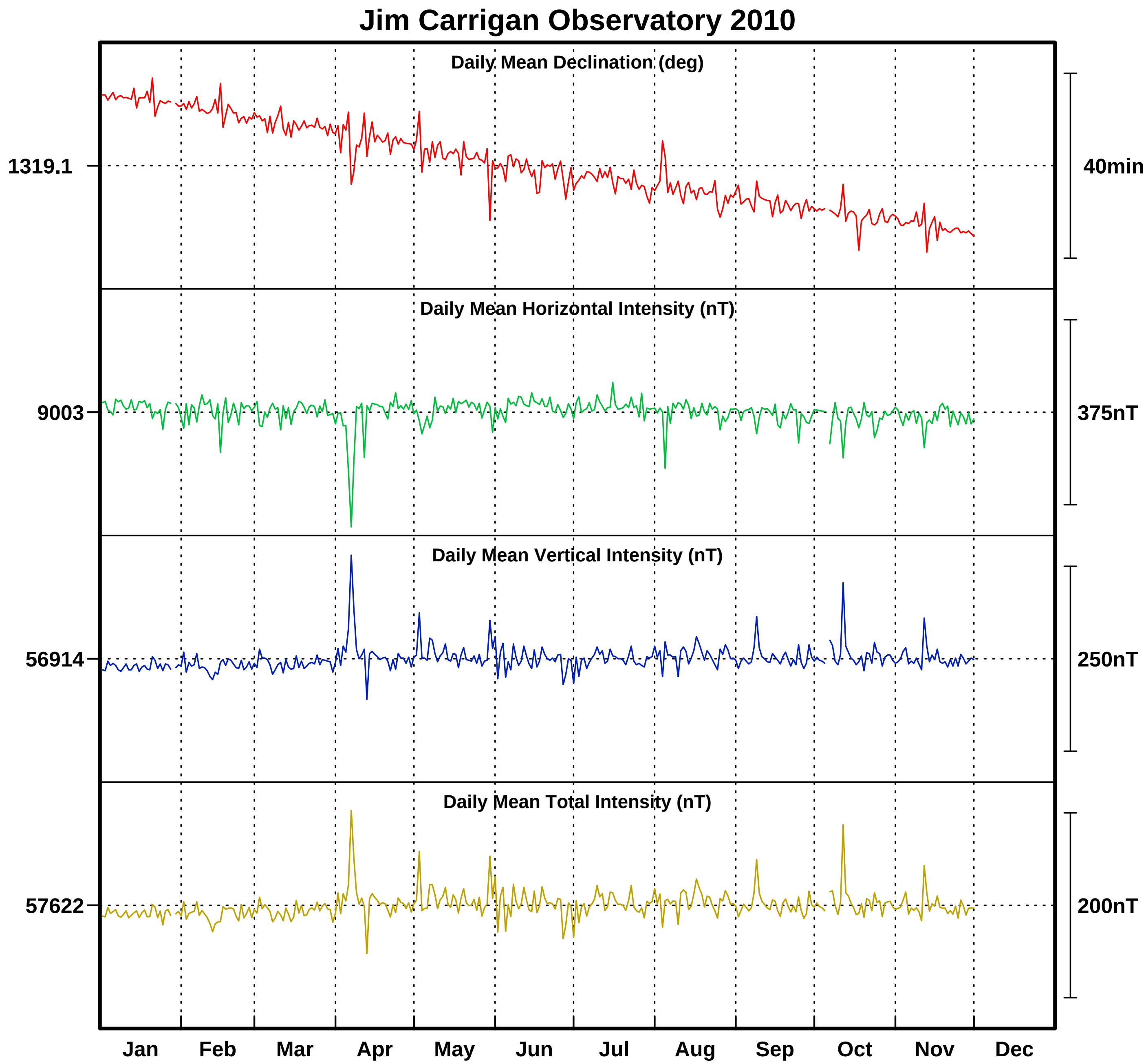


Jim Carrigan Observatory: Horizontal Intensity (nT)



Jim Carrigan Observatory: Vertical Intensity (nT)




Jim Carrigan Observatory 2010
Daily Mean Declination (deg)
1319.1
40min
Daily Mean Horizontal Intensity (nT)
9003
375nT
Daily Mean Vertical Intensity (nT)
56914
250nT
Daily Mean Total Intensity (nT)
57622
200nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Jim Carrigan Observatory 2010

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	22° 13.5´	9012 nT	81° 0.0´	8343 nT	3409 nT	56904 nT	57613 nT
February	22° 11.0´	9004 nT	81° 0.5´	8338 nT	3400 nT	56904 nT	57612 nT
March	22° 7.9´	9004 nT	81° 0.6´	8340 nT	3392 nT	56908 nT	57615 nT
April	22° 4.5´	8991 nT	81° 1.4´	8332 nT	3379 nT	56922 nT	57628 nT
May	22° 1.2´	9006 nT	81° 0.5´	8349 nT	3377 nT	56922 nT	57630 nT
June	21° 57.9´	9014 nT	80° 60.0´	8360 nT	3372 nT	56911 nT	57620 nT
July	21° 55.8´	9016 nT	80° 59.9´	8363 nT	3367 nT	56914 nT	57624 nT
August	21° 53.8´	9002 nT	81° 0.8´	8352 nT	3357 nT	56919 nT	57626 nT
September	21° 51.0´	8996 nT	81° 1.1´	8350 nT	3348 nT	56916 nT	57623 nT
October	21° 48.4´	8991 nT	81° 1.4´	8348 nT	3340 nT	56920 nT	57626 nT
November	21° 45.8´	8992 nT	81° 1.3´	8351 nT	3334 nT	56915 nT	57621 nT

<u>Note</u>

i. The values shown here are provisional.