British Geological Survey

MONTHLY MAGNETIC BULLETIN

Jim Carrigan Observatory

November 2022

MONTHLY MAGNETIC BULLETIN

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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Internet: 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° 21'21.6"N 211° 12'03.6"E*
Geomagnetic: *70° 28'04.8"N 257° 28'30.0"E*
Height above mean sea level: *20 m (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 13th generation International Geomagnetic Reference Field (IGRF) at epoch 2022.5. On-line access to models (including IGRF), charts and navigational data are available at 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.

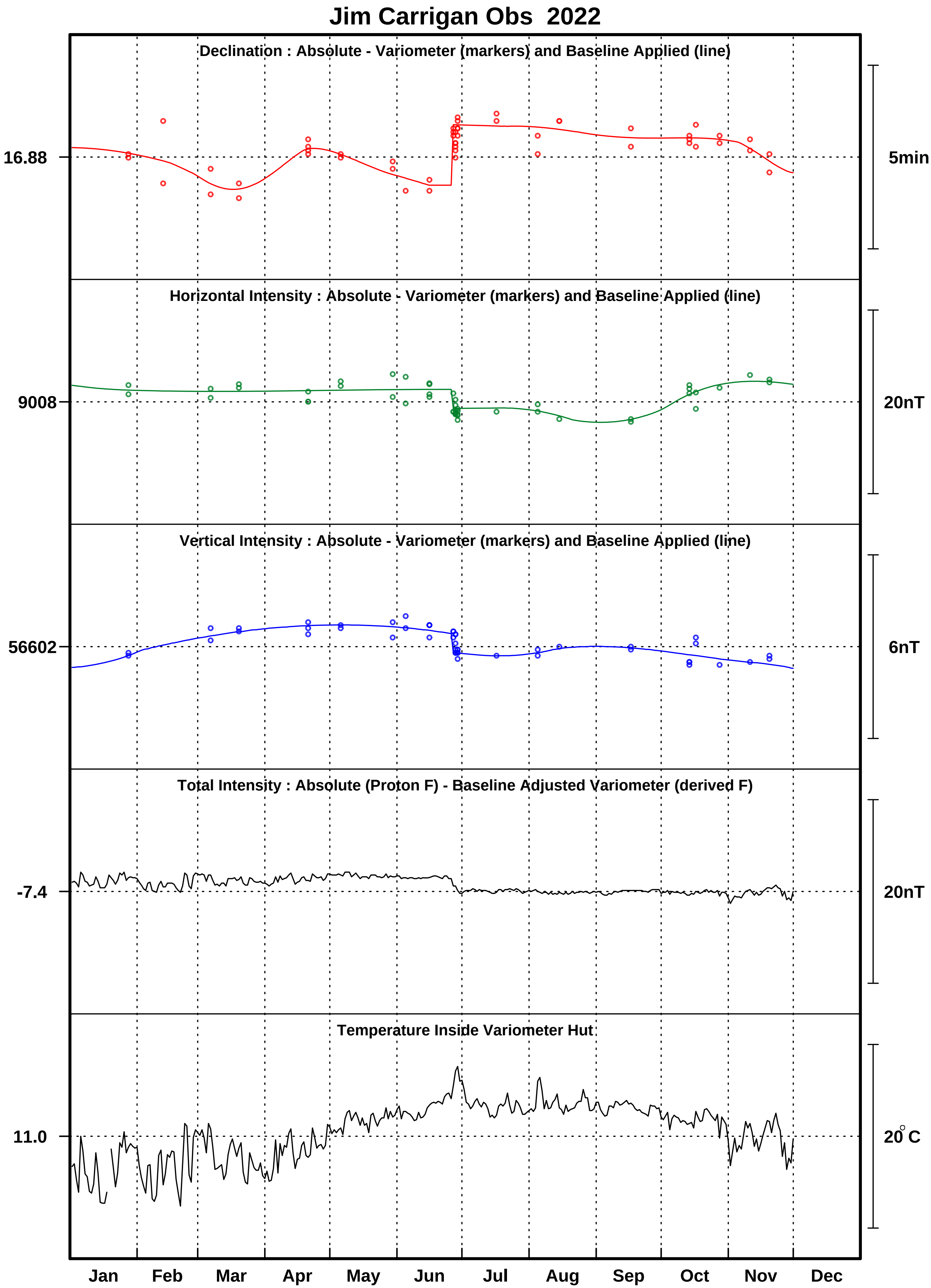
Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: 'The results presented in this paper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

Jim Carrigan Observatory

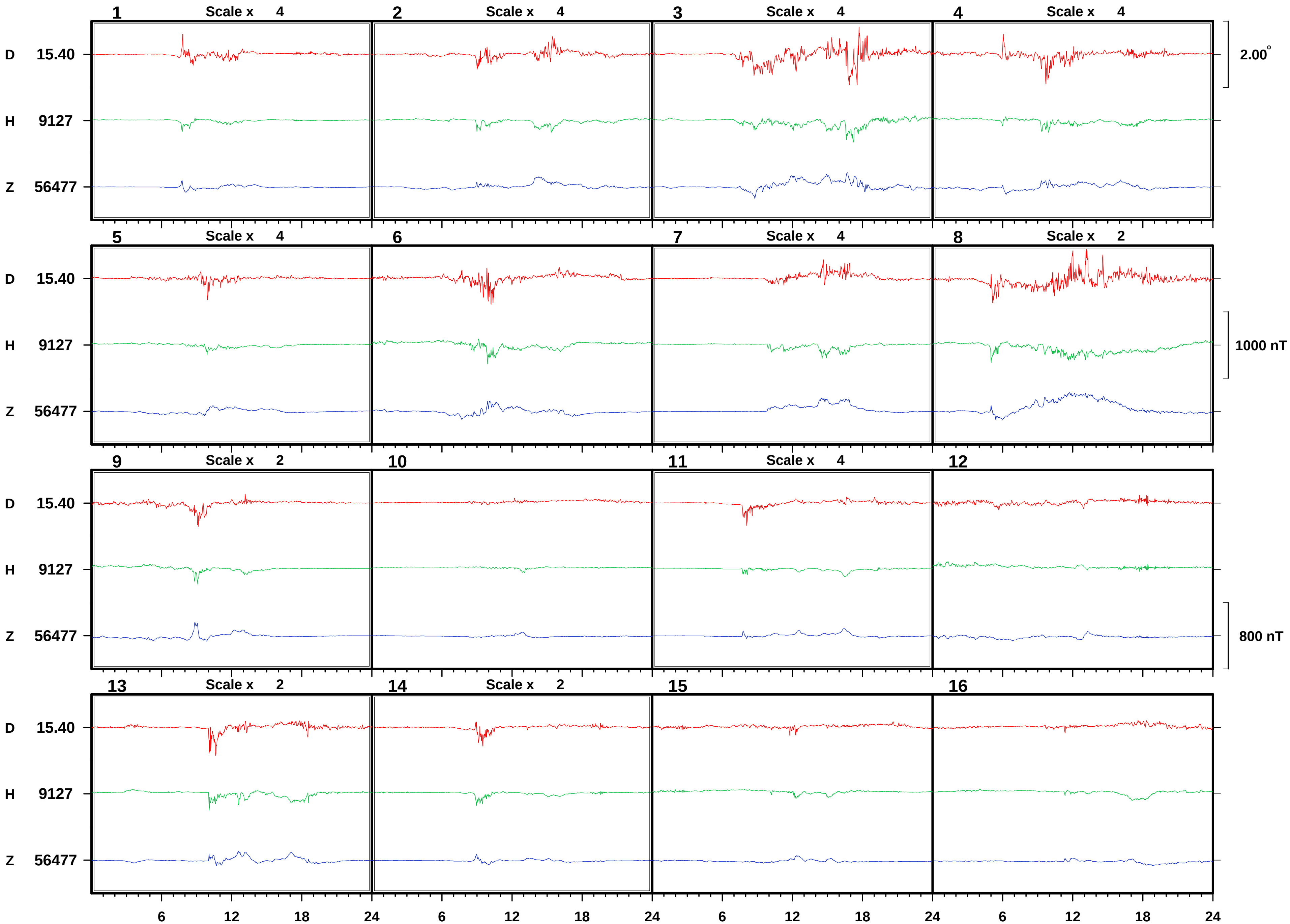
Absolute observations

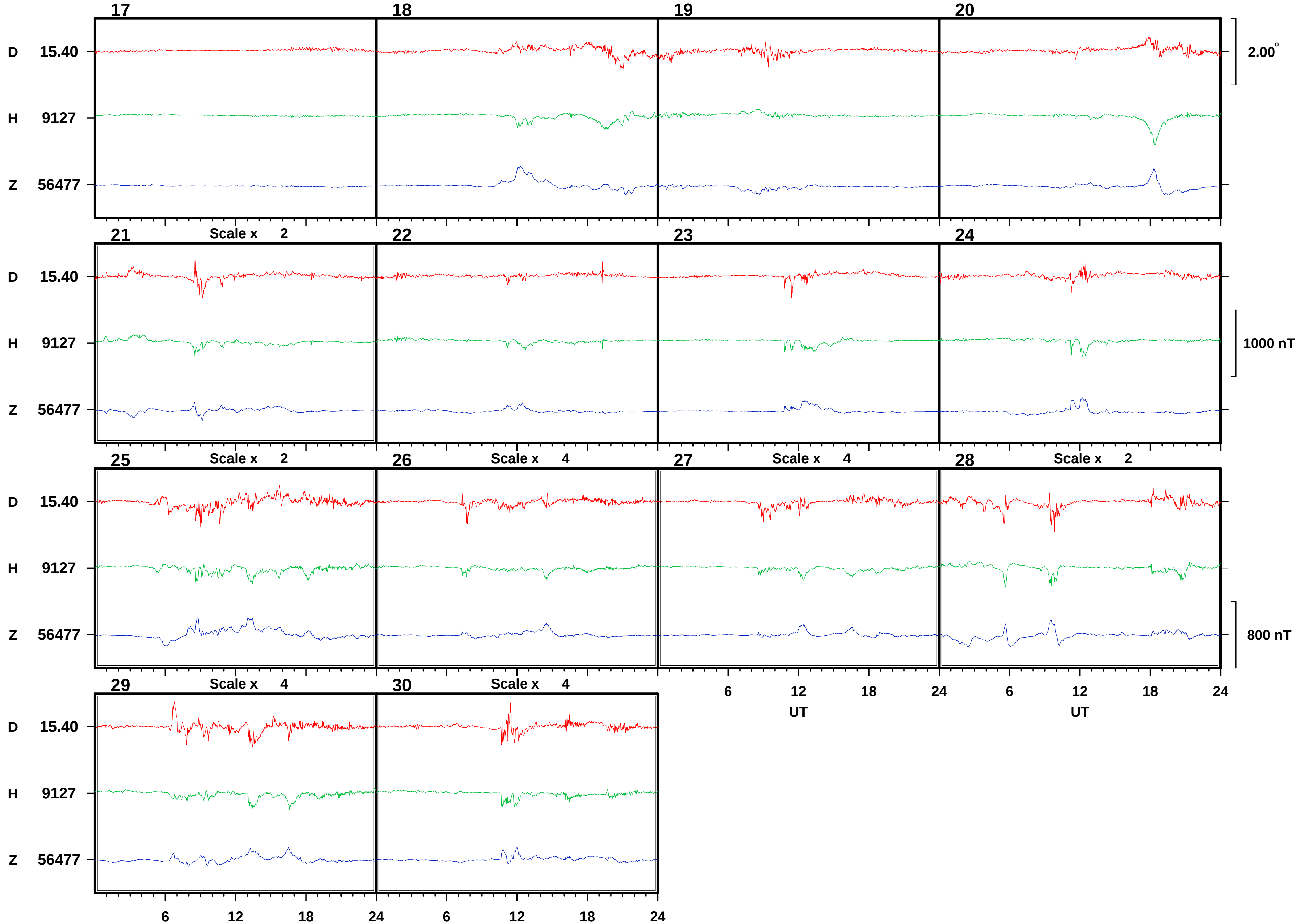
		Declination			Inclination		Total field		Horizontal intensity		Vertical intensity		
Date	Day Number	Time (UT)	Absolute (º)	Baseline (º)	Time (UT)	Absolute (º)	Site difference (nT)	Absolute corrected (nT)	Absolute (nT)	Baseline (nT)	Absolute (nT)	Baseline (nT)	Observer
10-Nov-22	314	21:12	15.4817	16.8850	21:23	80.7914	7.4	57209.2	9155.1	99999.9	56471.9	99999.9	CZ
10-Nov-22	314	21:35	15.4238	16.8900	21:46	80.7983	7.4	57212.0	9148.8	9011.4	56475.8	56601.4	CZ
19-Nov-22	323	20:51	15.4433	16.8750	21:03	80.7843	7.4	57181.8	9157.8	9010.6	56443.7	56601.6	CZ
19-Nov-22	323	21:32	15.4481	16.8833	21:42	80.7830	7.4	57180.6	9158.9	9010.9	56442.3	56601.5	CZ



Jim Carrigan Obs 2022
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
16.88
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
9008
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
56602
6nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
-7.4
20nT
Temperature Inside Variometer Hut
11.0
20°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Jim Carrigan November 2022

