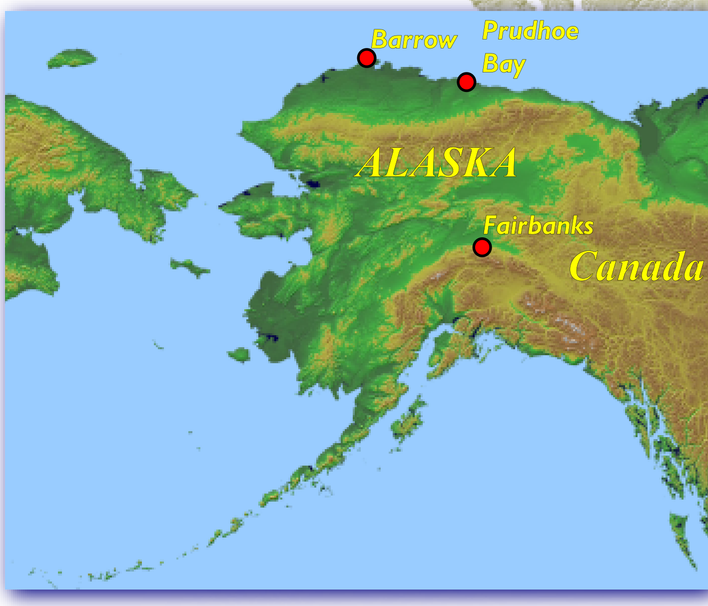
BRITISH GEOLOGICAL SURVEY

Jim Carrigan Observatory Prudhoe Bay Monthly Magnetic Bulletin

December 2009

09/12/JC



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

1. 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 is a joint project between BGS and Sperry Drilling Services (SDS) in support of directional drilling programmes. SDS has 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 meet the needs of users of geomagnetic data. Magnetic observatory data is presented as a series of plots of one-minute, hourly and daily values, followed by a tabulation 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:

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) 131 668 0265
E-mail:	orba@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° 21.36′N*	*211°12.06′E*
Geomagnetic:	*70° 04.2′N*	*254° 00.36′E*
Height above mean sea level:		*10m (approx)*

The geomagnetic co-ordinates are calculated using the 10^{th} generation International Geomagnetic Reference Field (IGRF) 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 and became fully operational from 27^{th} October 2003. The system operates under the control of data acquisition software running on QNX computers, which controls the data logging and communications.

There are two sets of sensors used for making magnetic measurements. A triaxial 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.

3.2 Absolute Observations

The GDAS fluxgate magnetometers accurately measure variations in the components of the geomagnetic field, but not the absolute magnitudes. Regular manual absolute measurements of the field are made throughout the year. 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.

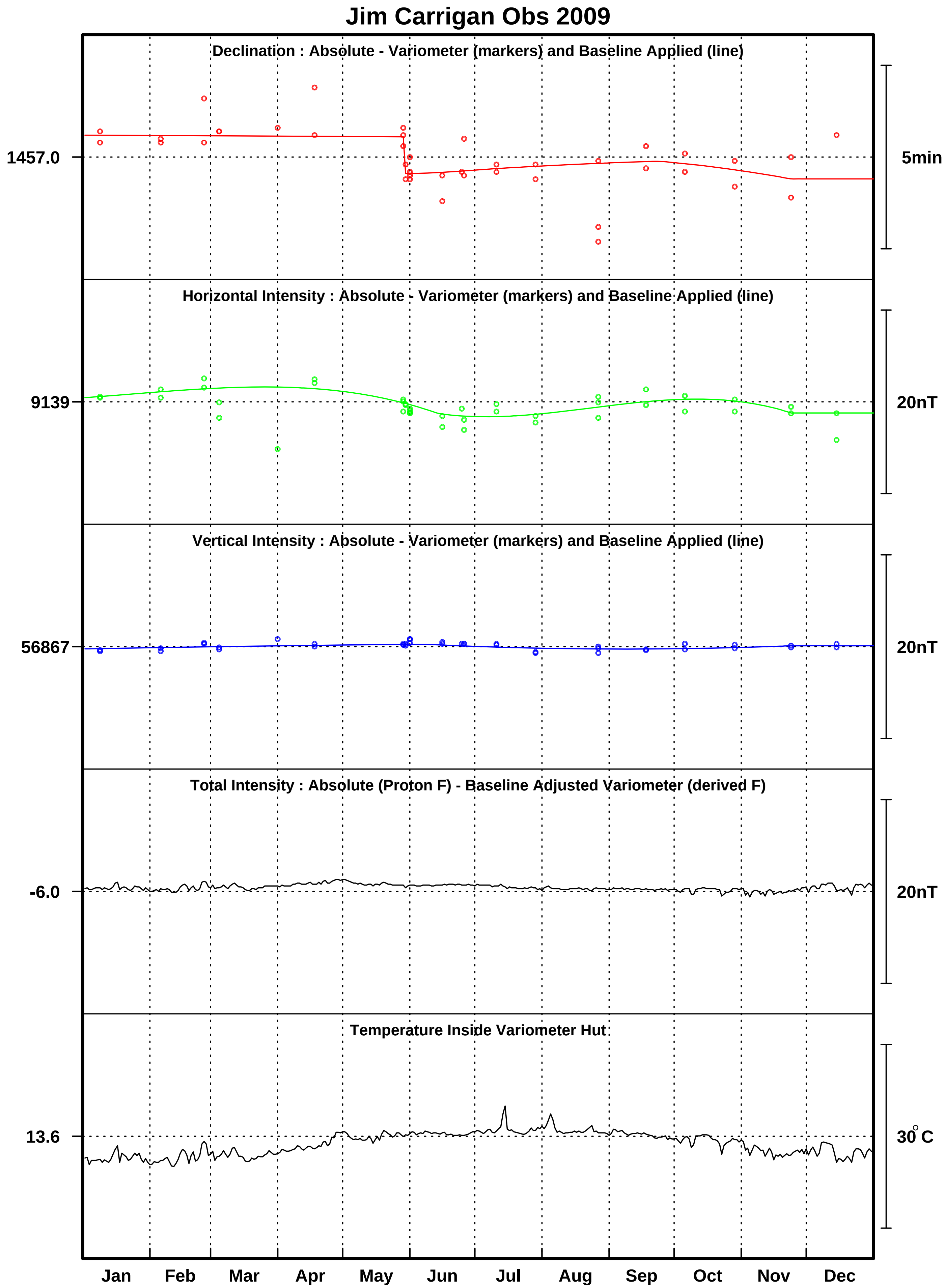
4.5 Daily and Monthly Mean Values

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.

JIM CARRIGAN OBSERVATORY

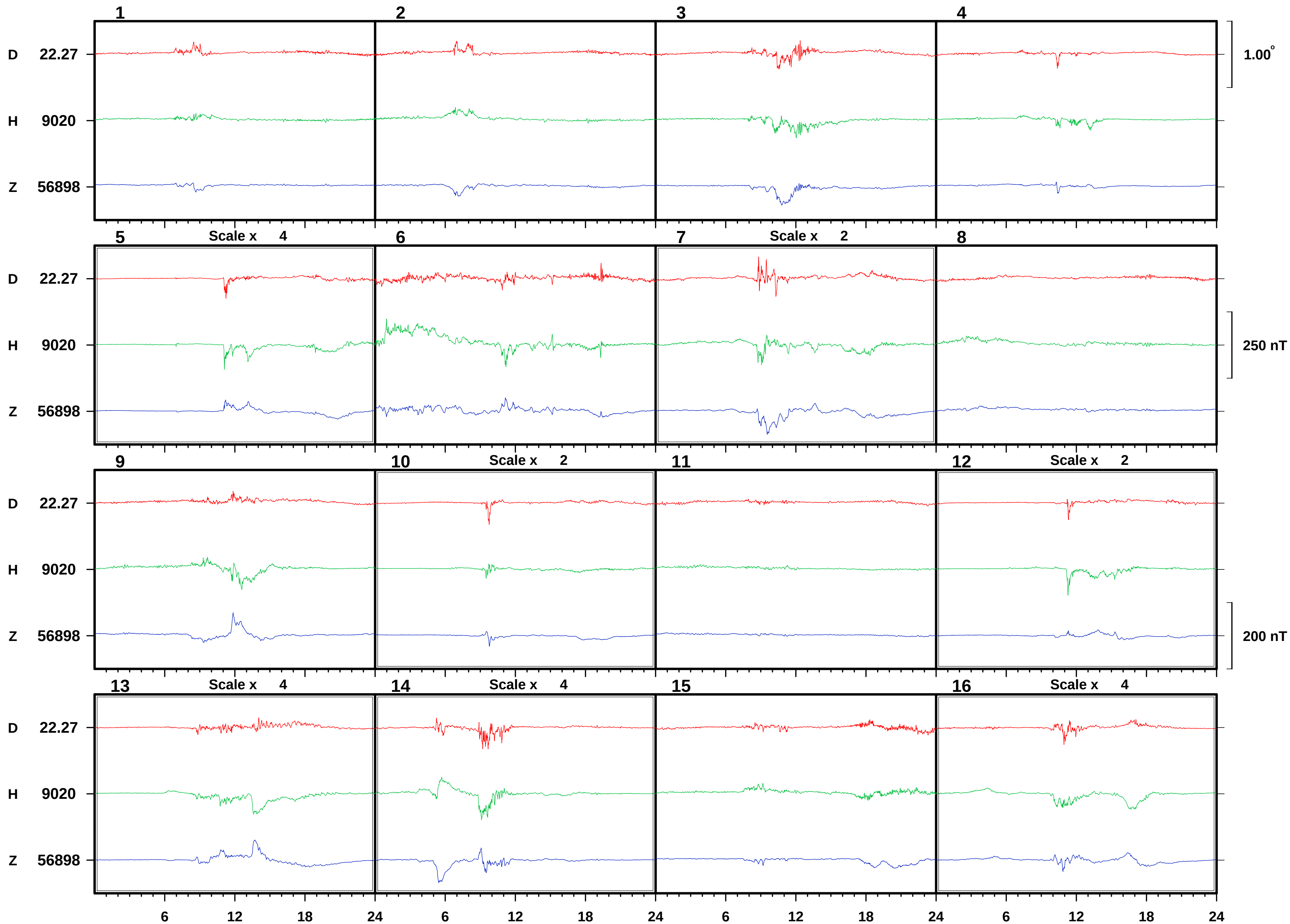
ABSOLUTE OBSERVATIONS

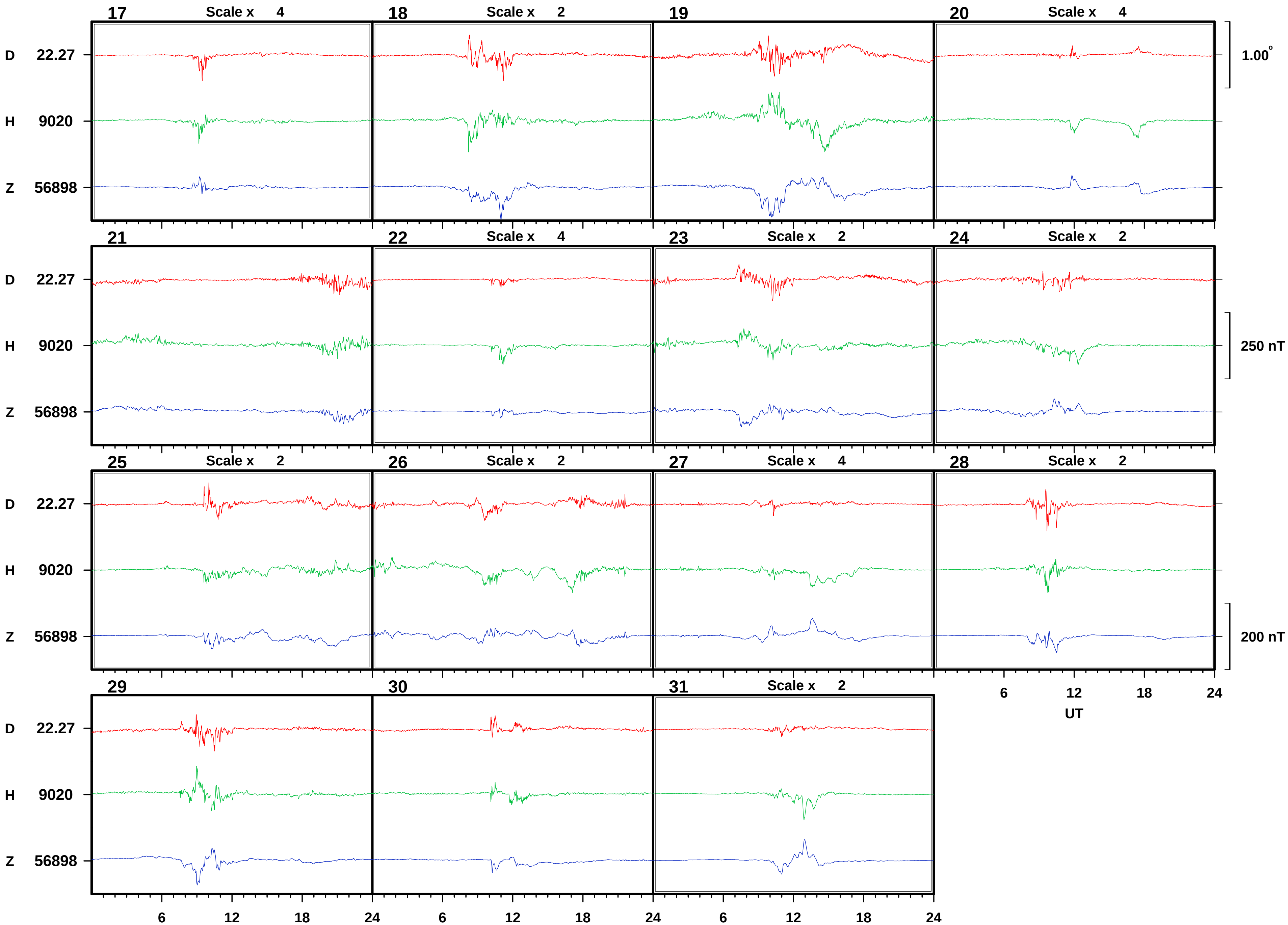
		DECLINATION			INCLINATION							
Date	Day Number	Time (UT)	Absolute (°)	Baseline (°)	Time (UT)	Inclination (°)	Total Field Intensity (nT)	H Absolute (nT)	H Baseline (nT)	Z Absolute (nT)	Z Baseline (nT)	Observer
14-Dec-09	348	21:35	21.2573	20.4417	21:52	80.9869	57609.3	9025.1	9135.1	56898.0	56867.5	PS
14-Dec-09	348	22:22	22.2689	21.4667	22:39	80.9866	57611.8	9025.8	9138.0	56900.4	56867.1	PS



Jim Carrigan Obs 2009
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
1457.0
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
9139
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
56867
20nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
-6.0
20nT
Temperature Inside Variometer Hut
13.6
30°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Jim Carrigan December 2009