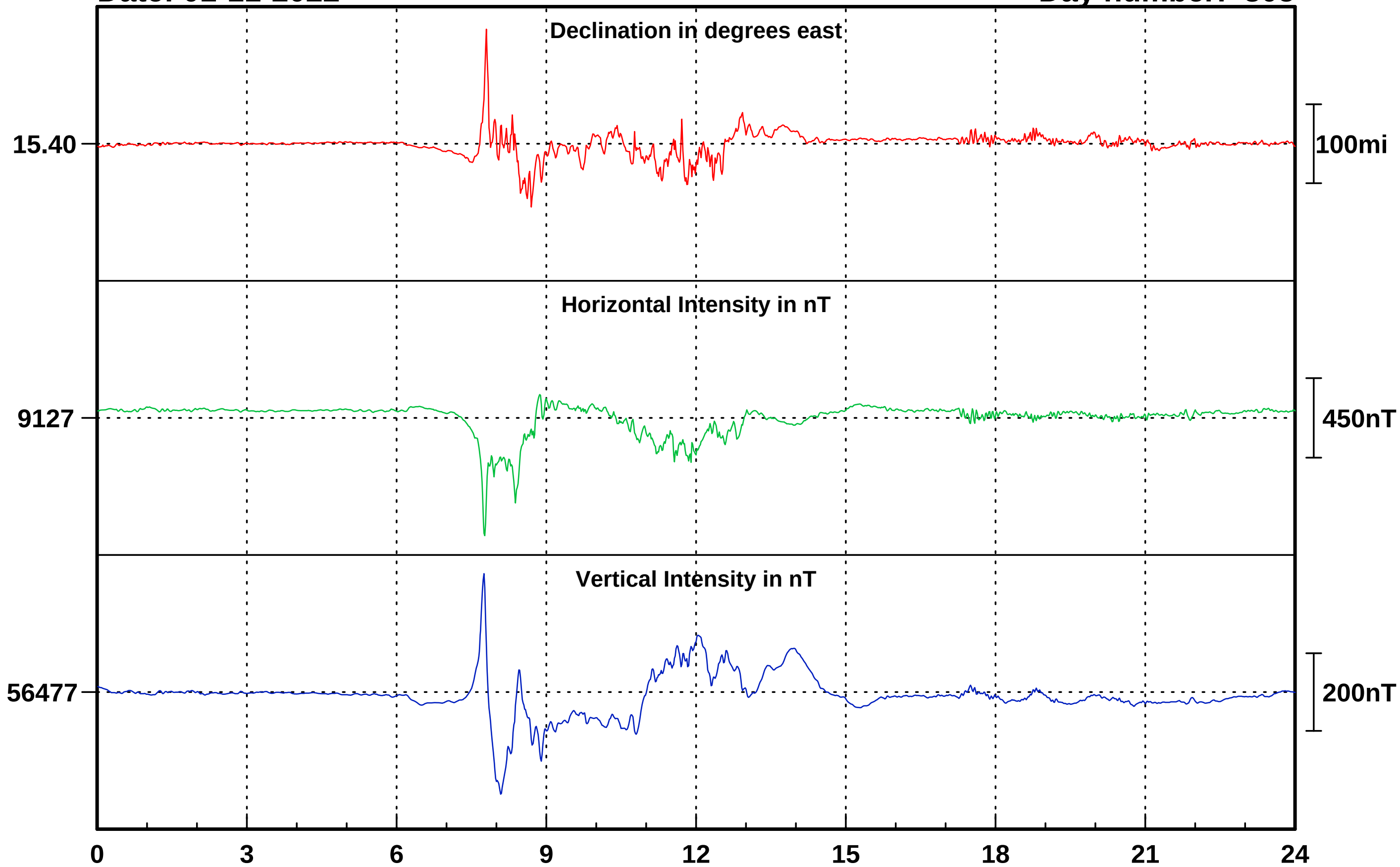




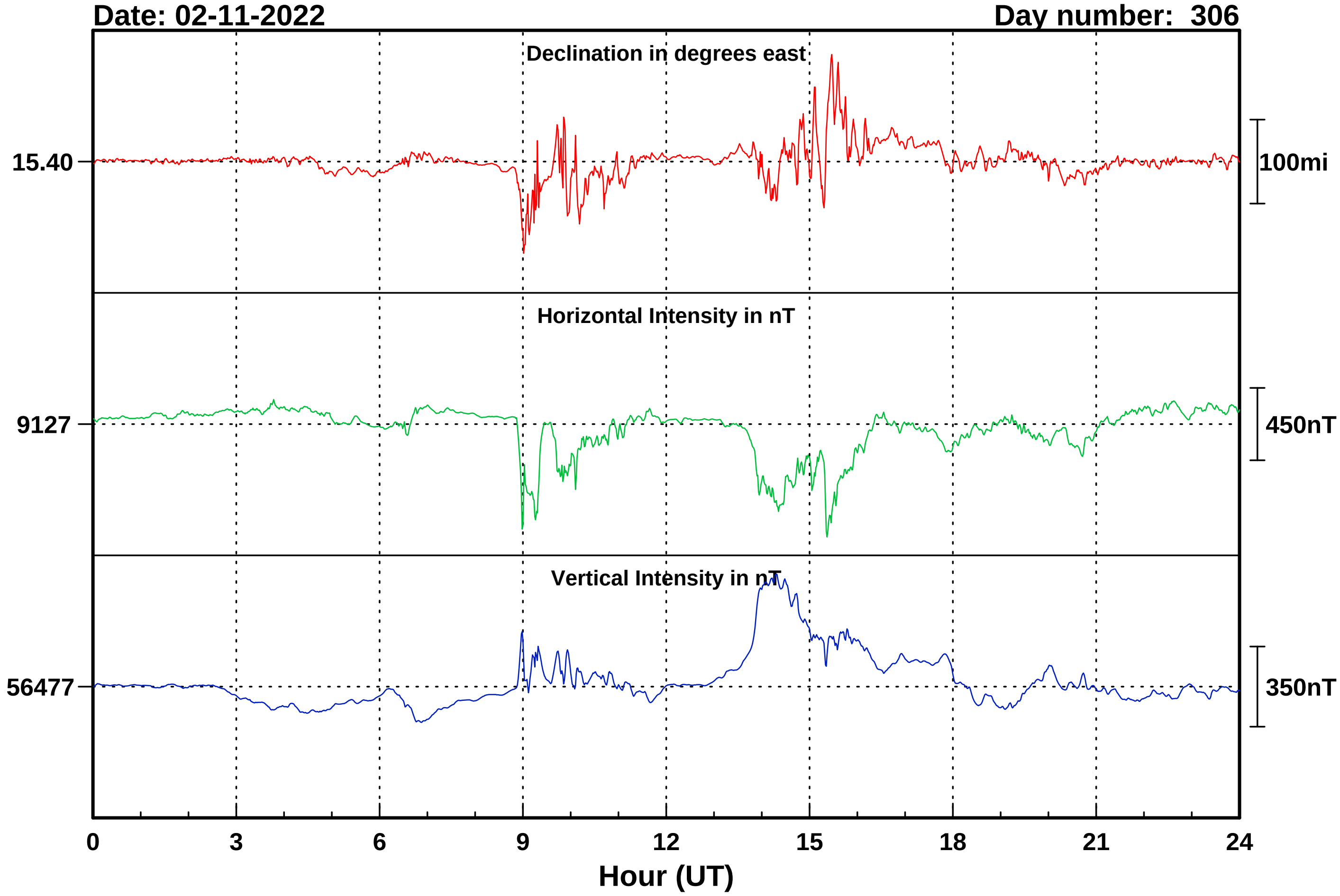
Jim Carrigan November 2022

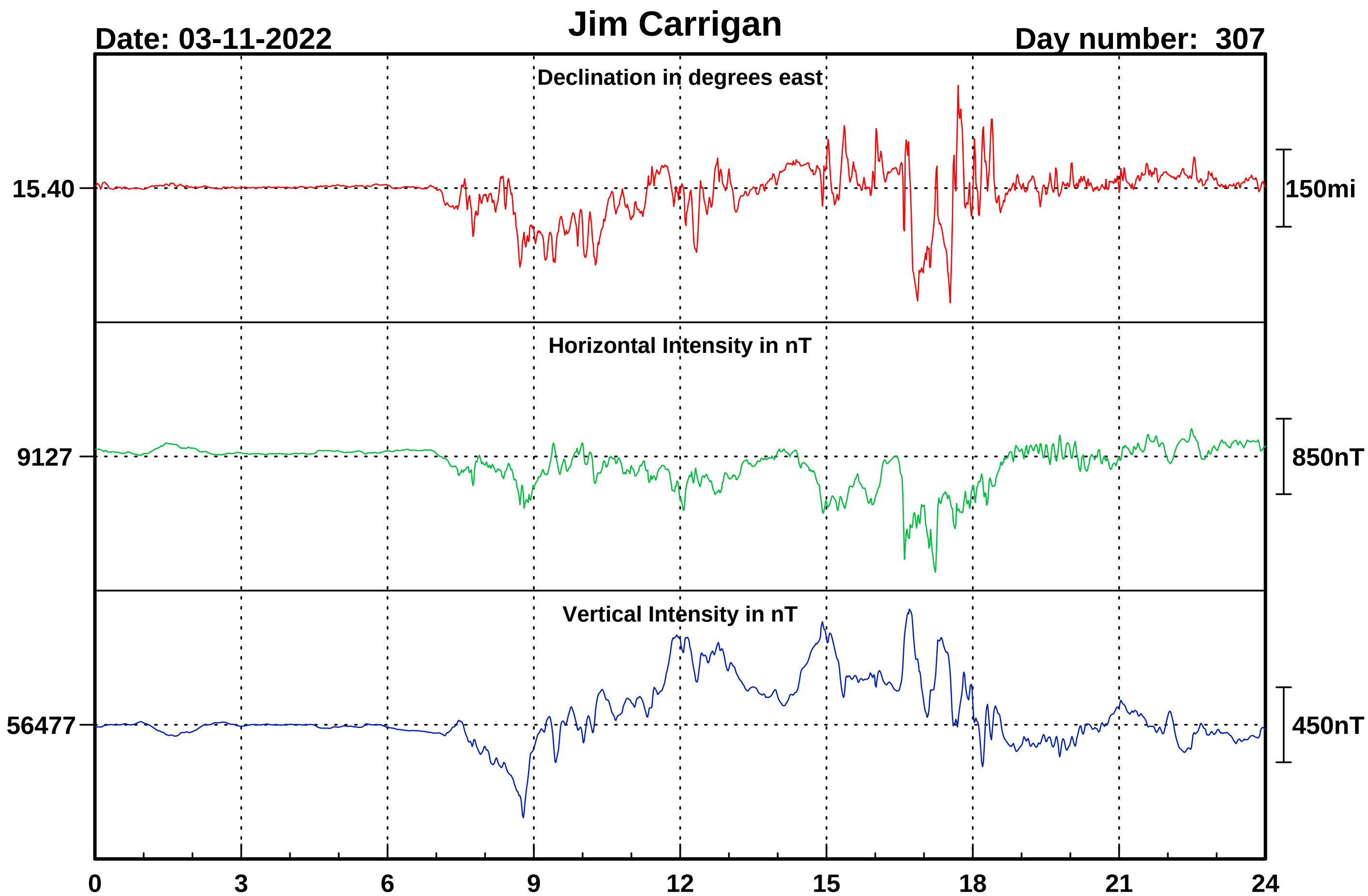
Jim Carrigan

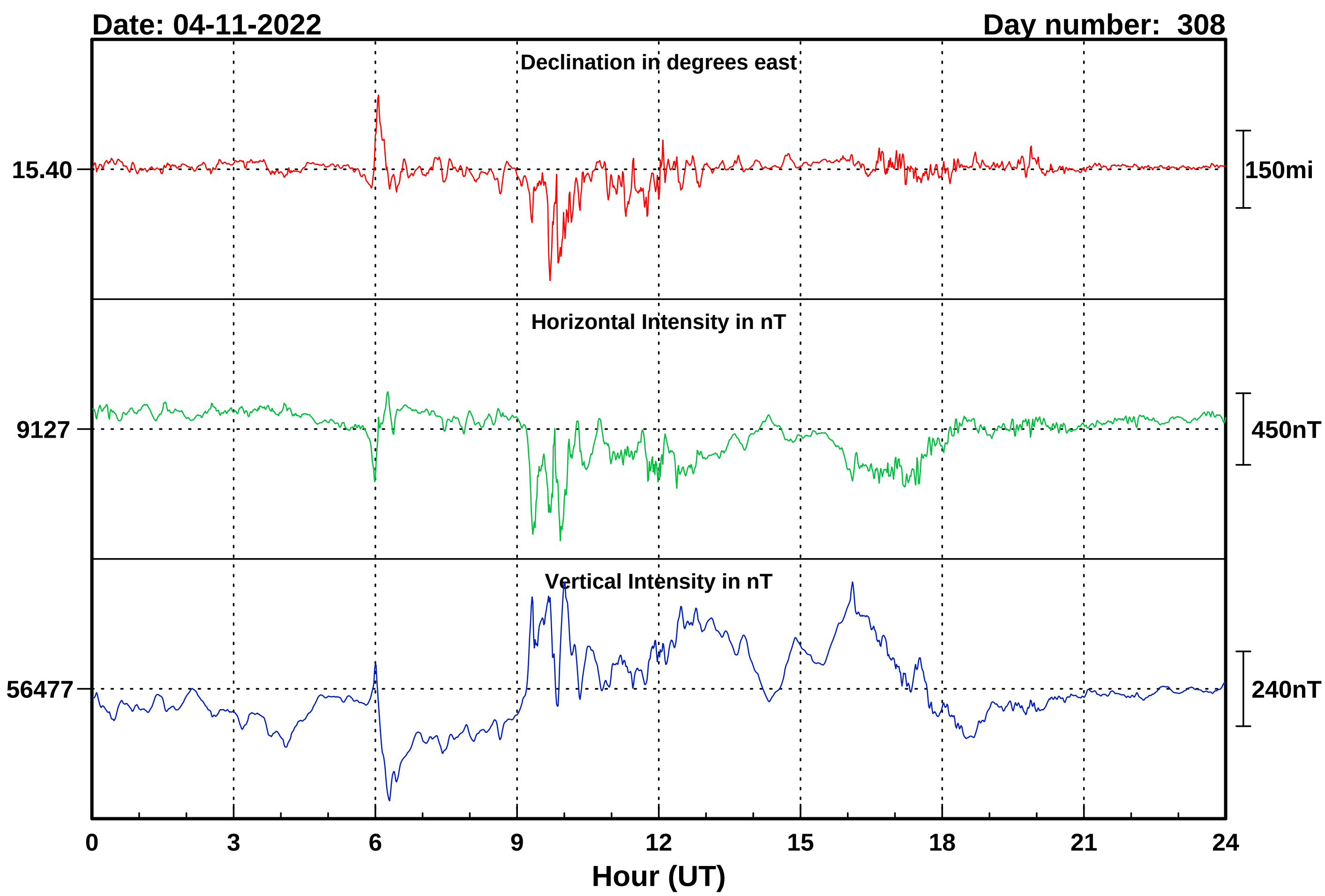
Date: 01-11-2022 Day number: 305



Date: 02-11-2022 Day number: 306

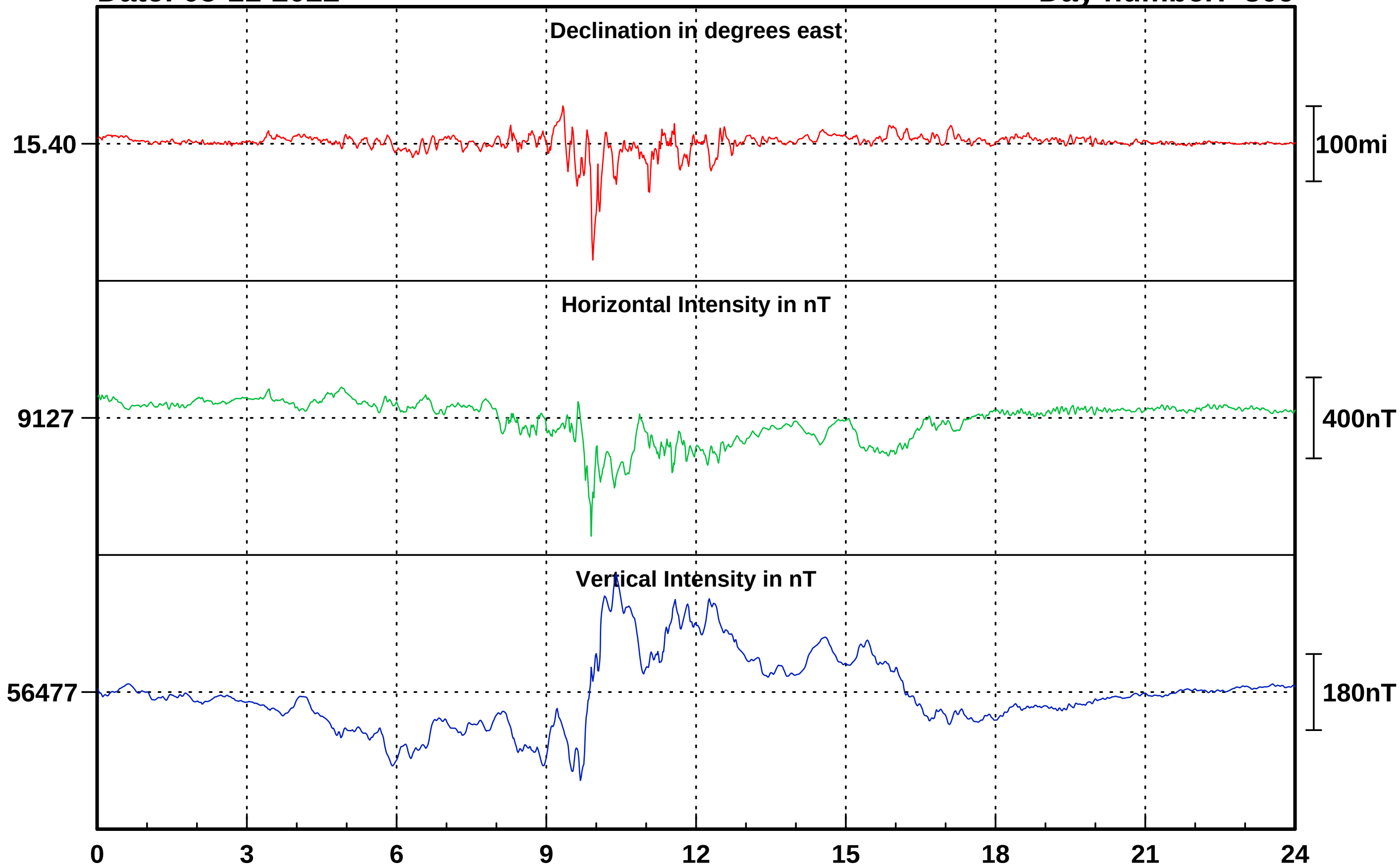



Jim Carrigan
Date: 03-11-2022
Day number: 307
Declination in degrees east
15.40
150mi
Horizontal Intensity in nT
9127
850nT
Vertical Intensity in nT
56477
450nT
0
3
6
9
12
15
18
21
24

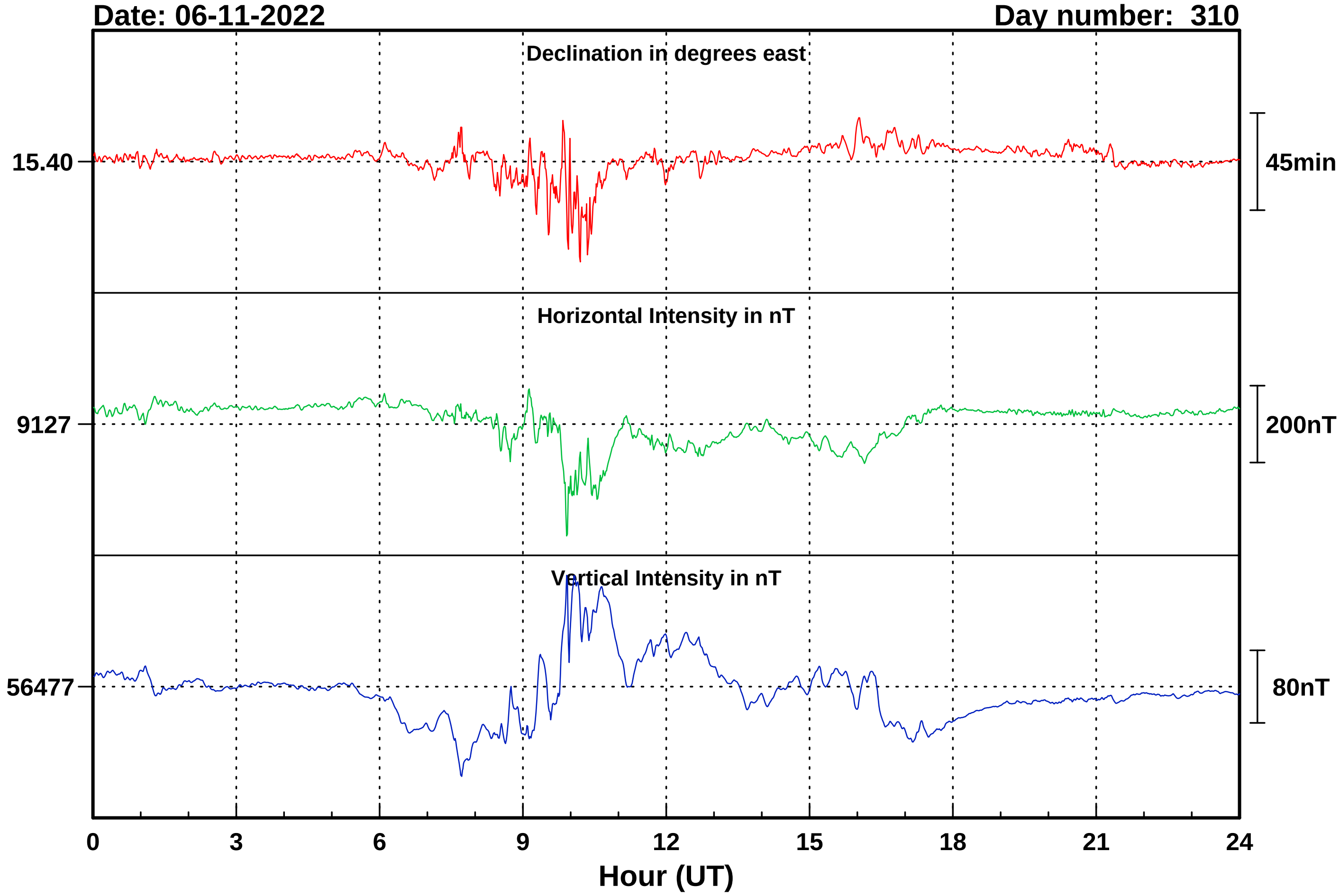

Date: 04-11-2022
Day number: 308
Declination in degrees east
15.40
150mi
Horizontal Intensity in nT
9127
450nT
Vertical Intensity in nT
56477
240nT
0
3
6
9
12
15
18
21
24
Hour (UT)

Jim Carrigan

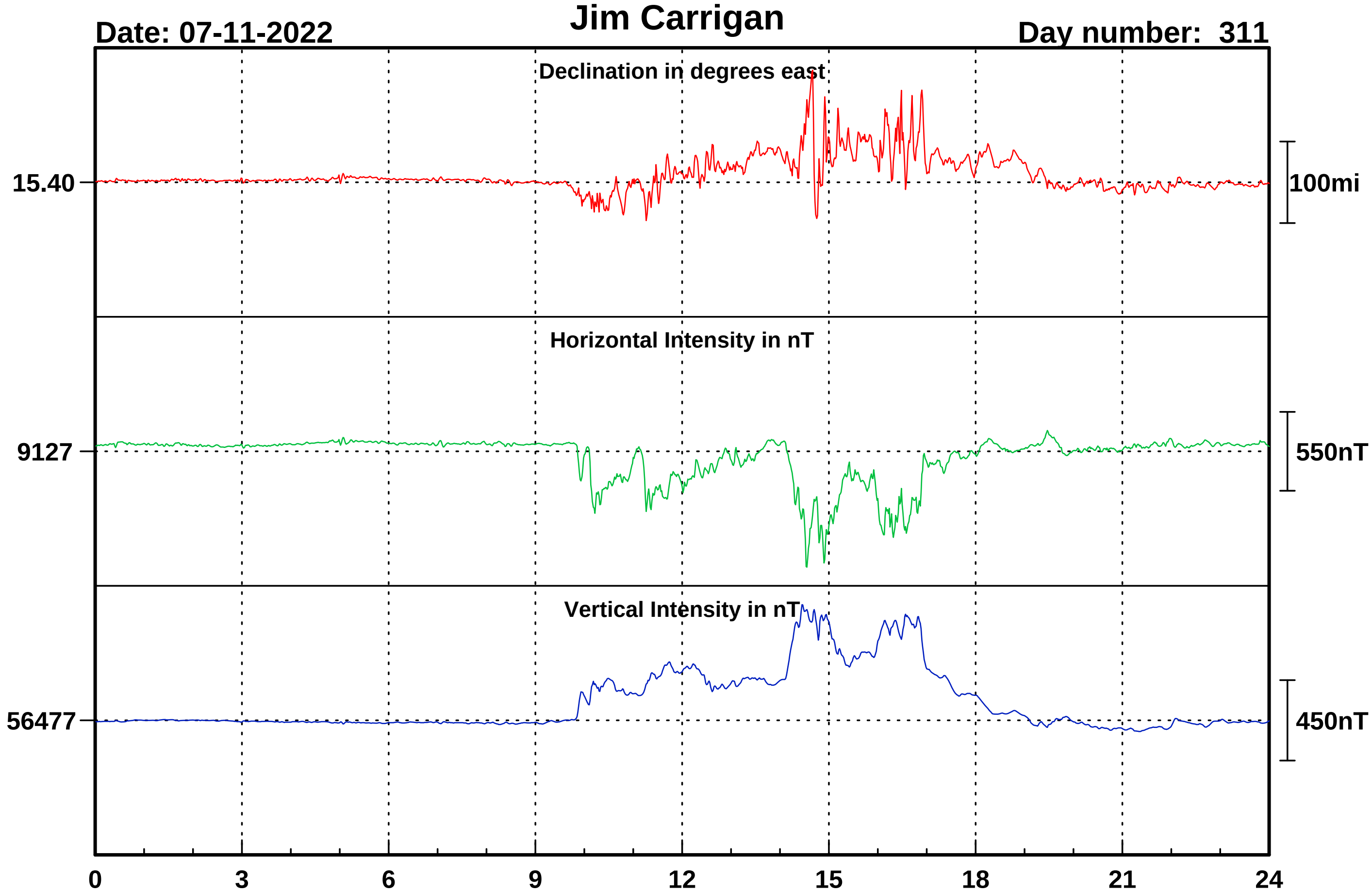
Date: 05-11-2022 Day number: 309

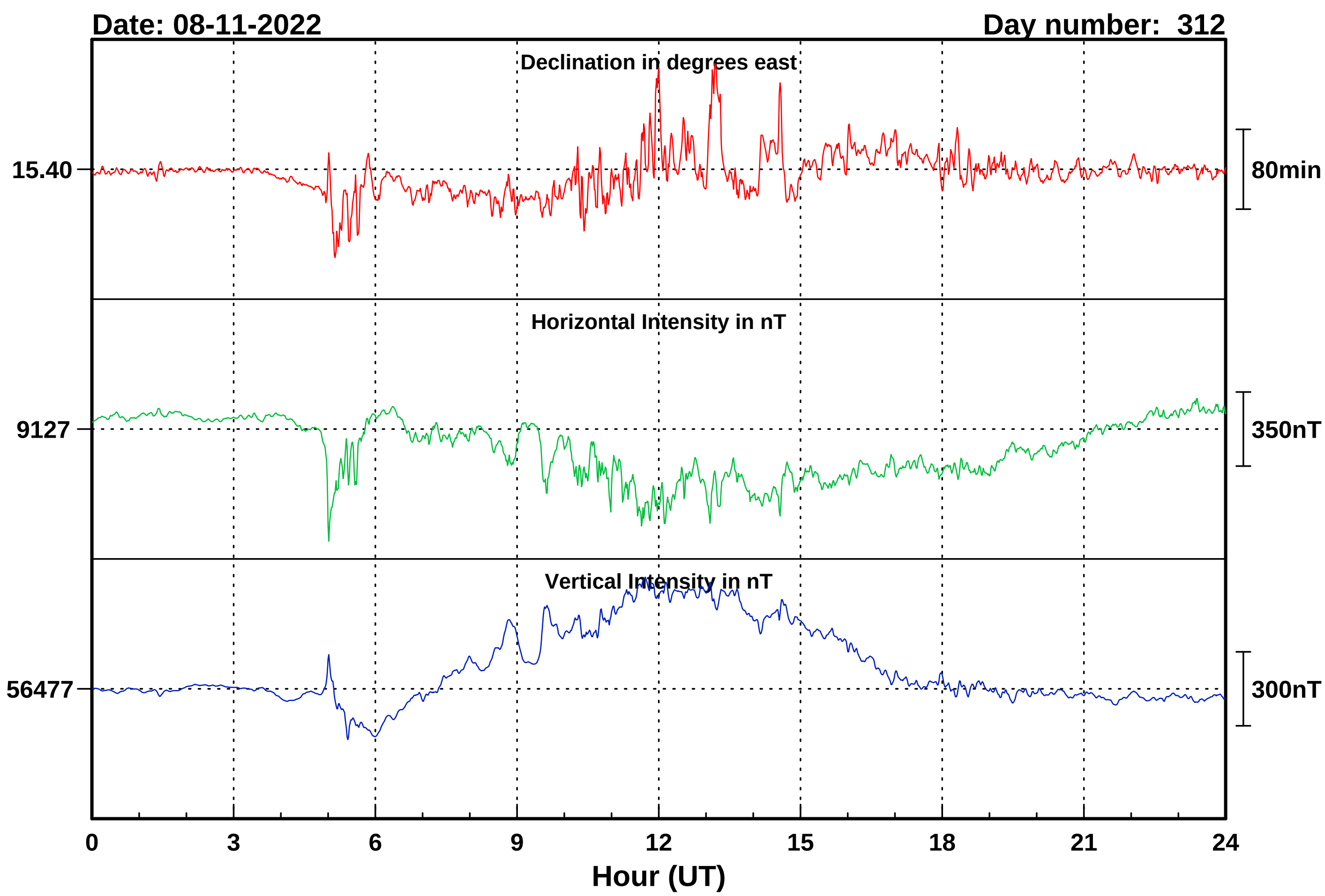


Date: 06-11-2022 Day number: 310



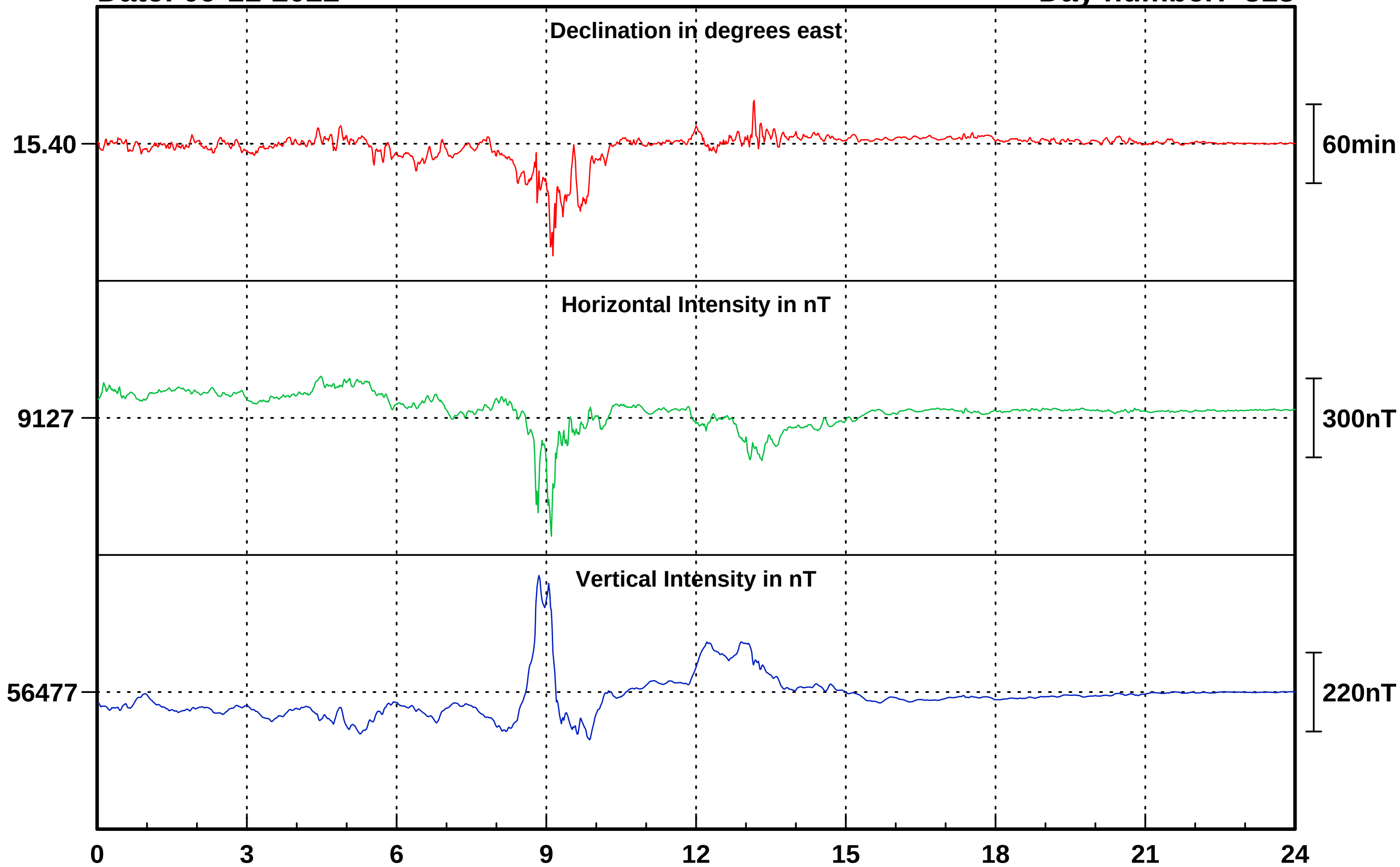
Jim Carrigan



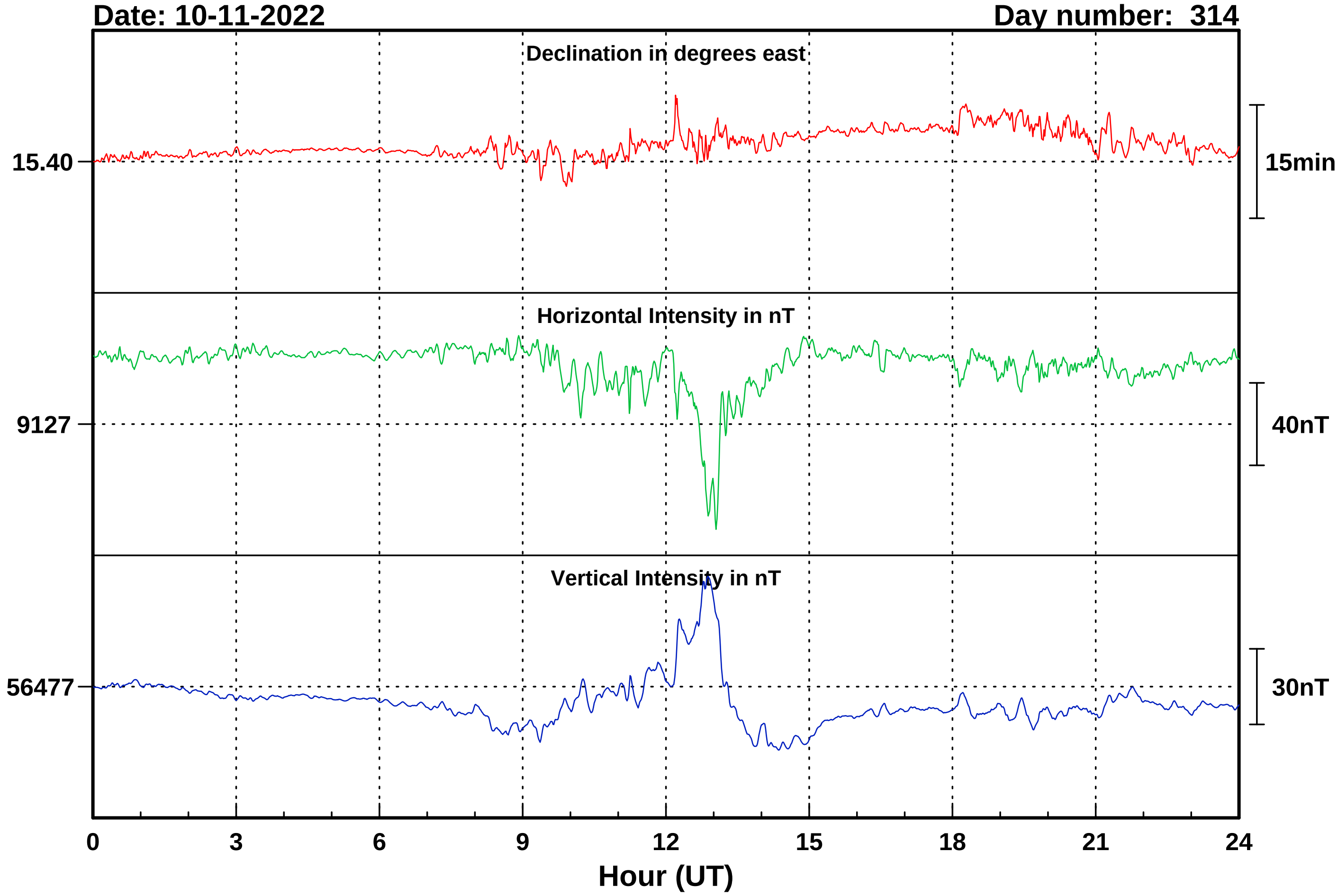


Jim Carrigan

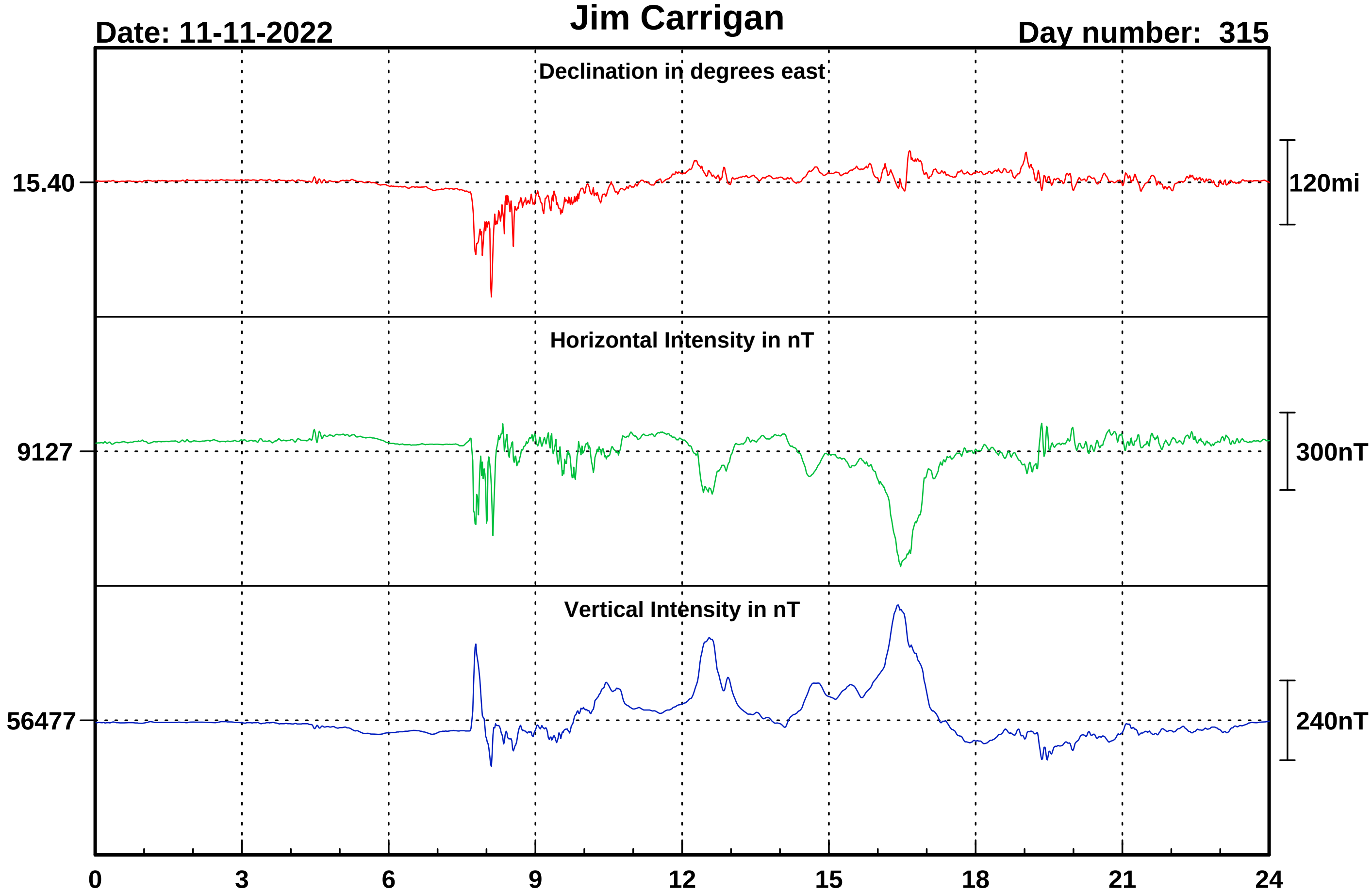
Date: 09-11-2022 Day number: 313

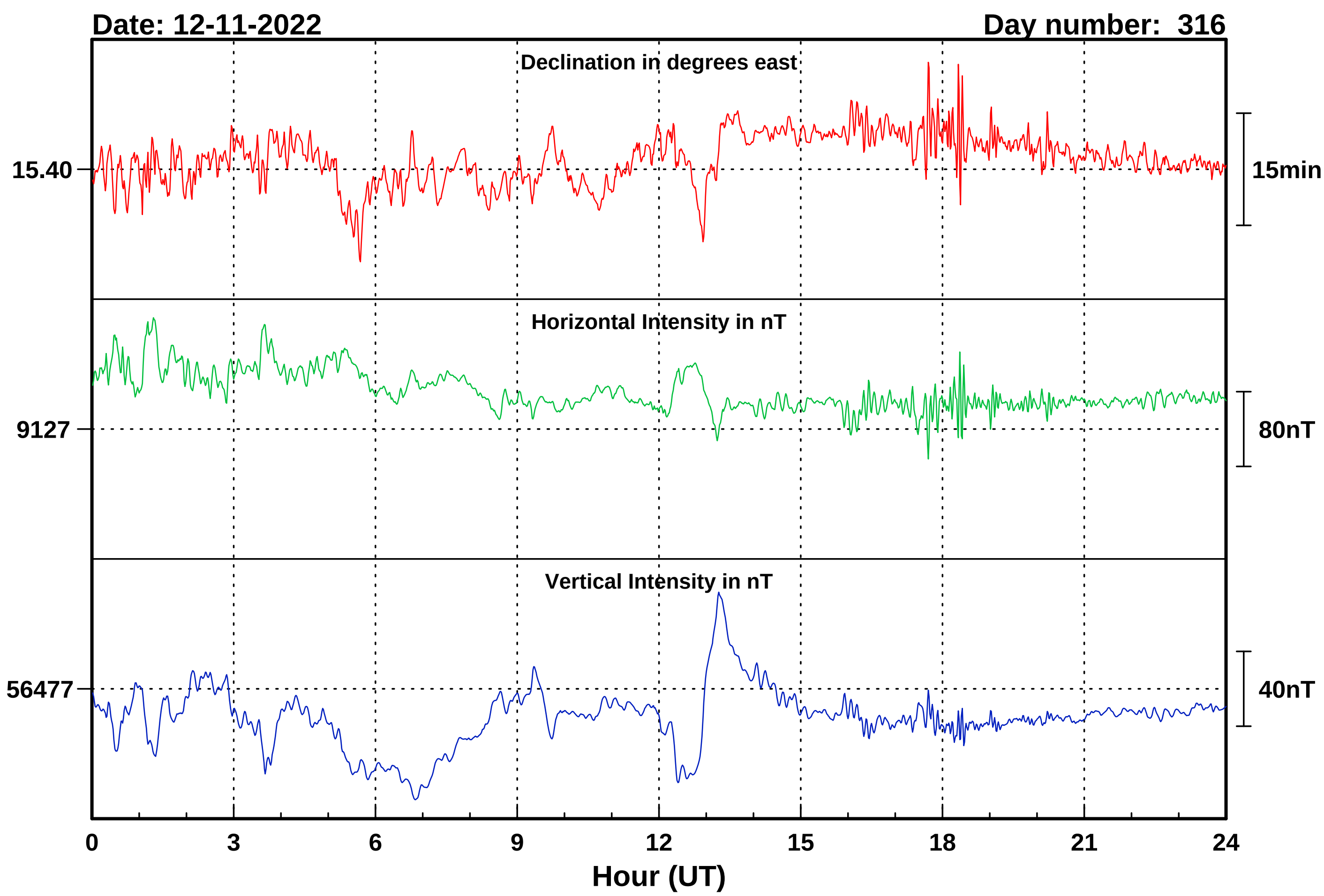