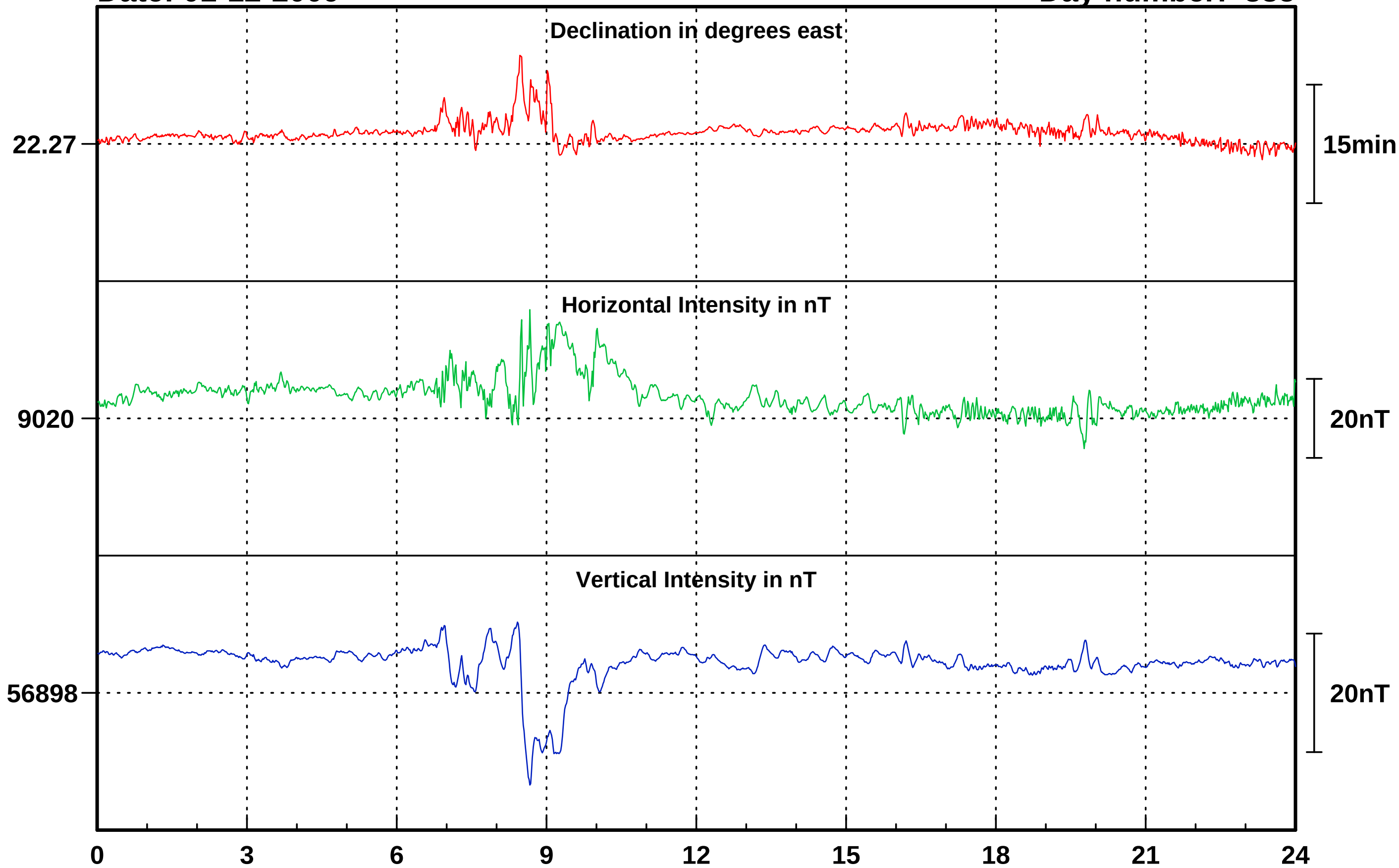




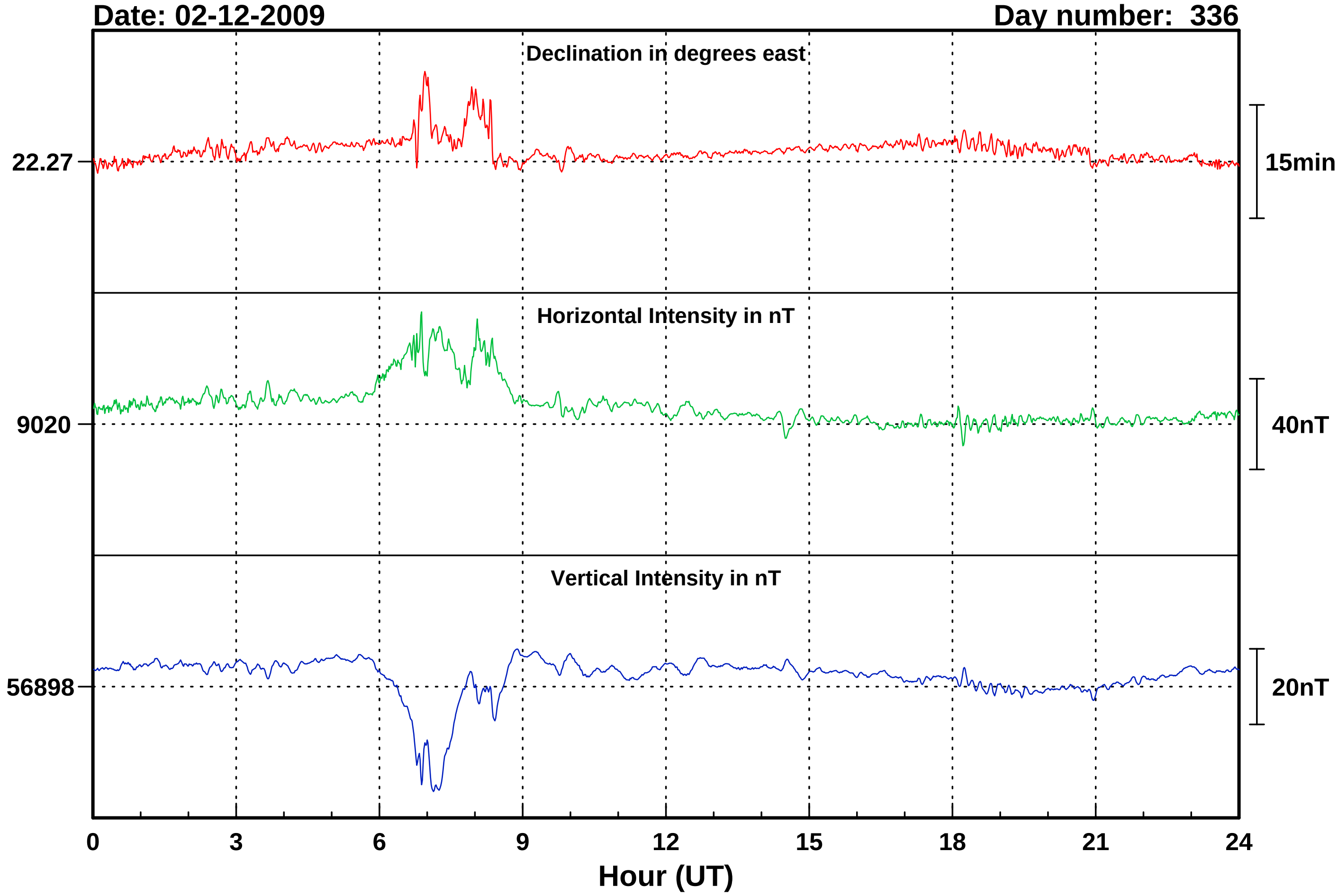
Jim Carrigan December 2009

Jim Carrigan

Date: 01-12-2009 Day number: 335