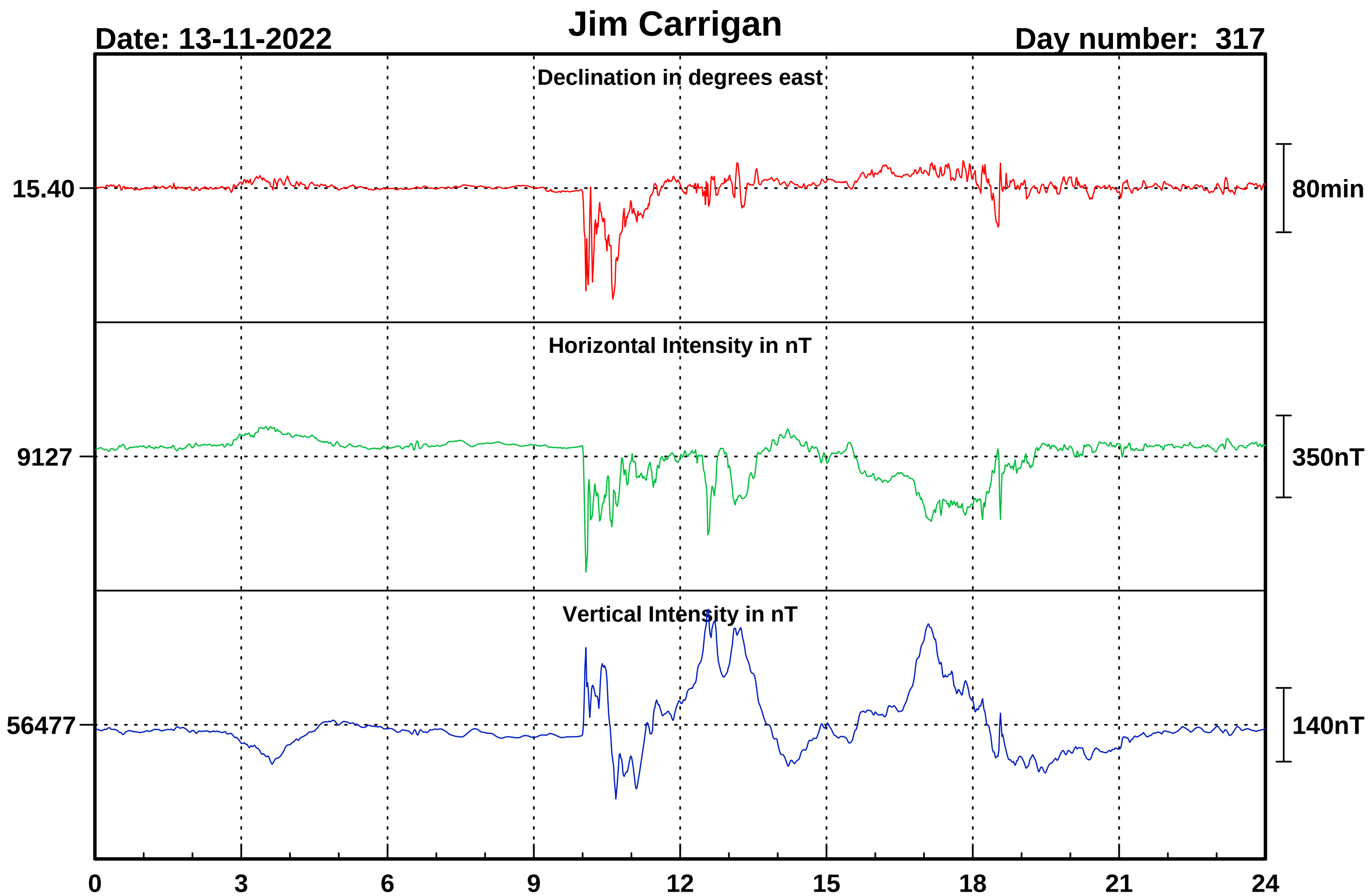
Date: 10-11-2022 Day number: 314

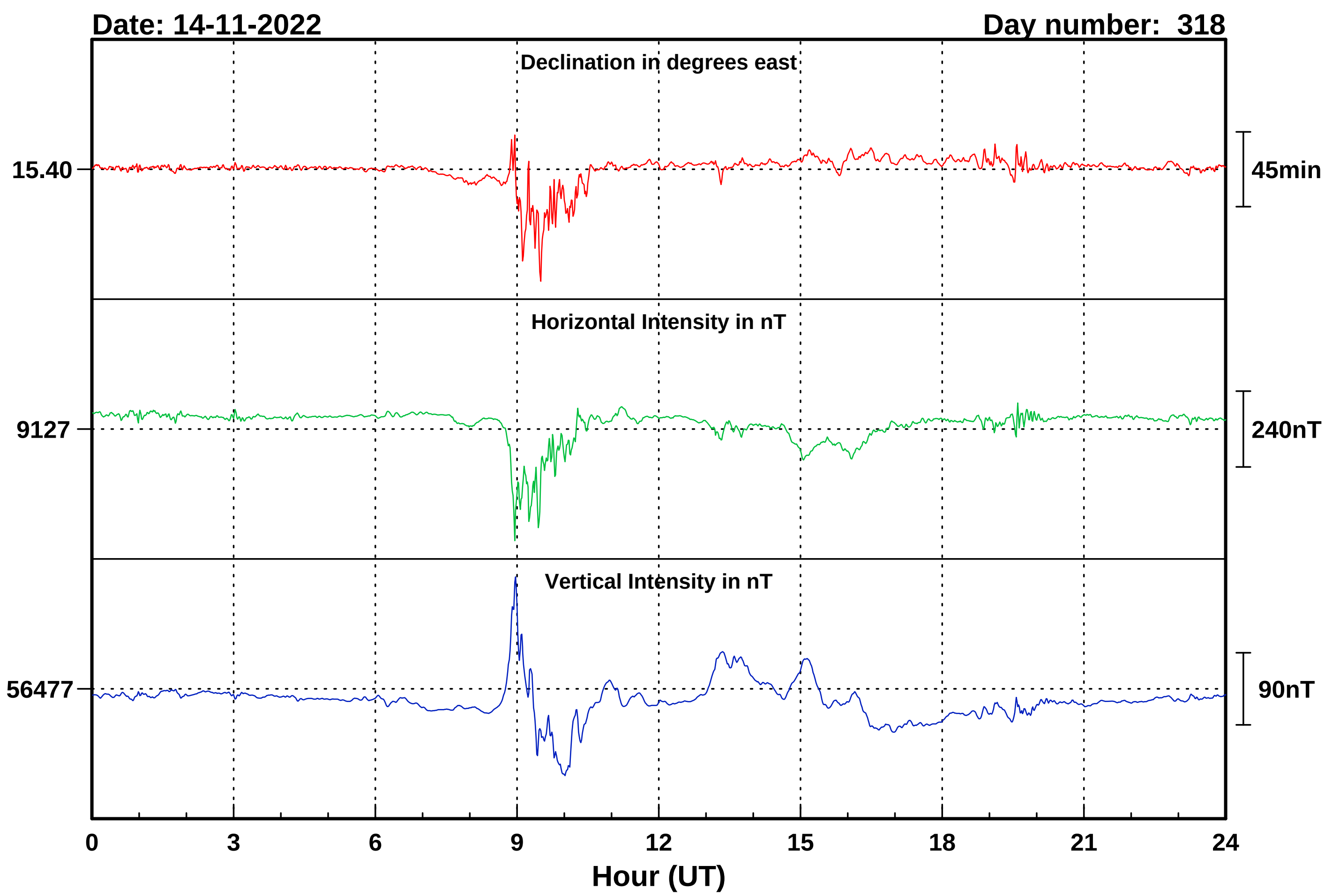


Jim Carrigan

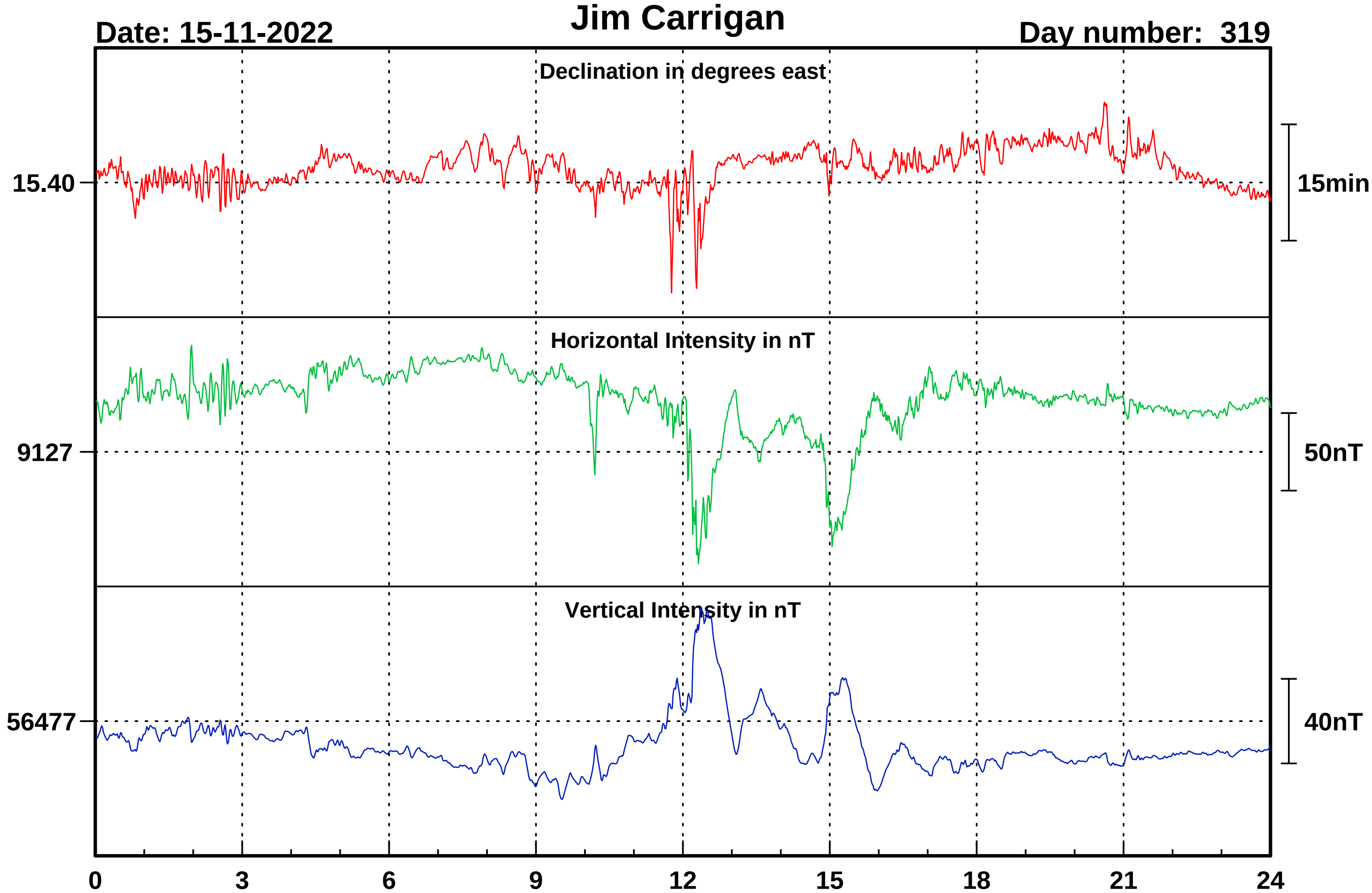


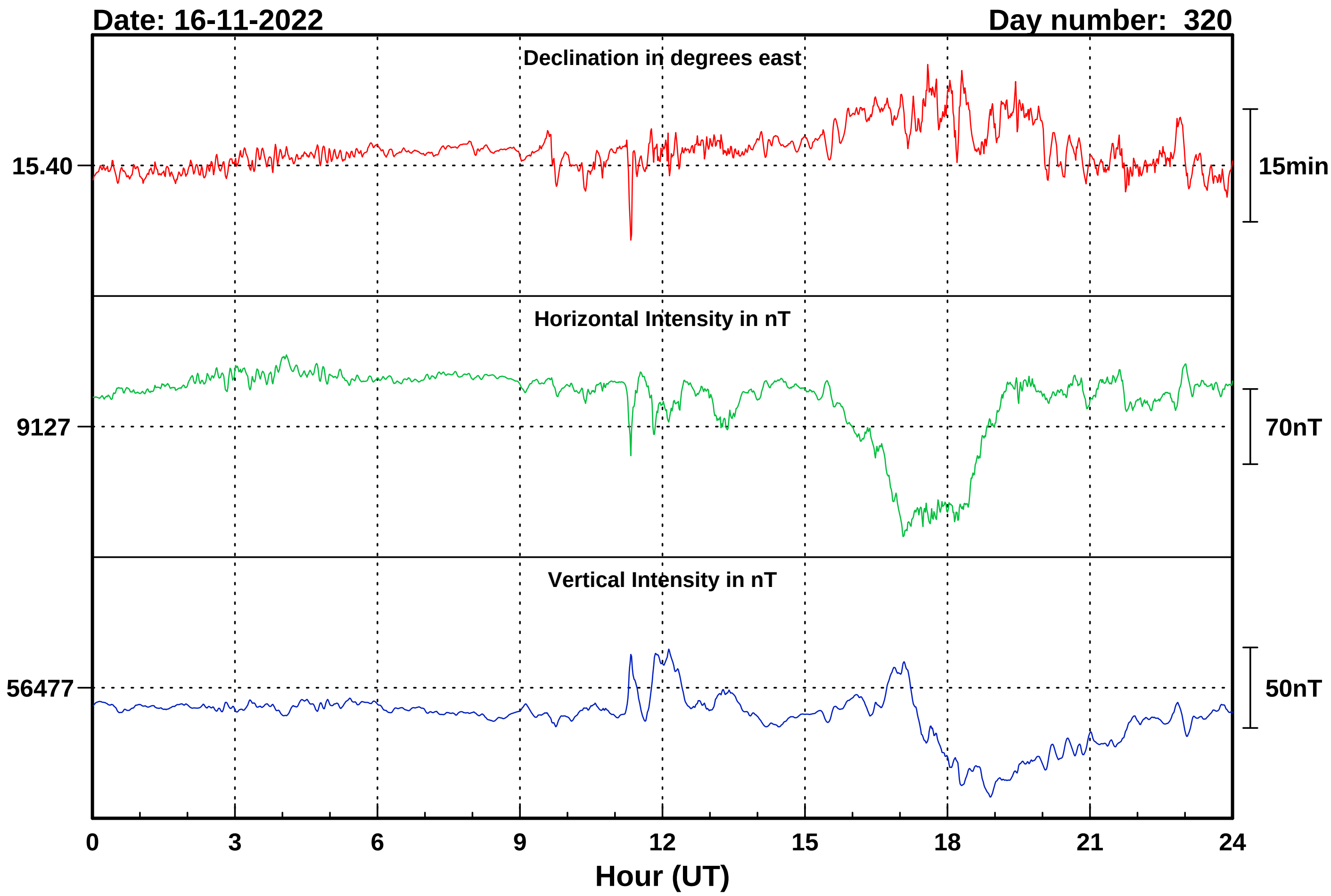



Date: 13-11-2022
Jim Carrigan
Day number: 317
Declination in degrees east
15.40
80min
Horizontal Intensity in nT
9127
350nT
Vertical Intensity in nT
56477
140nT
0
3
6
9
12
15
18
21
24