Date: 02-12-2009 Day number: 336



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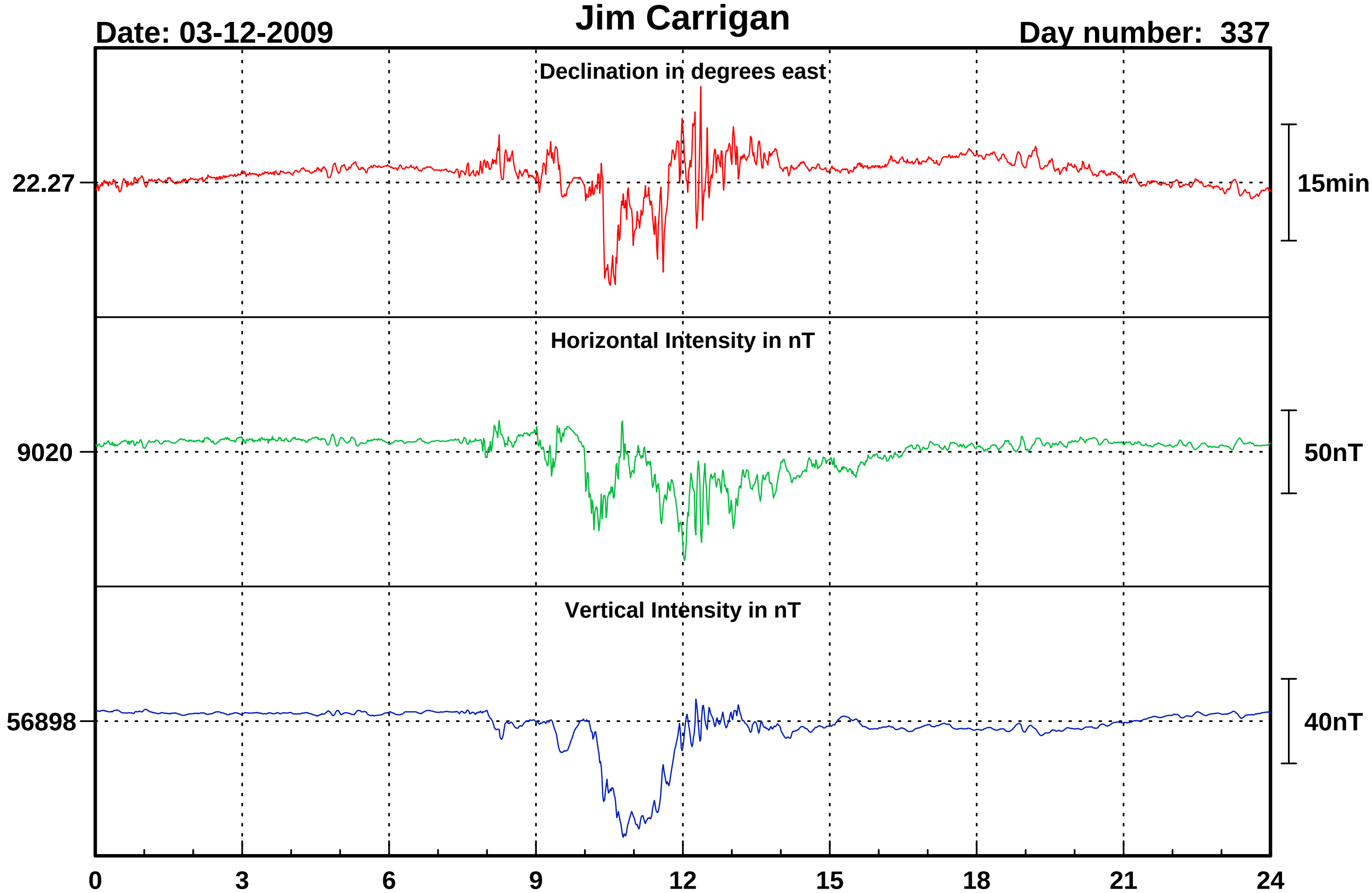