Date: 14-11-2022
Day number: 318
Declination in degrees east
15.40
45min
Horizontal Intensity in nT
9127
240nT
Vertical Intensity in nT
56477
90nT
0
3
6
9
12
15
18
21
24
Hour (UT)

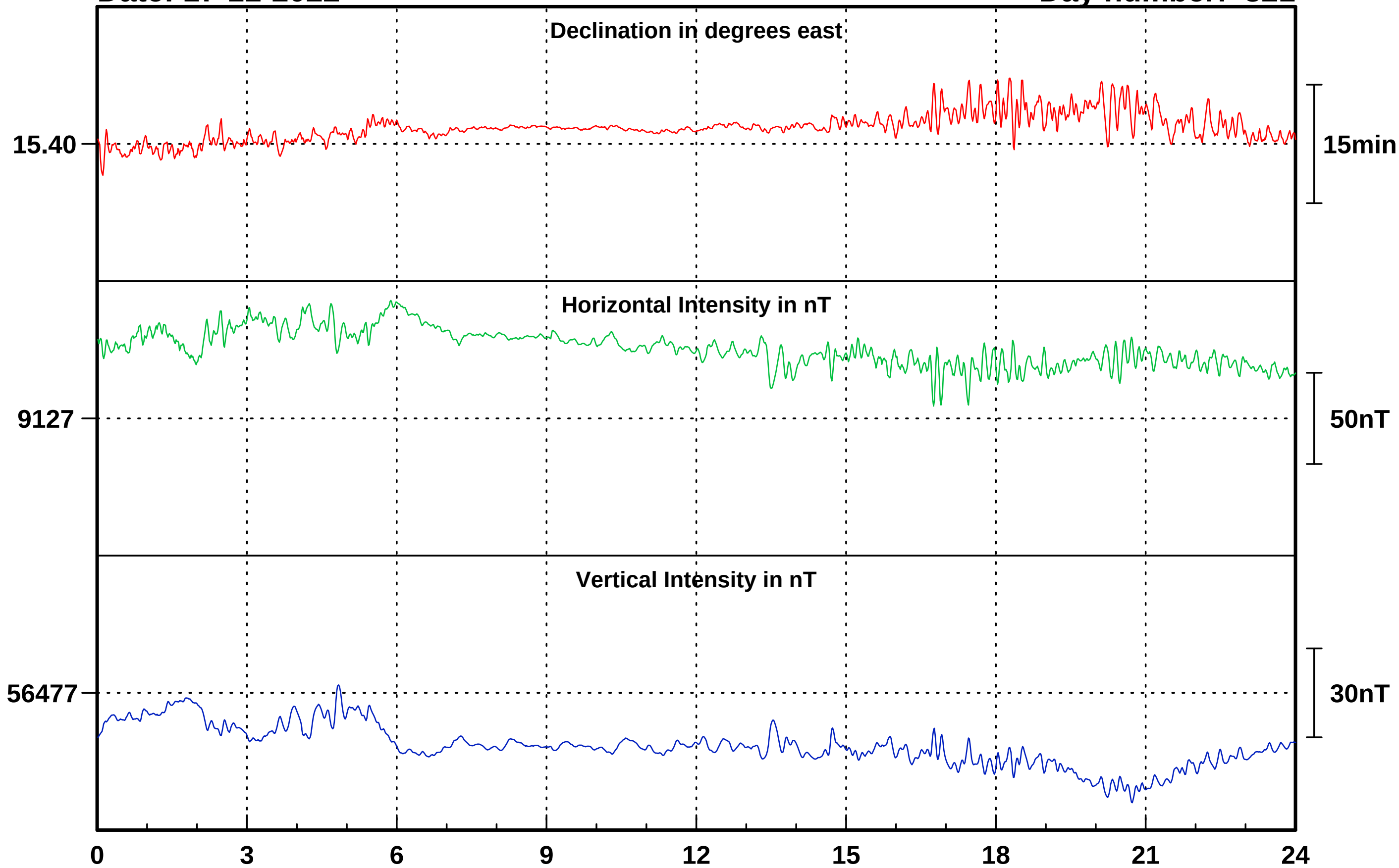
Jim Carrigan



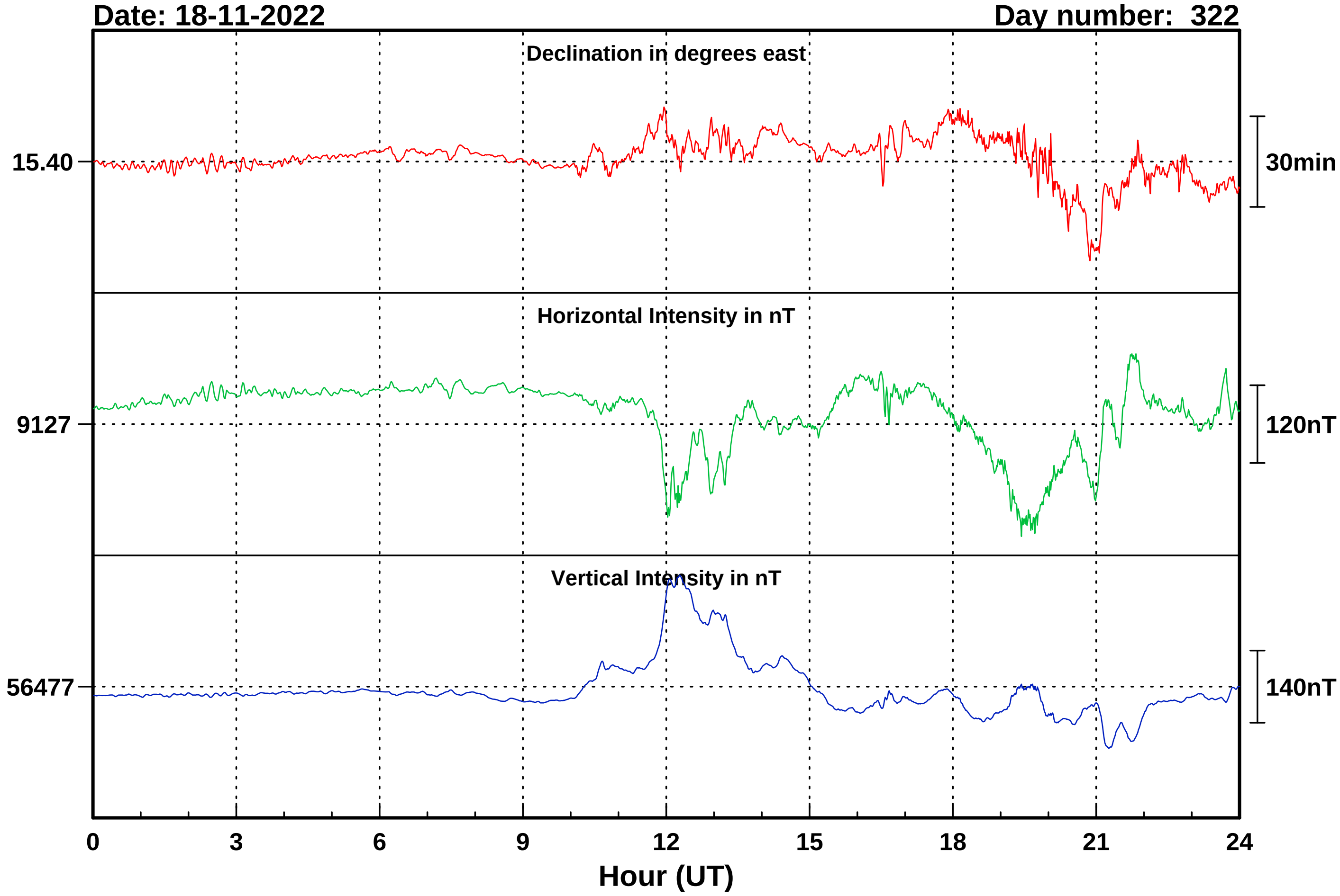


Jim Carrigan

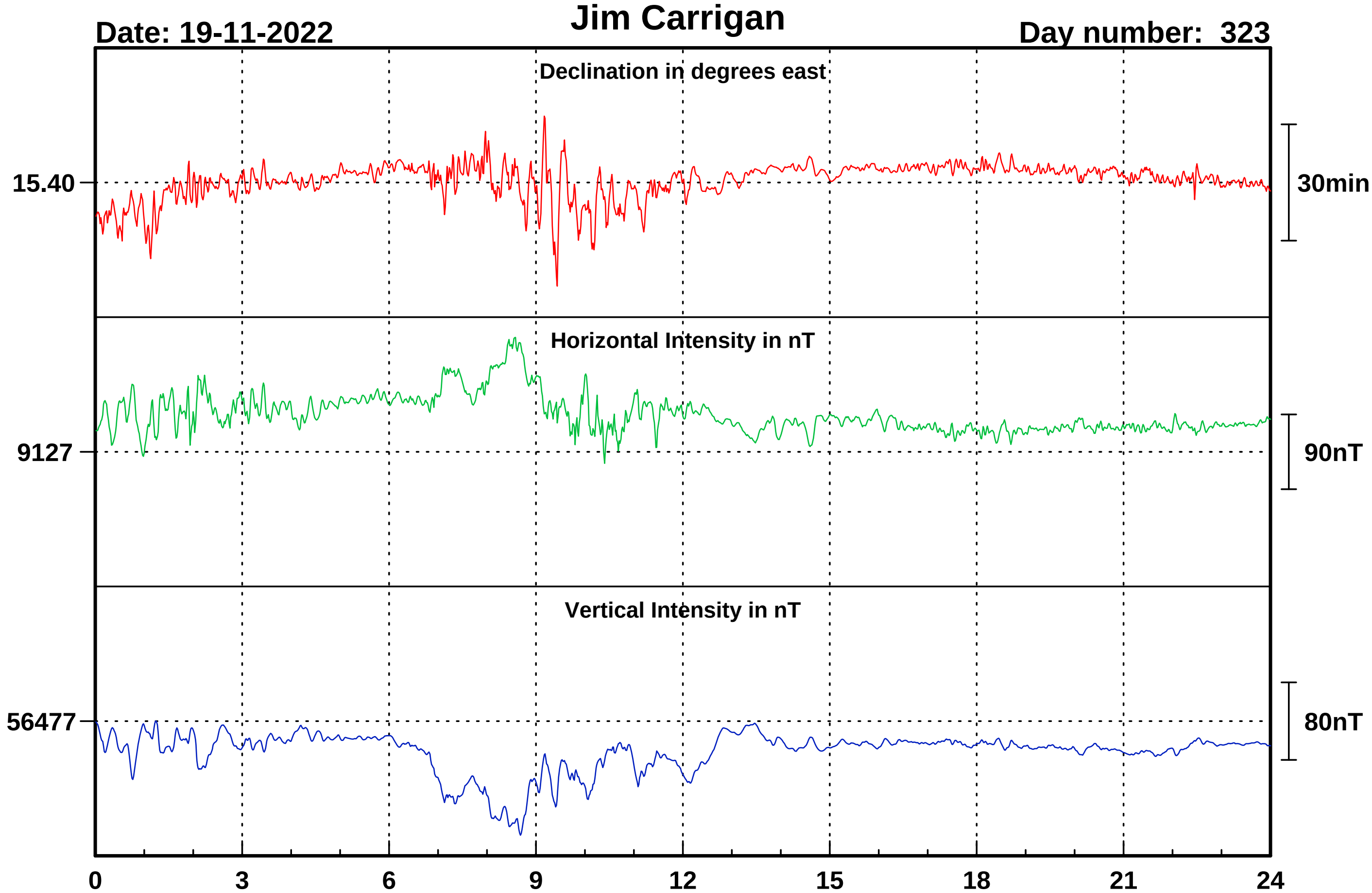
Date: 17-11-2022 Day number: 321

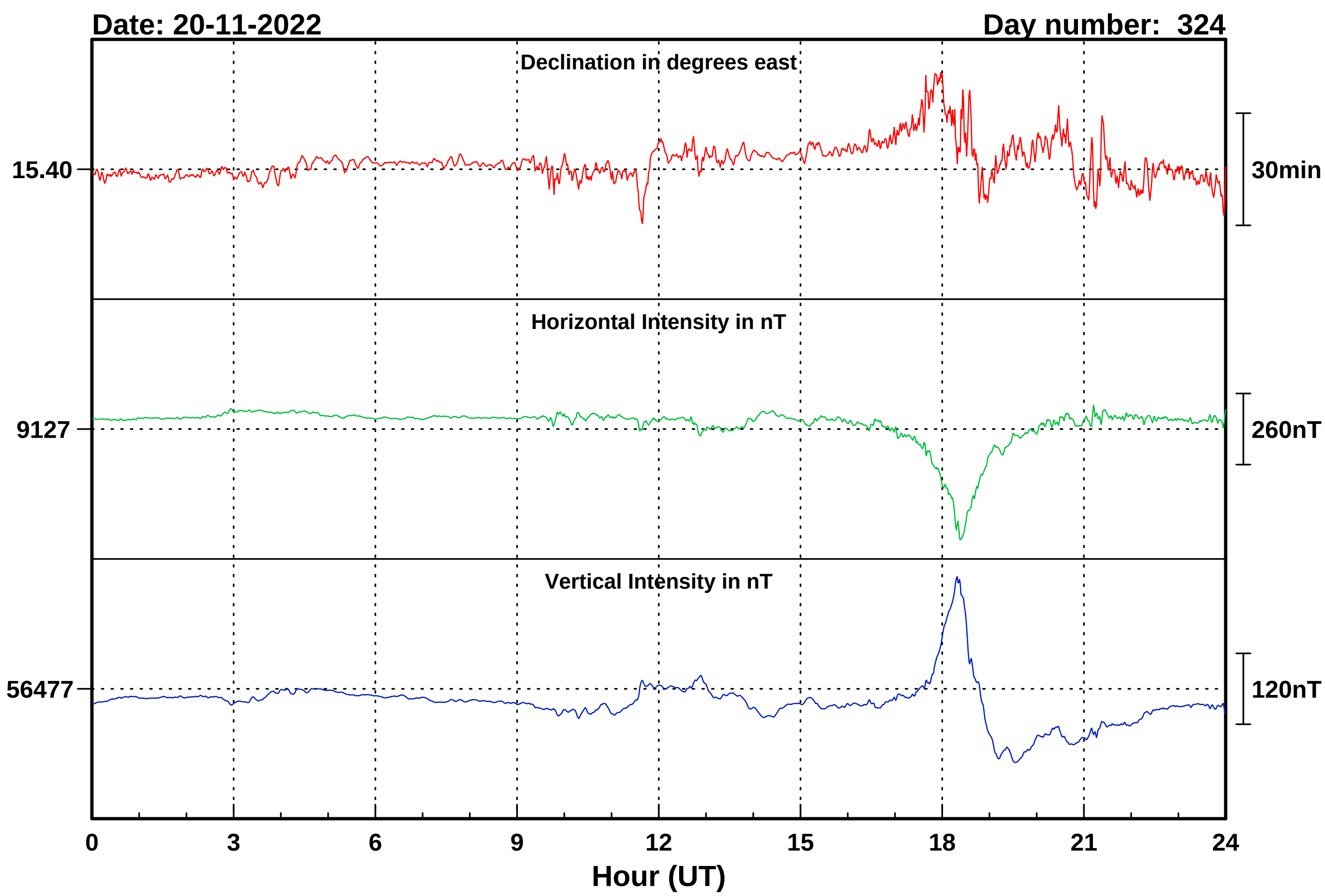


Date: 18-11-2022 Day number: 322



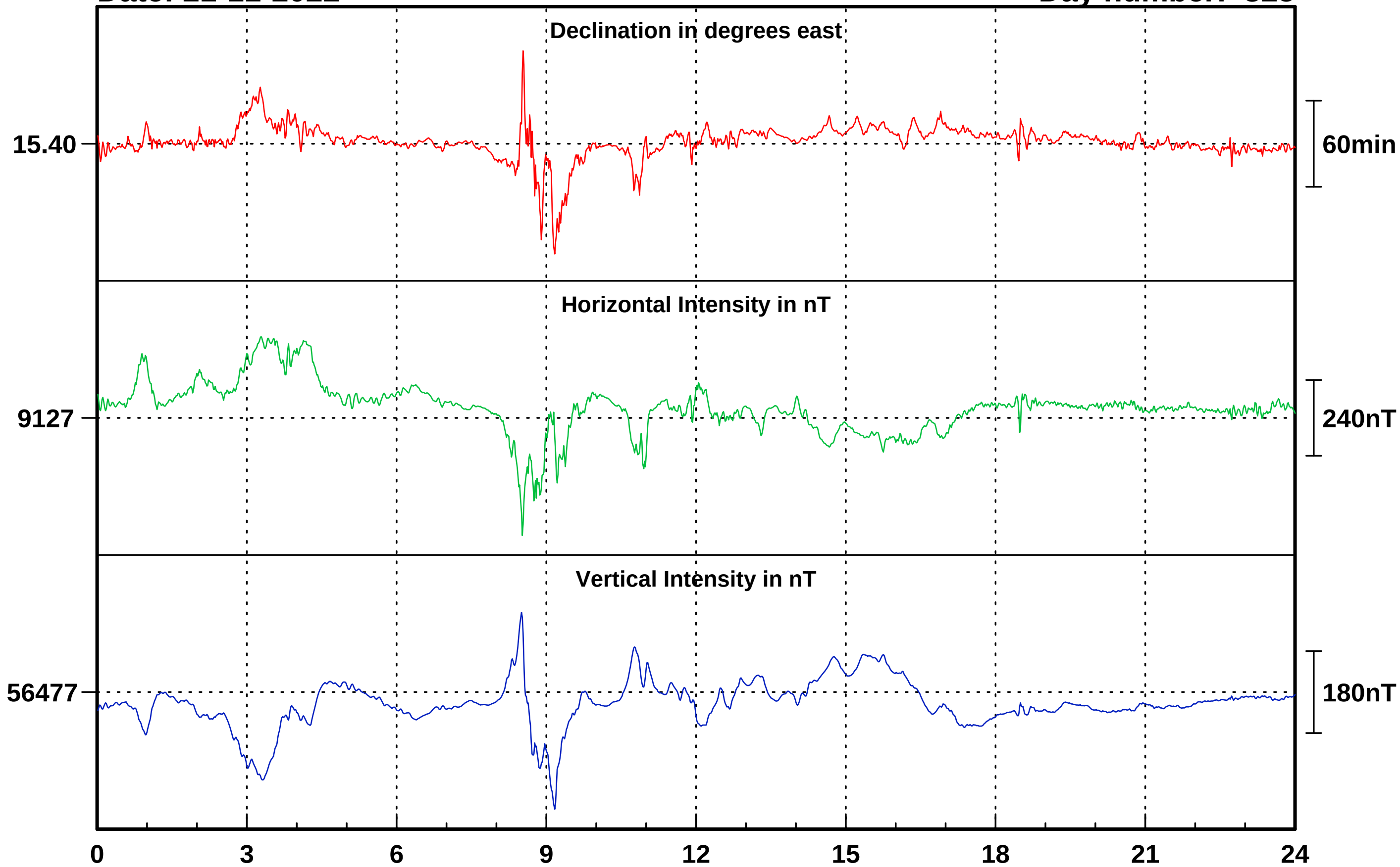
Jim Carrigan



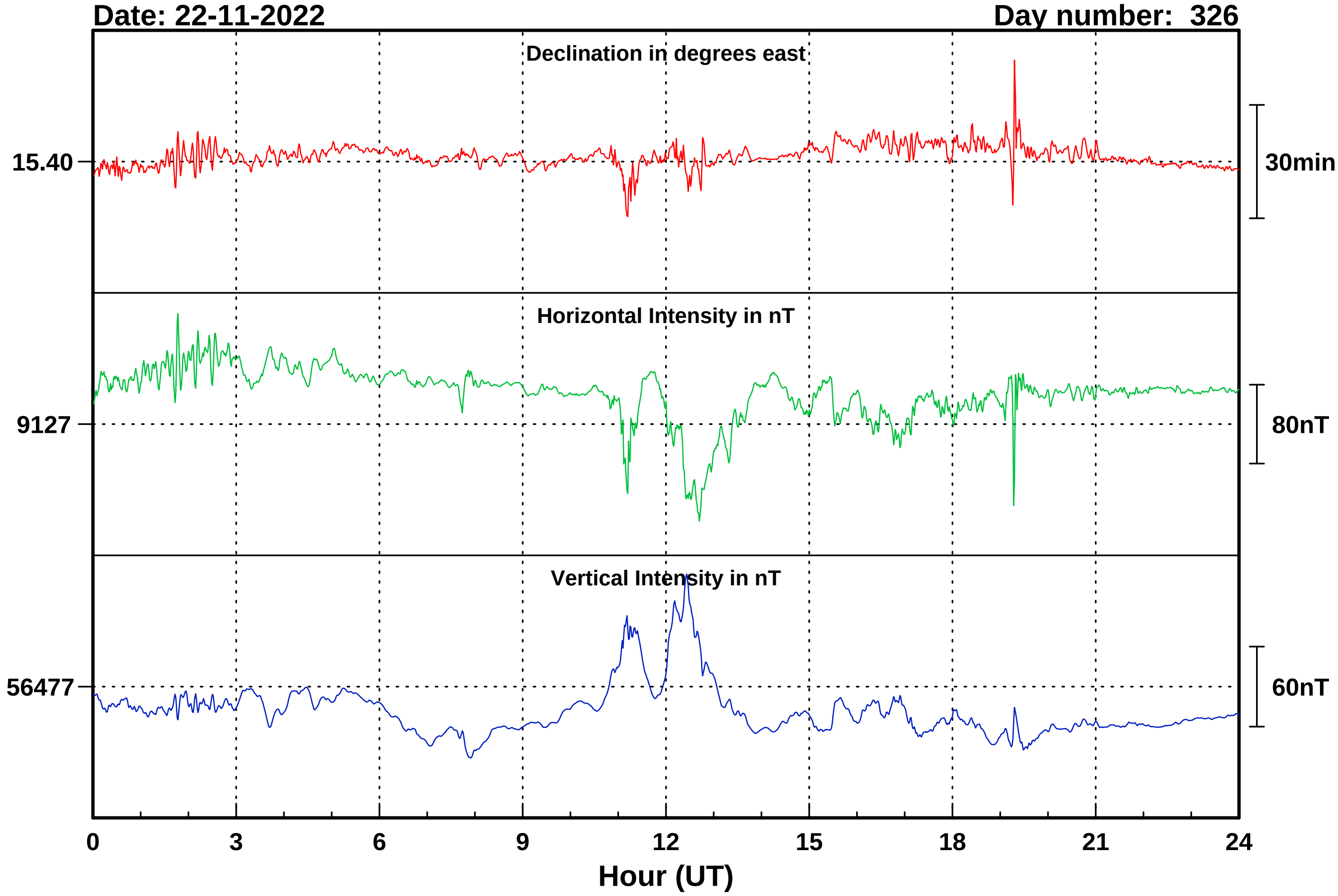


Jim Carrigan

Date: 21-11-2022 Day number: 325

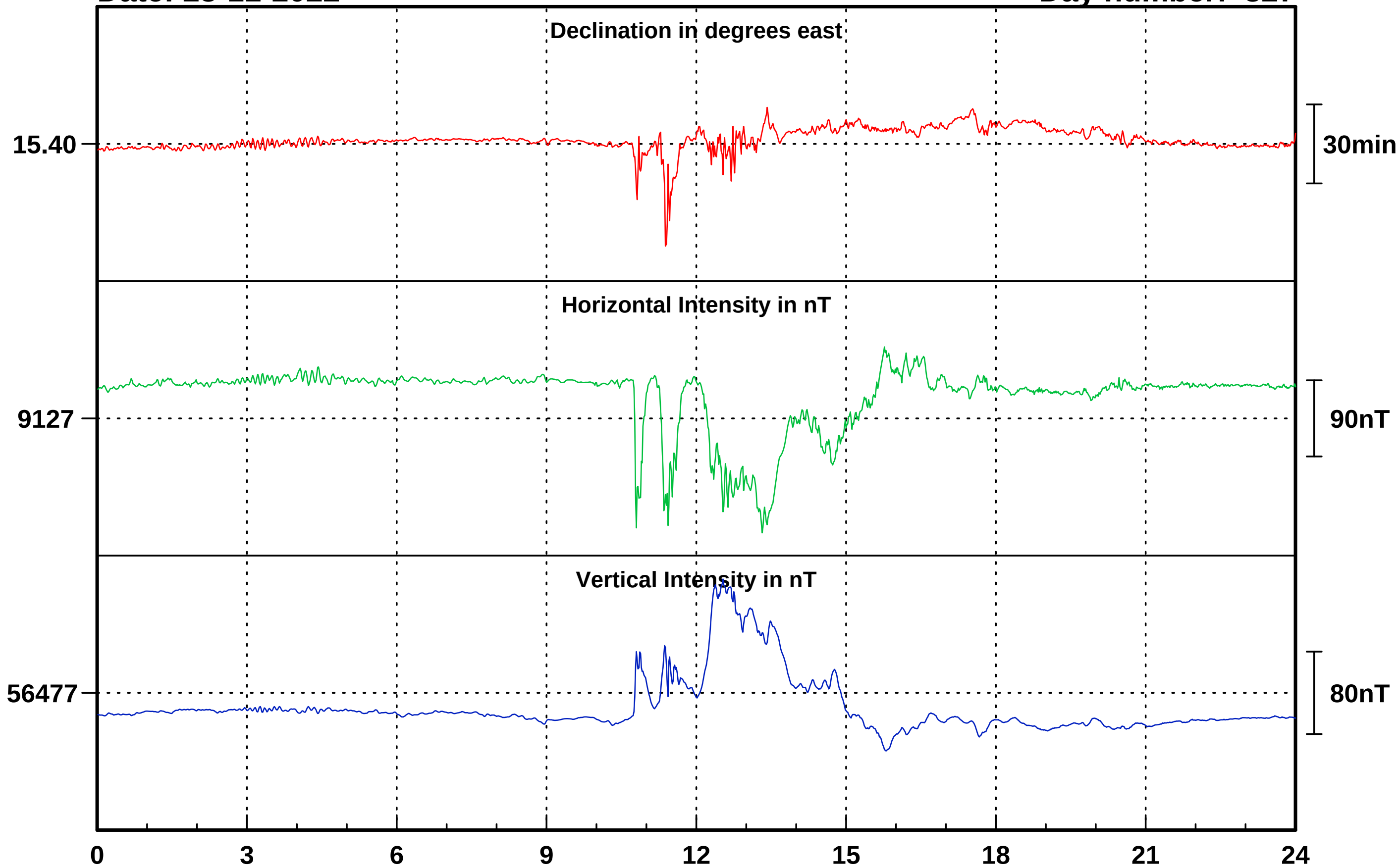


Date: 22-11-2022 Day number: 326

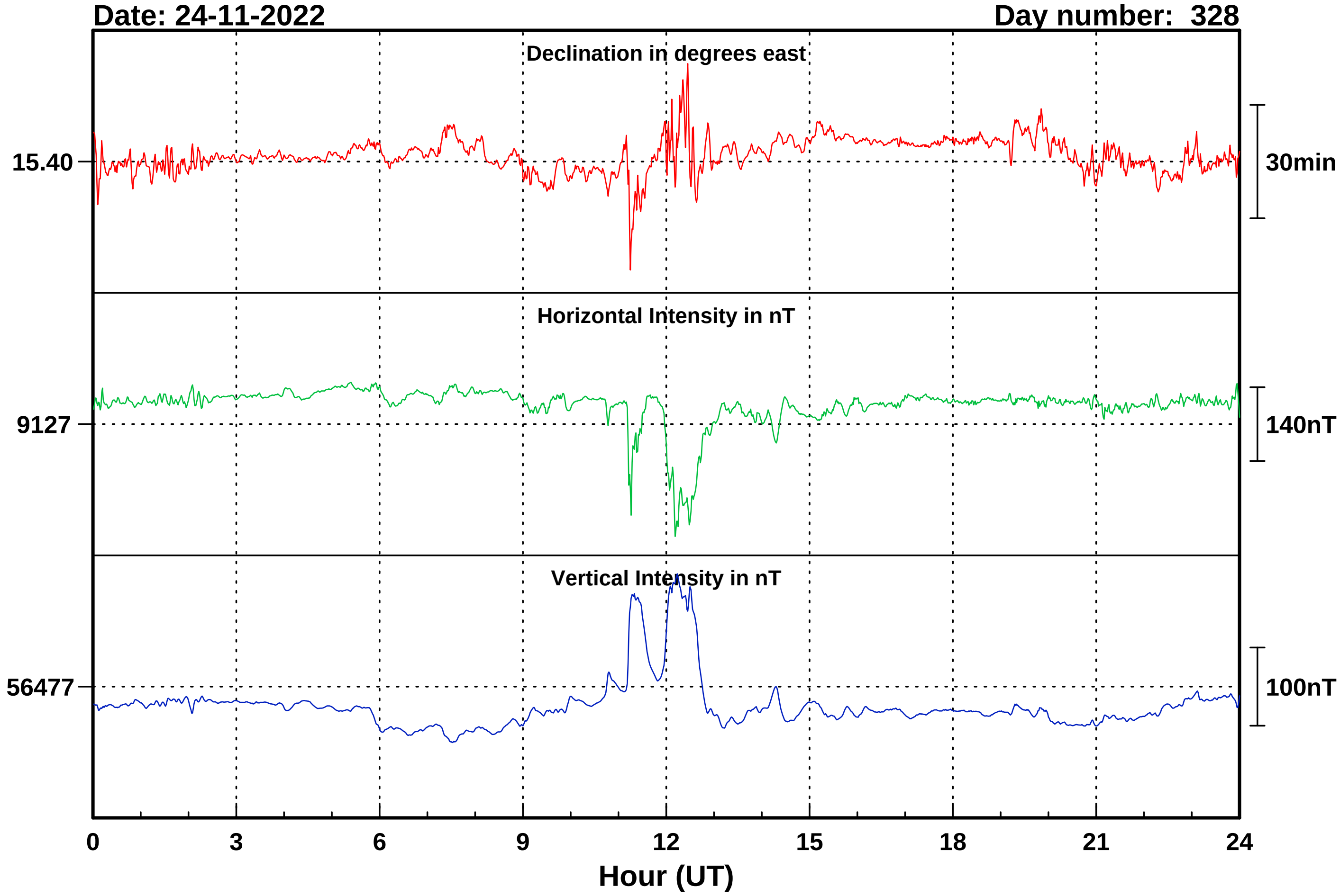


Jim Carrigan

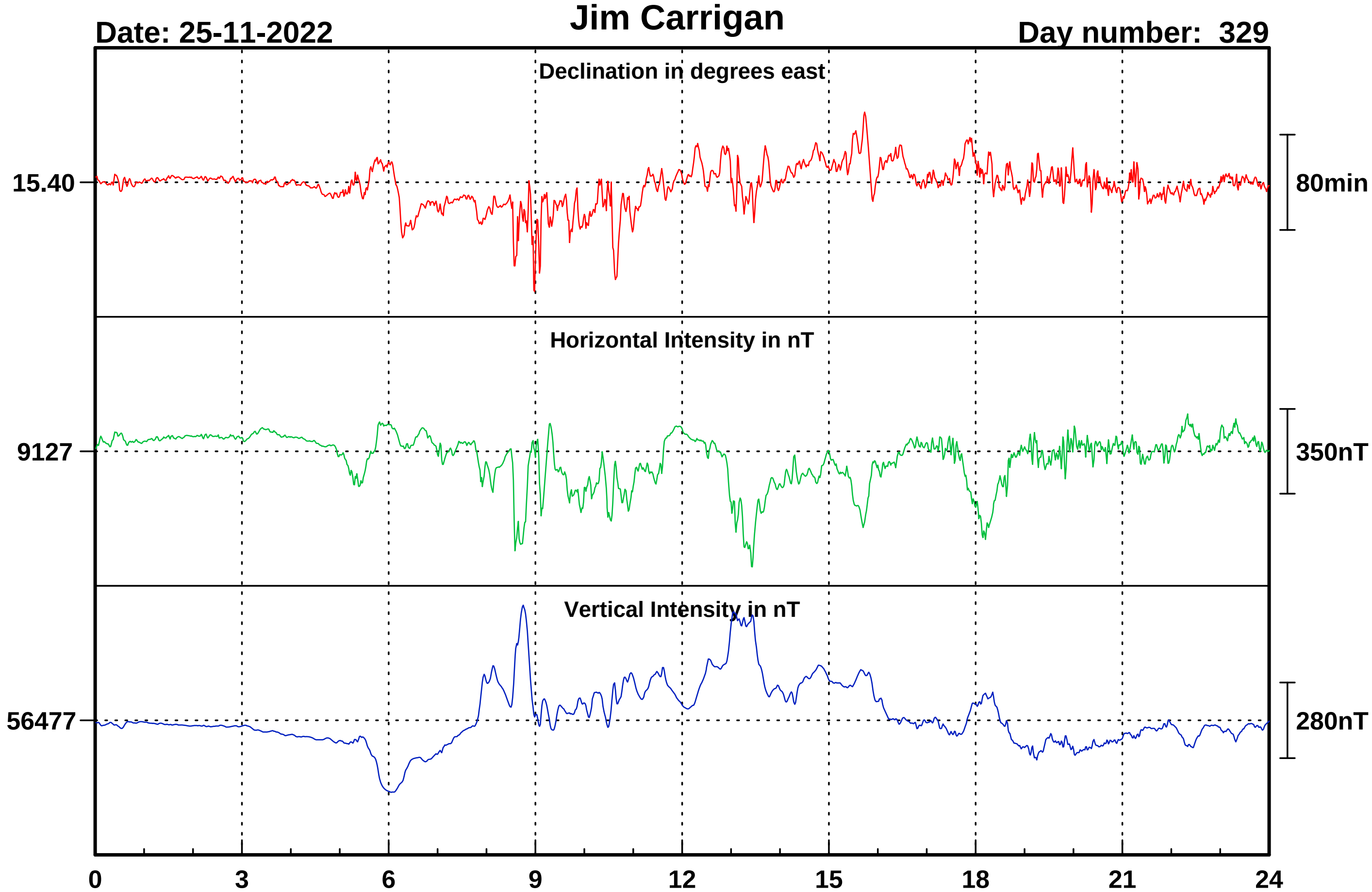
Date: 23-11-2022 **Day number: 327**

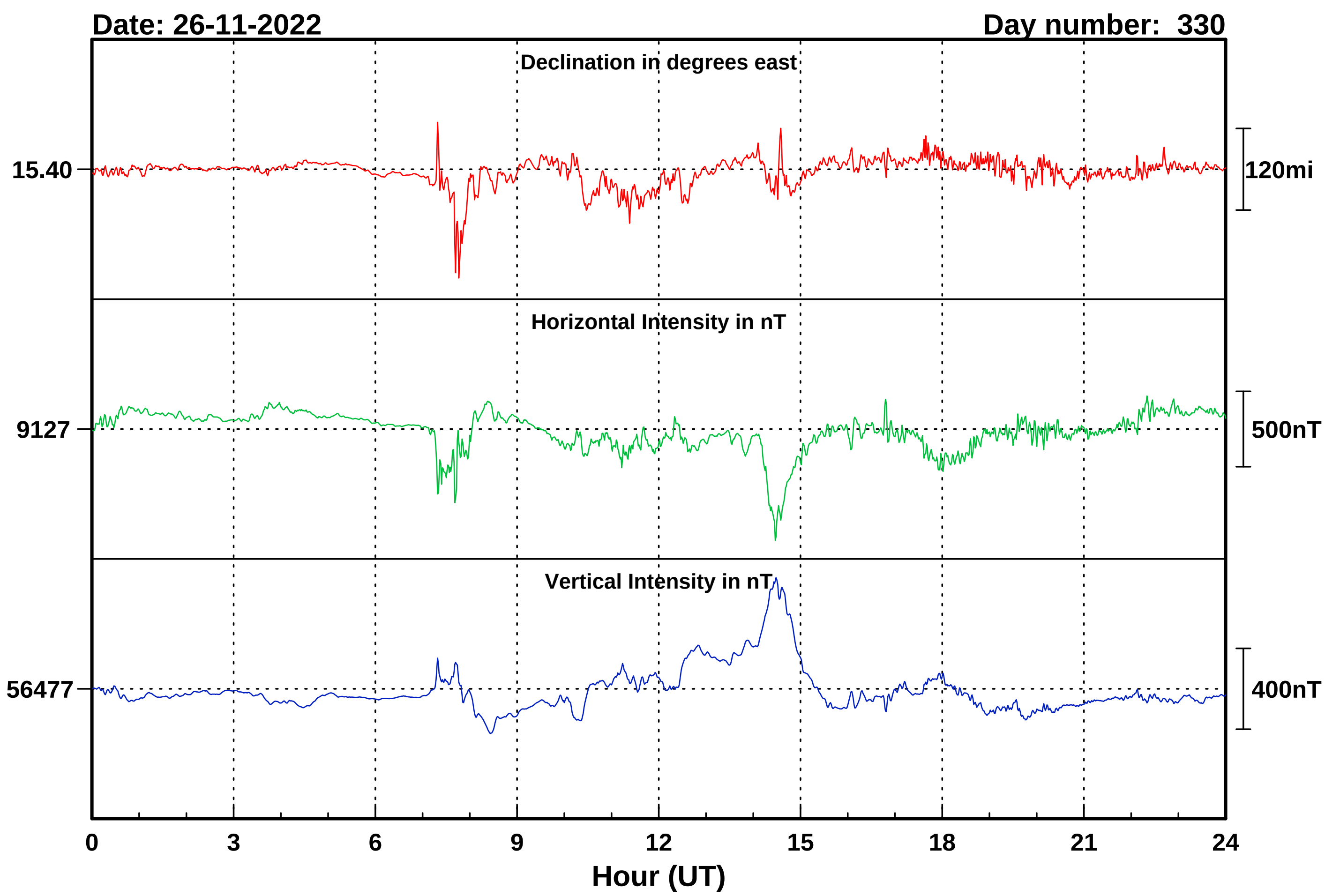


Date: 24-11-2022 **Day number: 328**



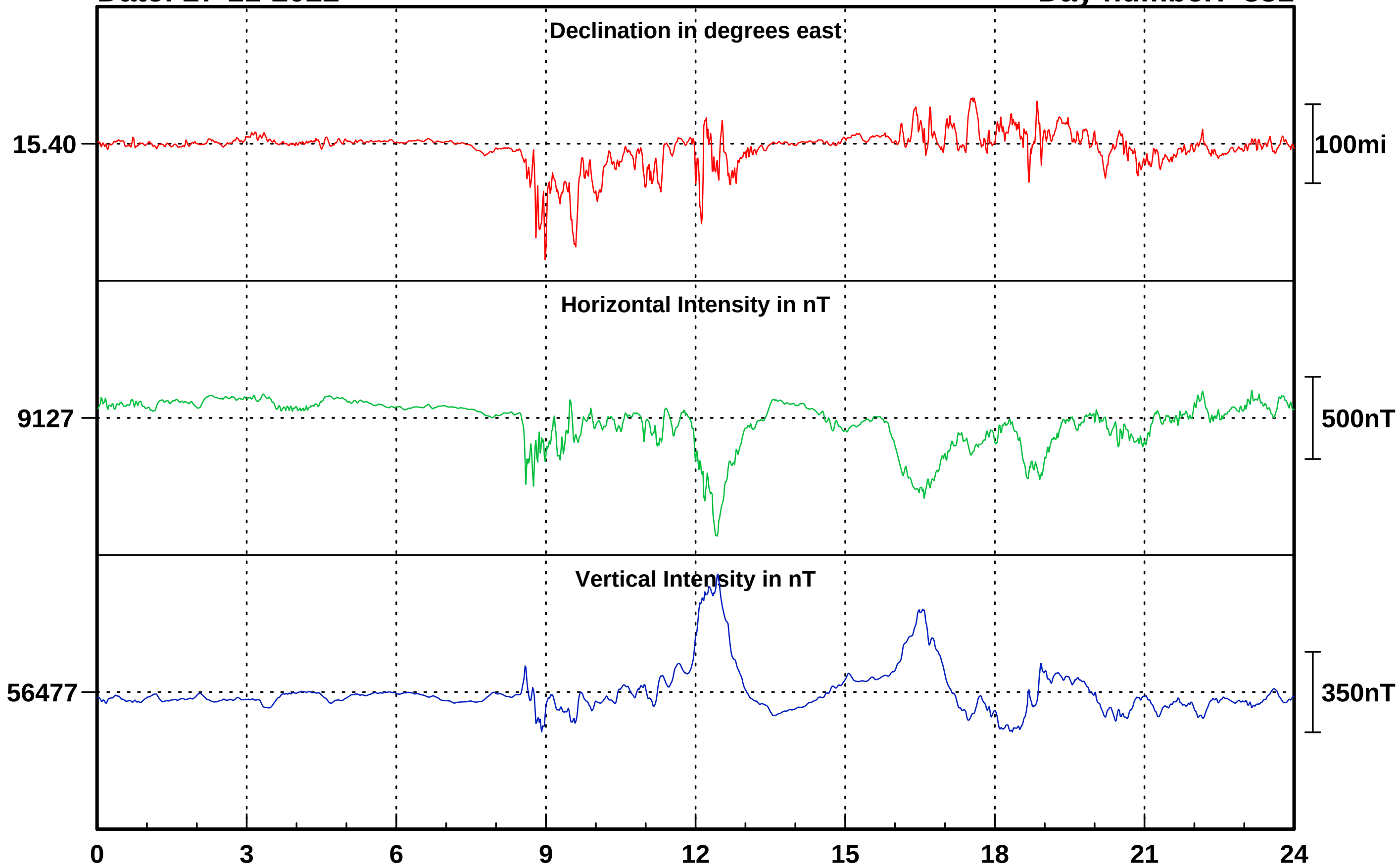
Jim Carrigan



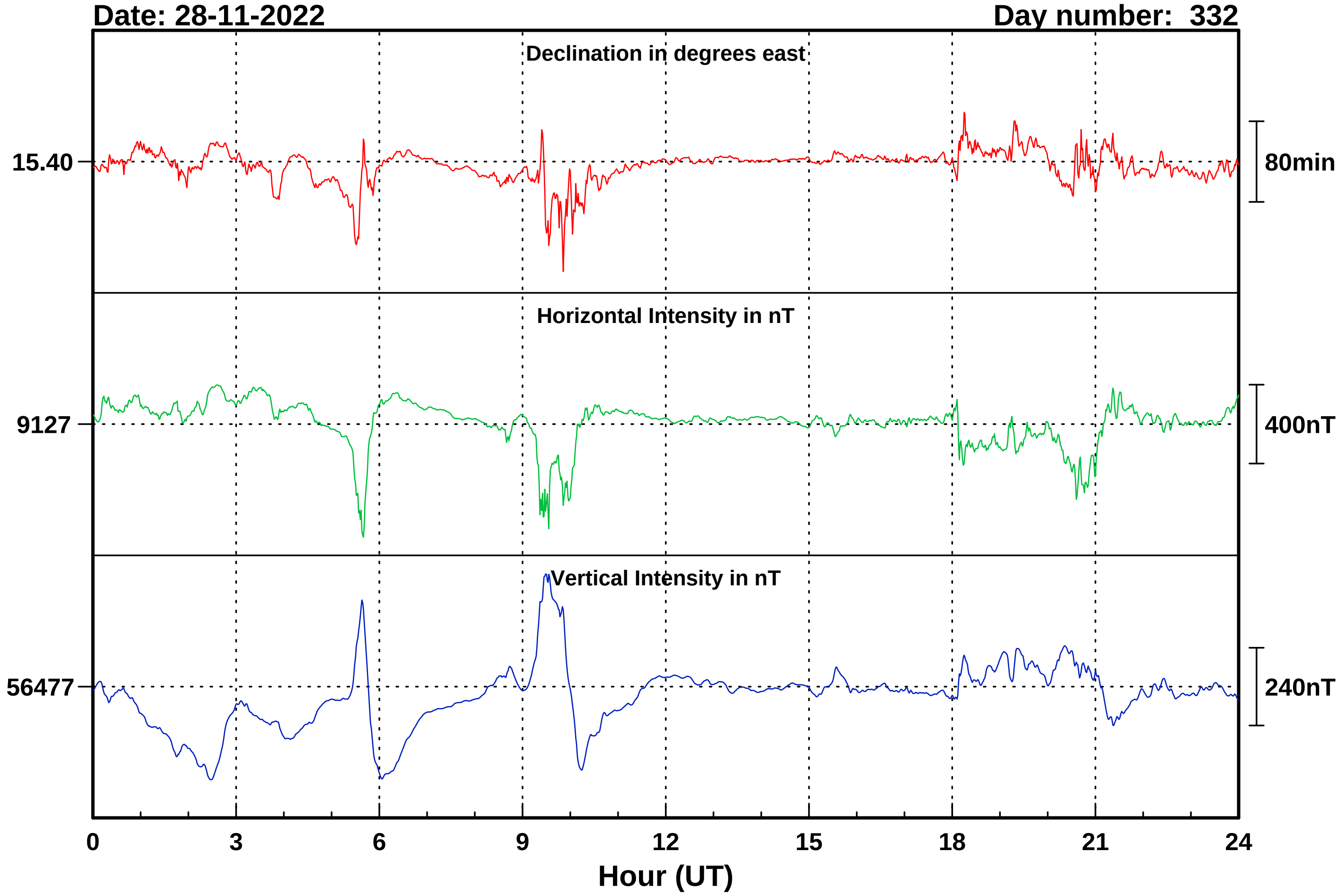


Jim Carrigan

Date: 27-11-2022 Day number: 331



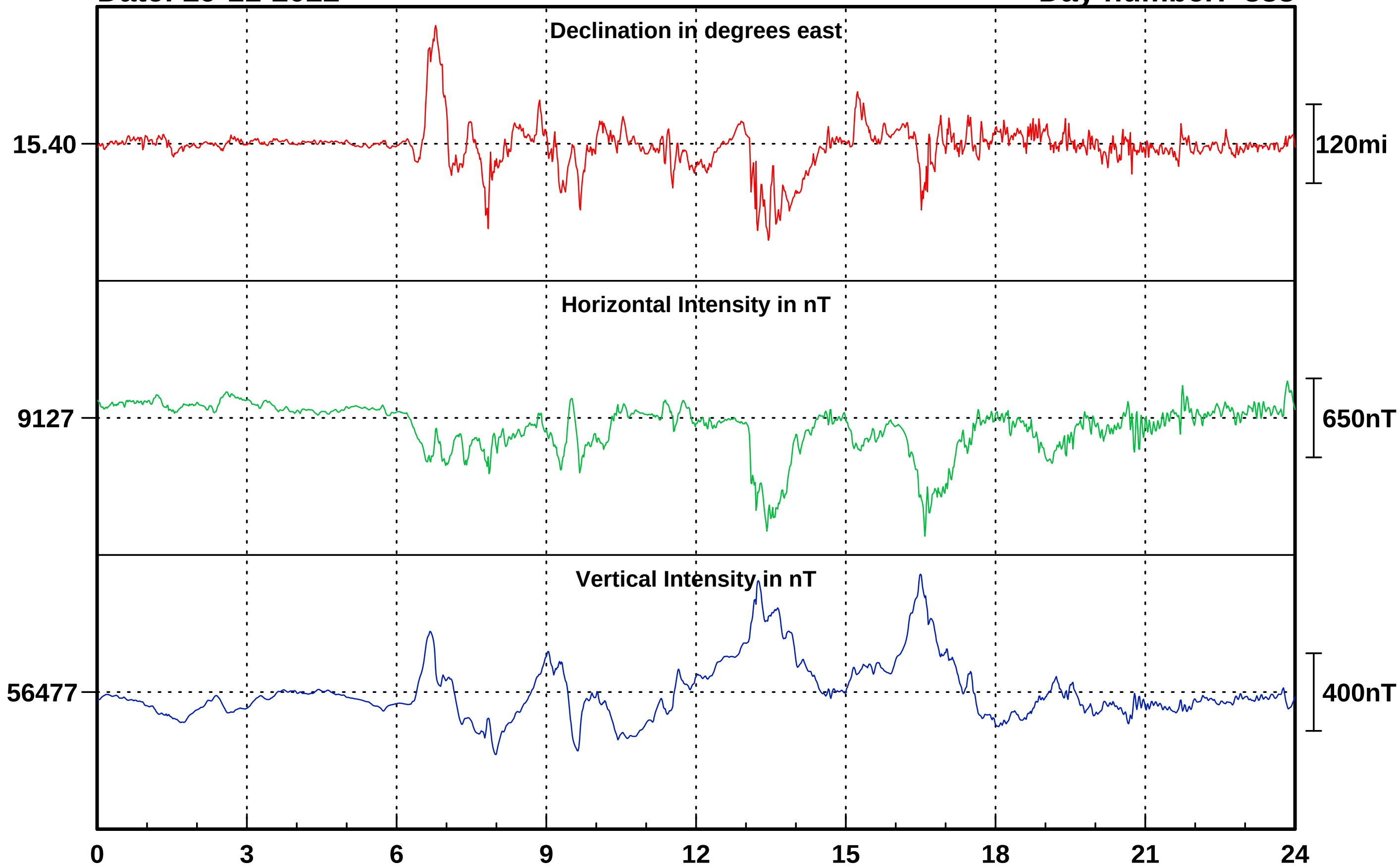
Date: 28-11-2022 Day number: 332



Jim Carrigan

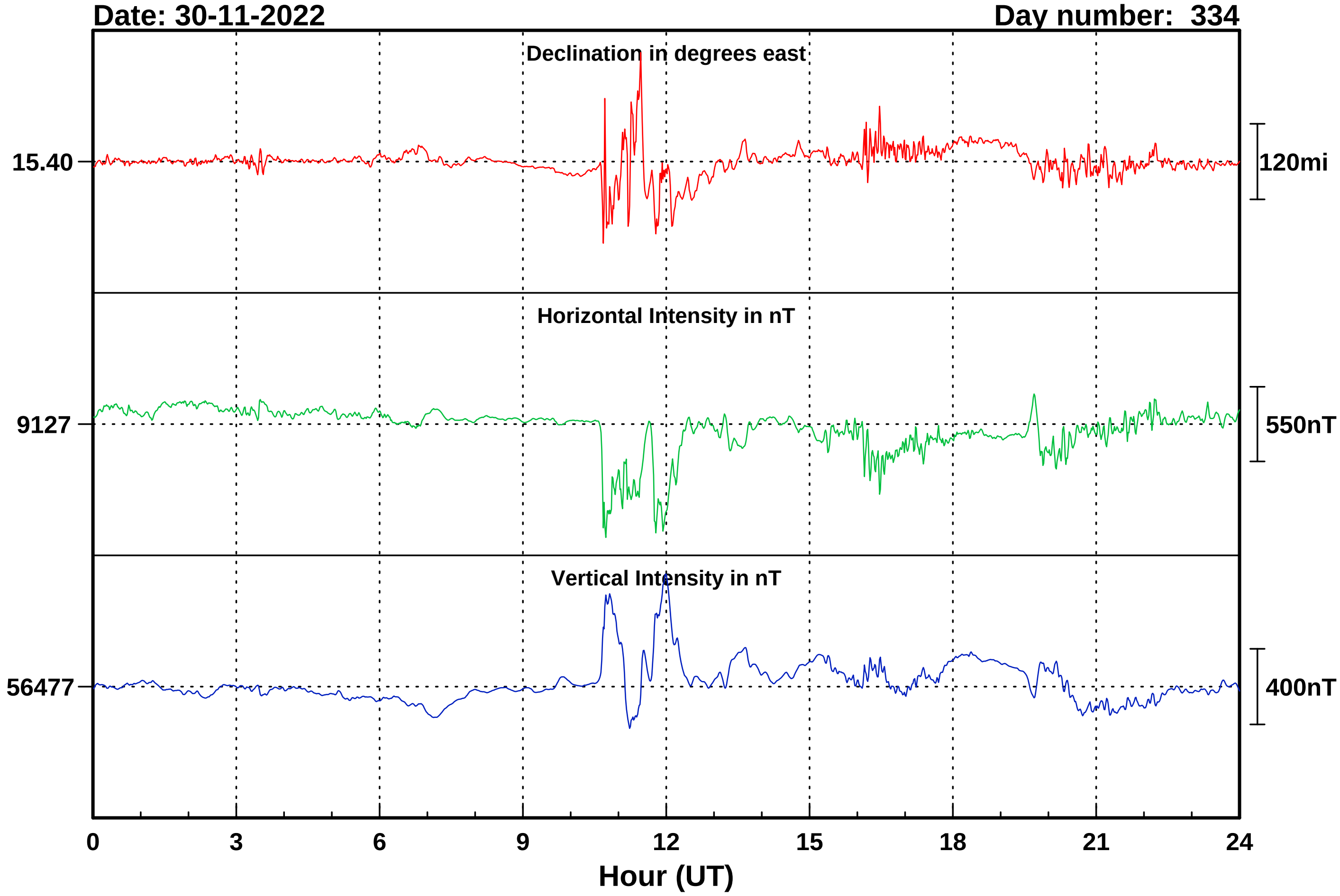
Date: 29-11-2022

Day number: 333

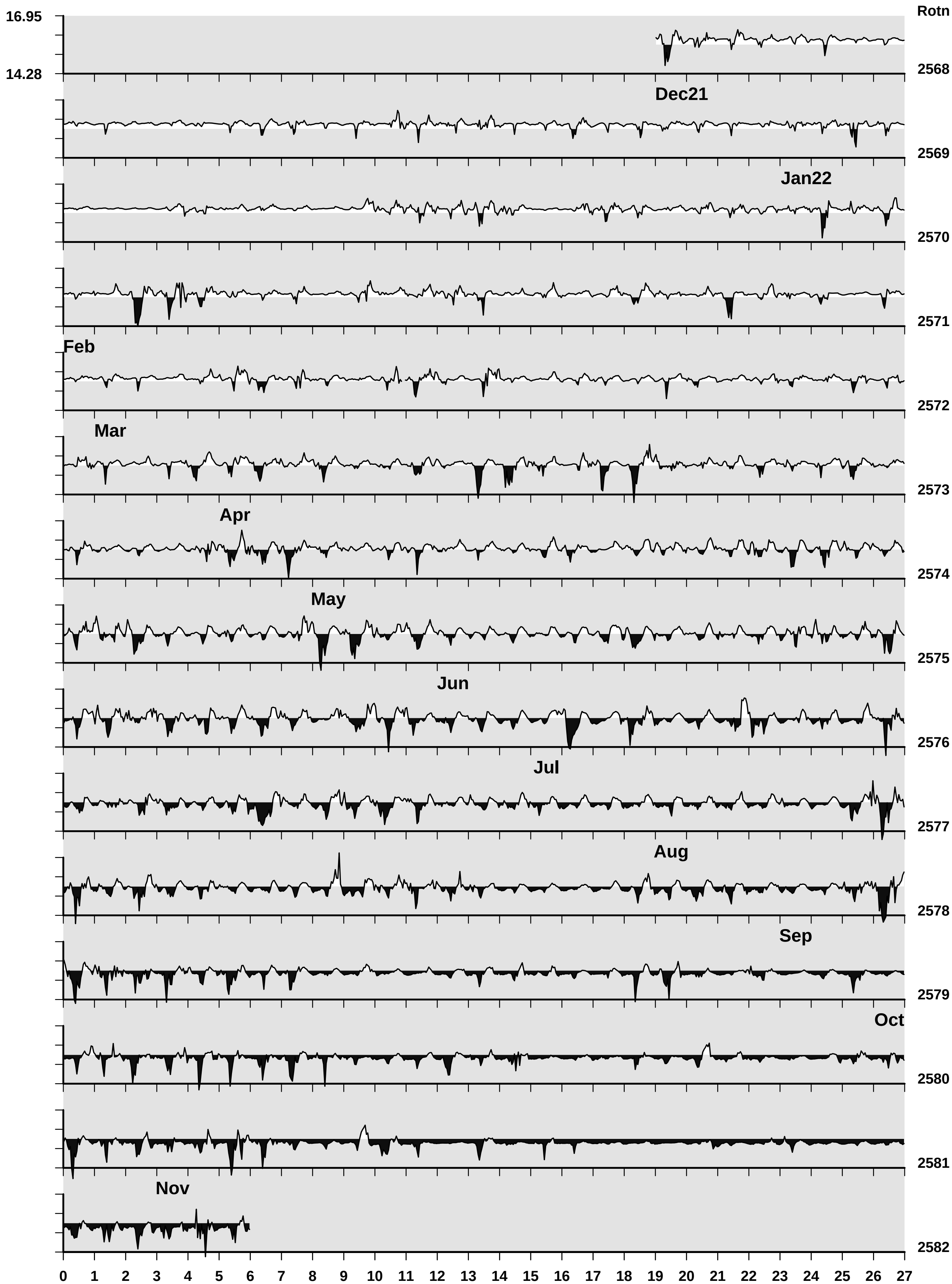


Date: 30-11-2022

Day number: 334

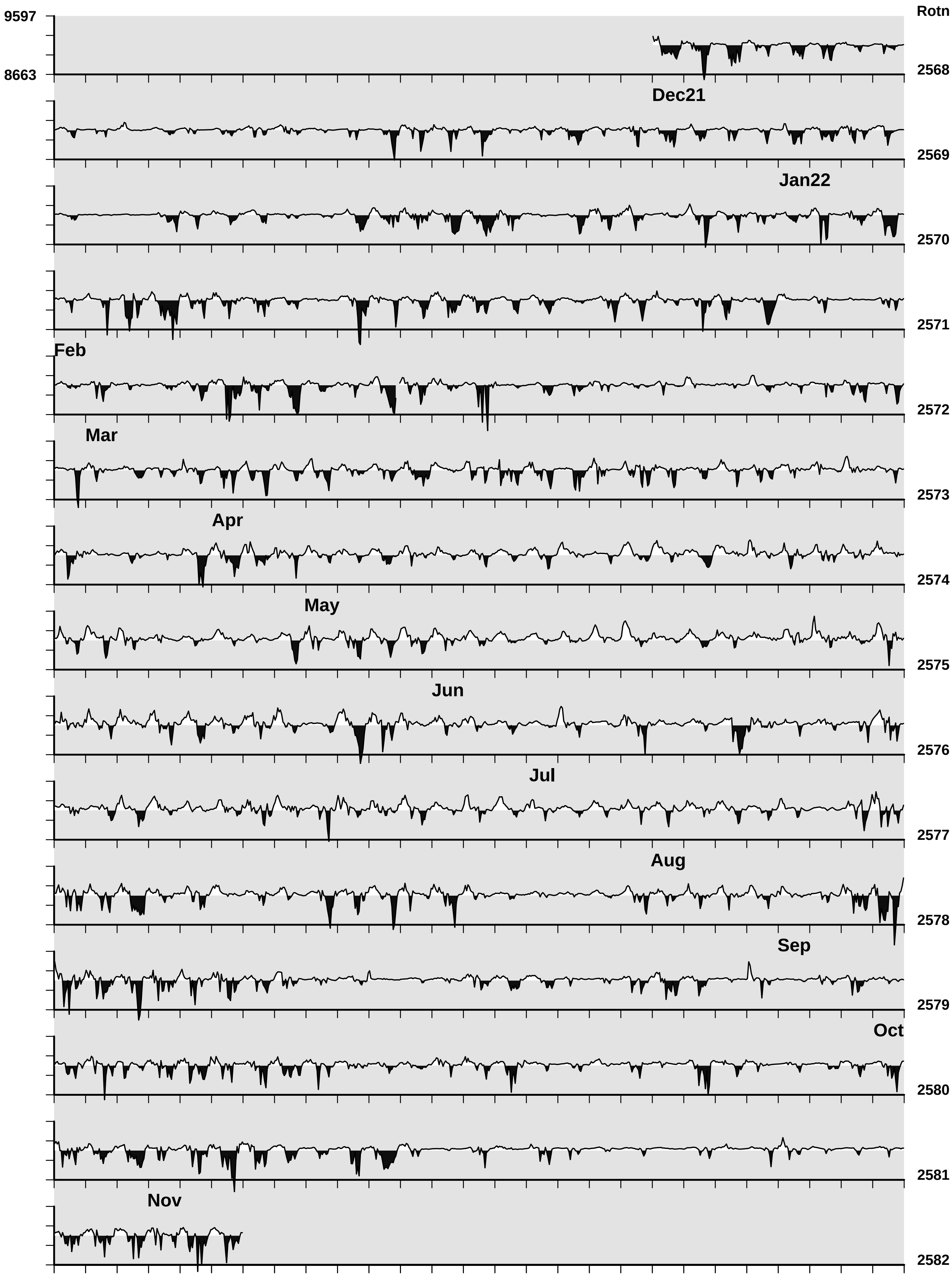


Jim Carrigan Observatory: Declination (degrees)

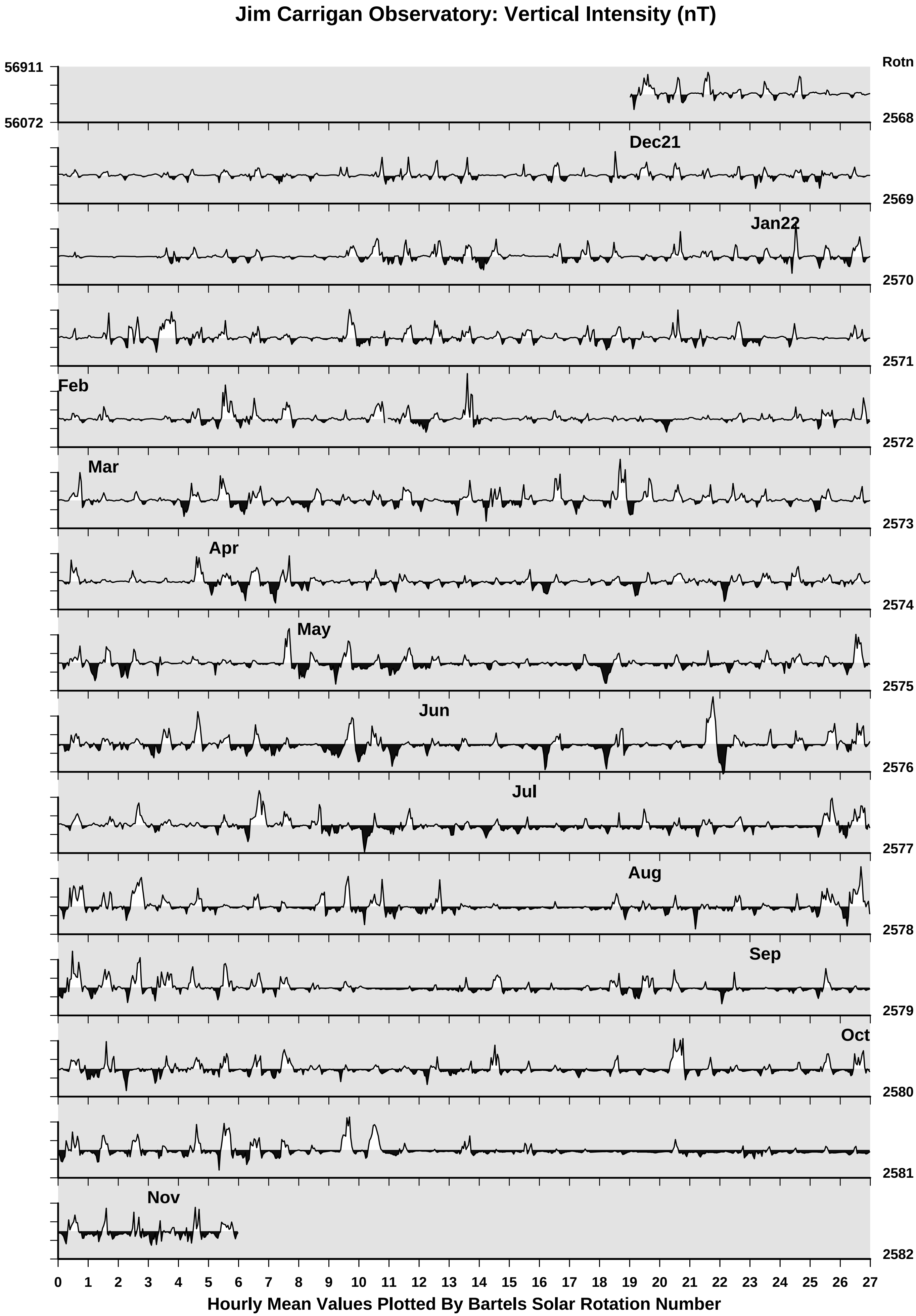