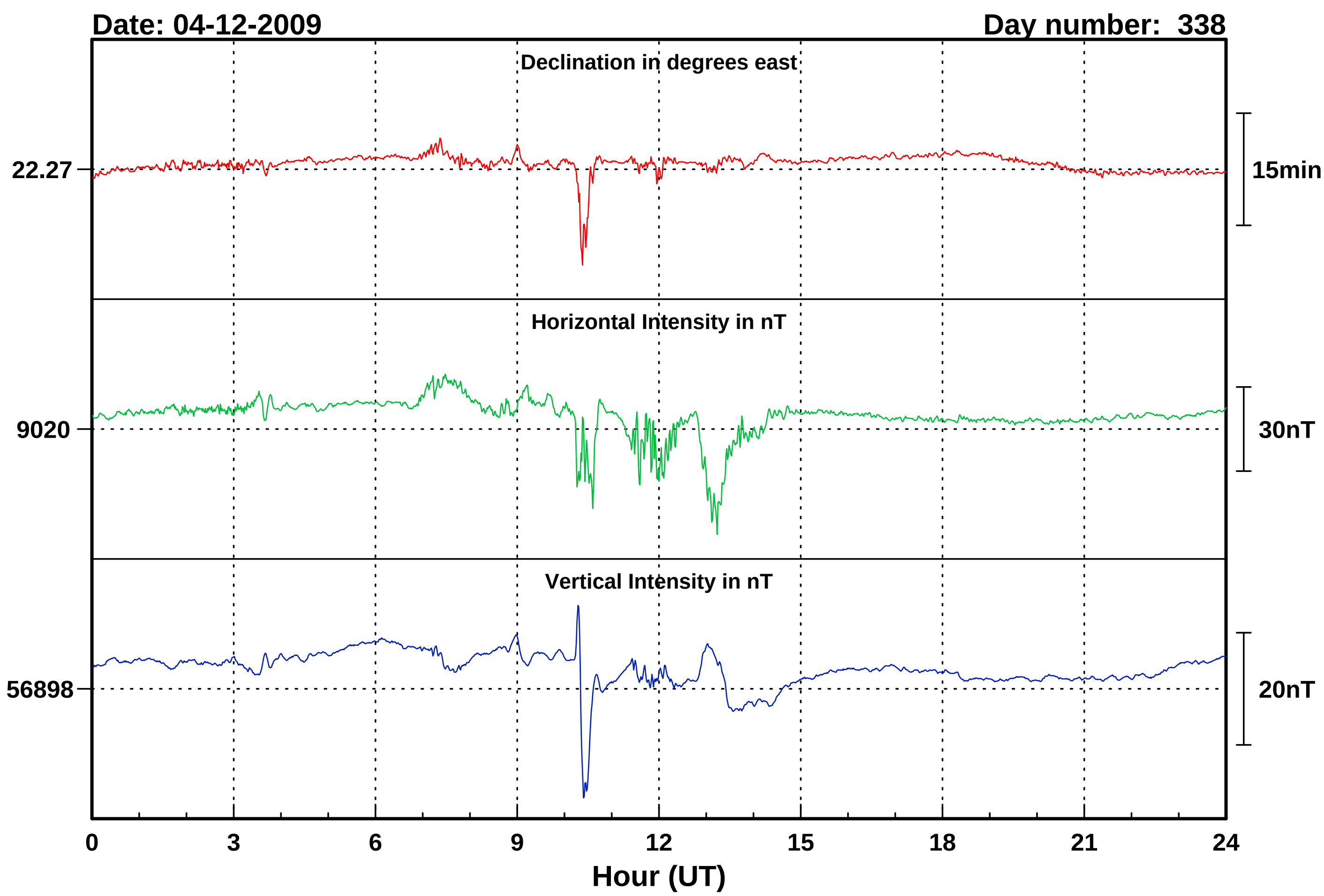

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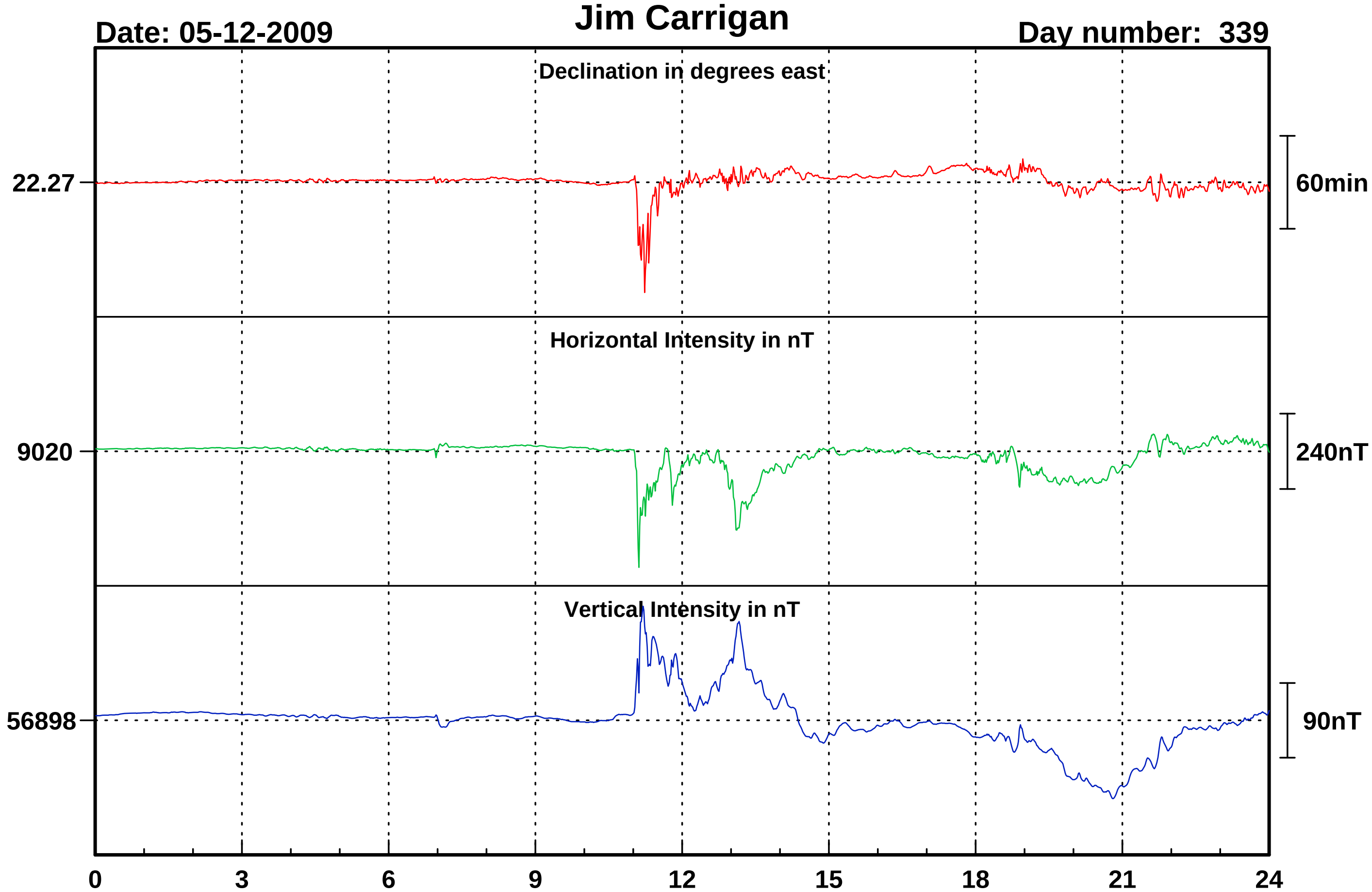