Hourly Mean Values Plotted By Bartels Solar Rotation Number

Jim Carrigan Observatory: Horizontal Intensity (nT)

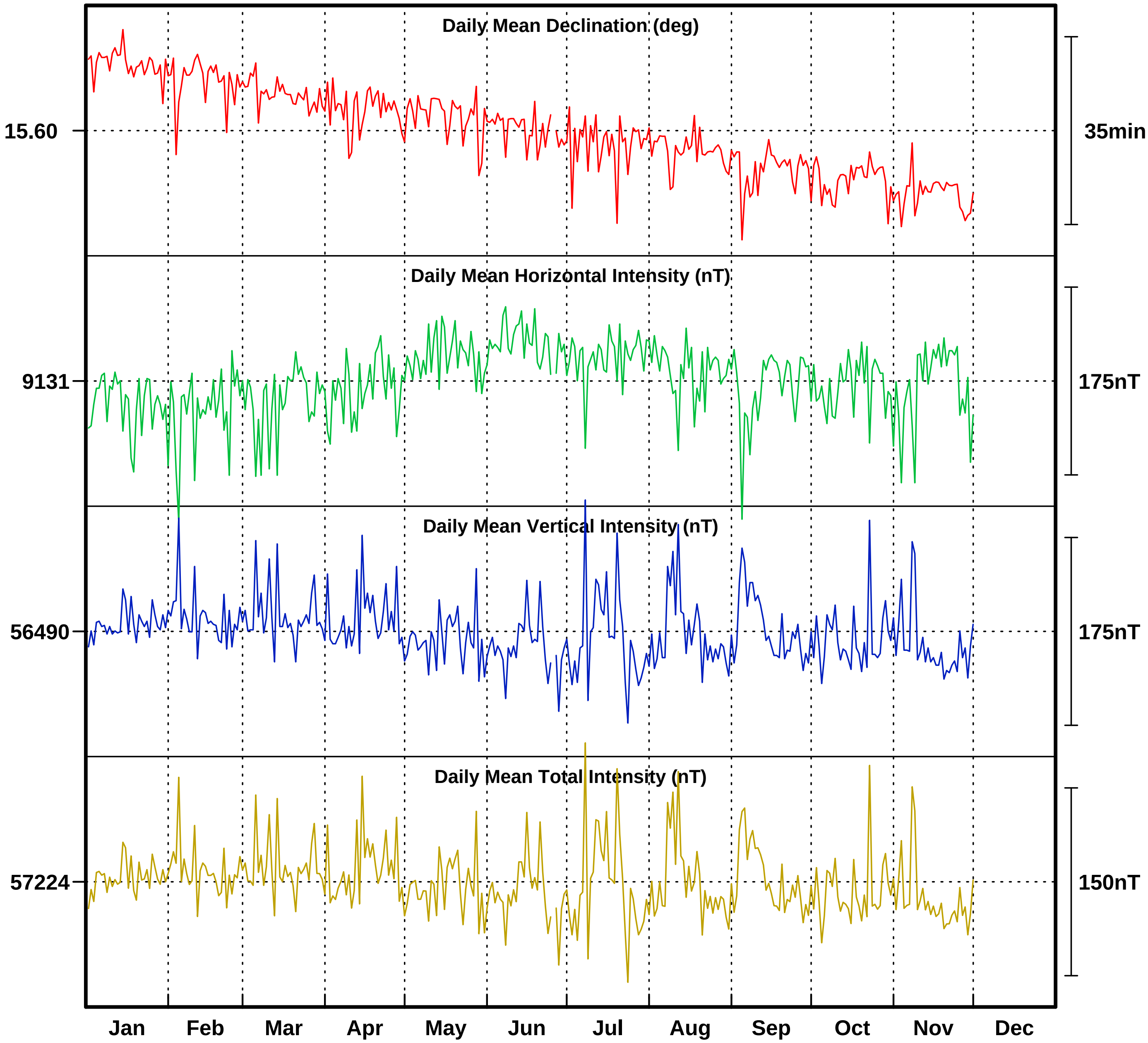


Hourly Mean Values Plotted By Bartels Solar Rotation Number



Jim Carrigan Observatory: Vertical Intensity (nT)
56911
56072
Rotn
2568
Dec21
2569
Jan22
2570
2571
Feb
2572
Mar
2573
Apr
2574
May
2575
Jun
2576
Jul
2577
Aug
2578
Sep
2579
Oct
2580
2581
Nov
2582
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 2022



Monthly mean values for Jim Carrigan Observatory 2022

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	15° 48.1´	9109 nT	80° 50.5´	8764 nT	2480 nT	56498 nT	57227 nT
February	15° 45.3´	9106 nT	80° 50.7´	8764 nT	2473 nT	56503 nT	57232 nT
March	15° 43.4´	9113 nT	80° 50.3´	8772 nT	2470 nT	56504 nT	57234 nT
April	15° 38.7´	9123 nT	80° 49.7´	8785 nT	2460 nT	56502 nT	57234 nT
May	15° 38.9´	9154 nT	80° 47.6´	8815 nT	2469 nT	56482 nT	57219 nT
June	15° 36.0´	9164 nT	80° 47.0´	8827 nT	2465 nT	56477 nT	57216 nT
July	15° 32.2´	9156 nT	80° 47.6´	8821 nT	2452 nT	56485 nT	57222 nT
August	15° 31.9´	9140 nT	80° 48.6´	8806 nT	2447 nT	56490 nT	57224 nT
September	15° 28.3´	9124 nT	80° 49.5´	8794 nT	2434 nT	56494 nT	57226 nT
October	15° 26.6´	9125 nT	80° 49.4´	8796 nT	2430 nT	56484 nT	57216 nT
November	15° 24.1´	9127 nT	80° 49.2´	8799 nT	2424 nT	56477 nT	57210 nT

Note:

i. The values shown here are provisional.