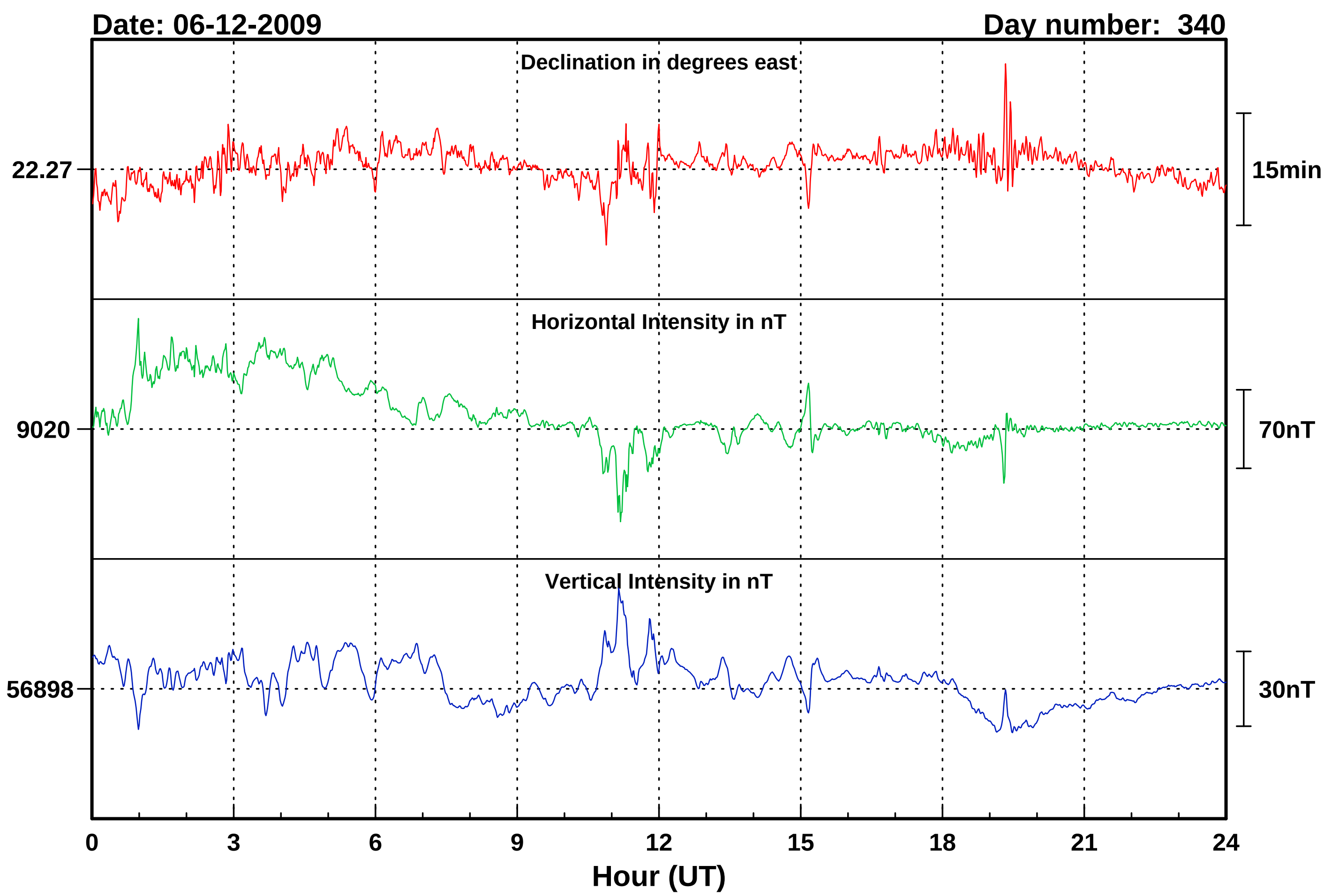

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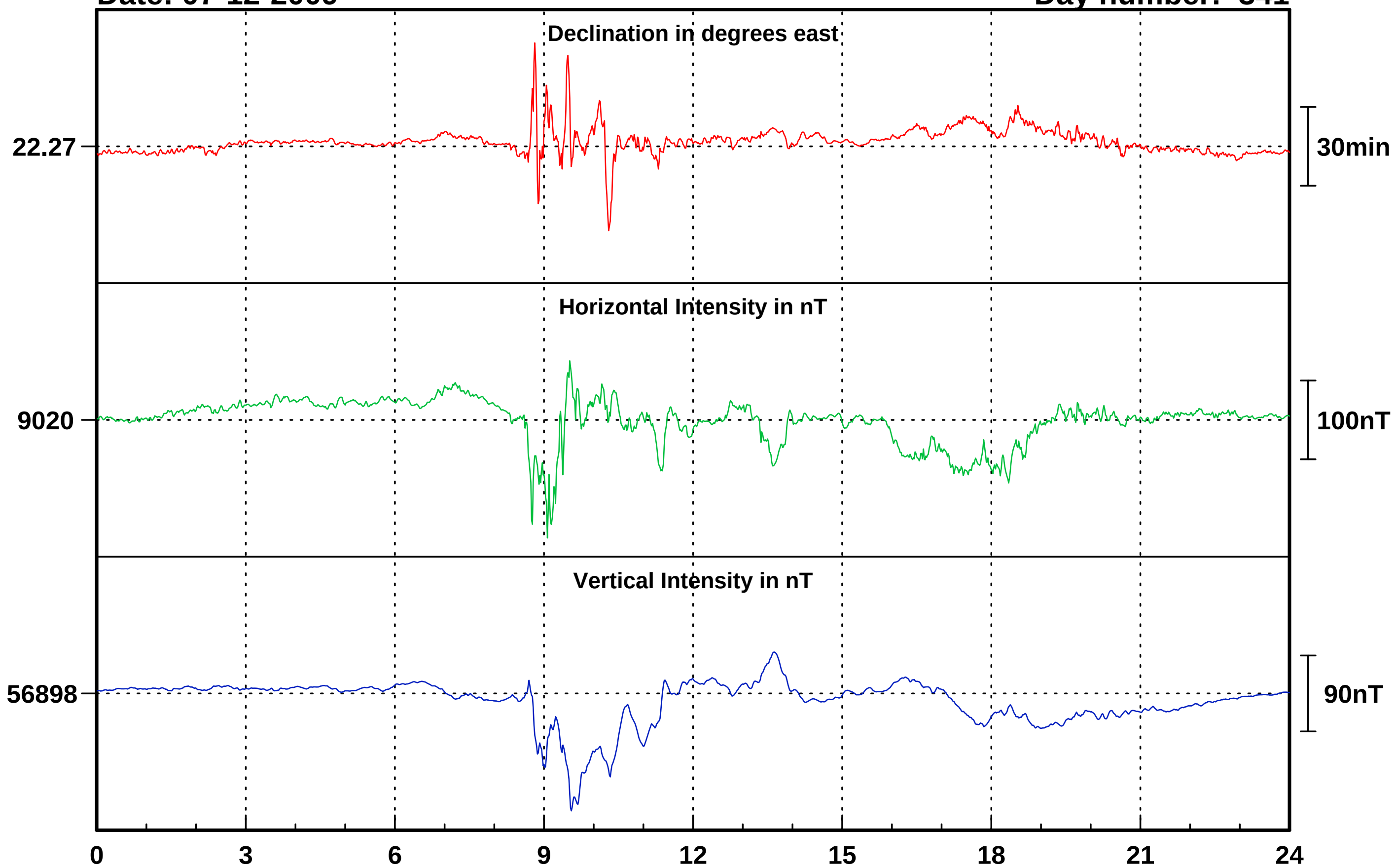
Date: 07-12-2009 Day number: 341



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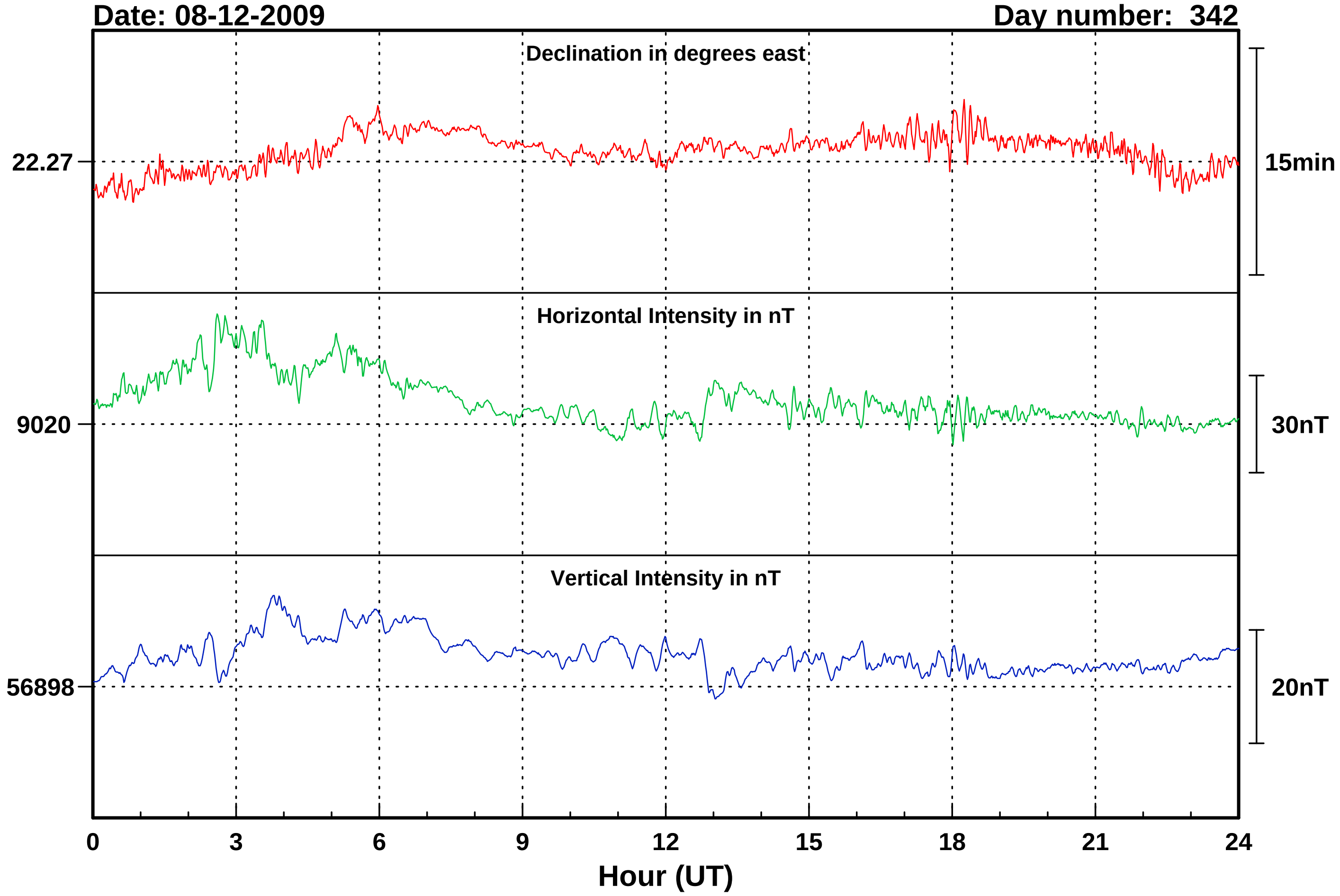
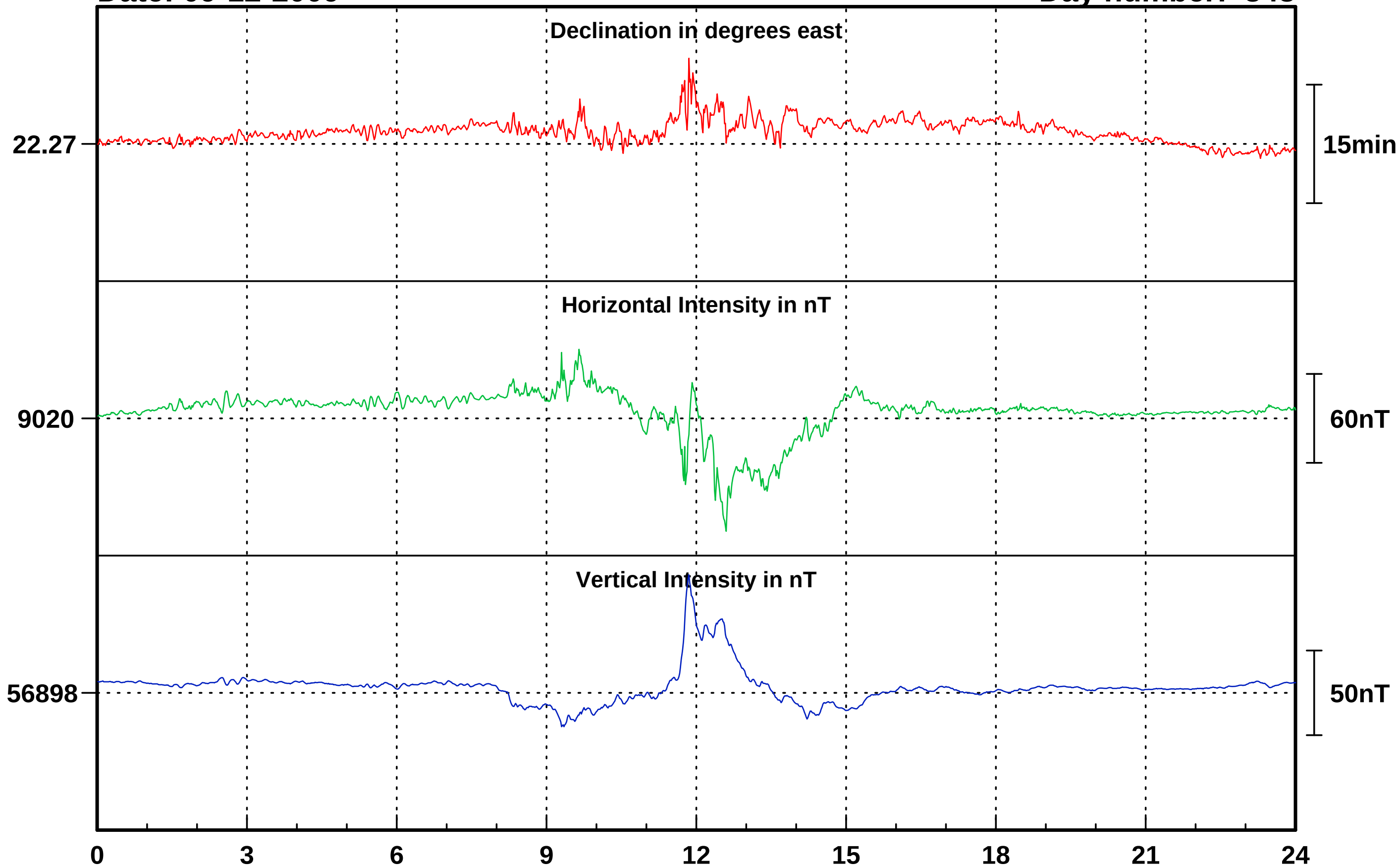
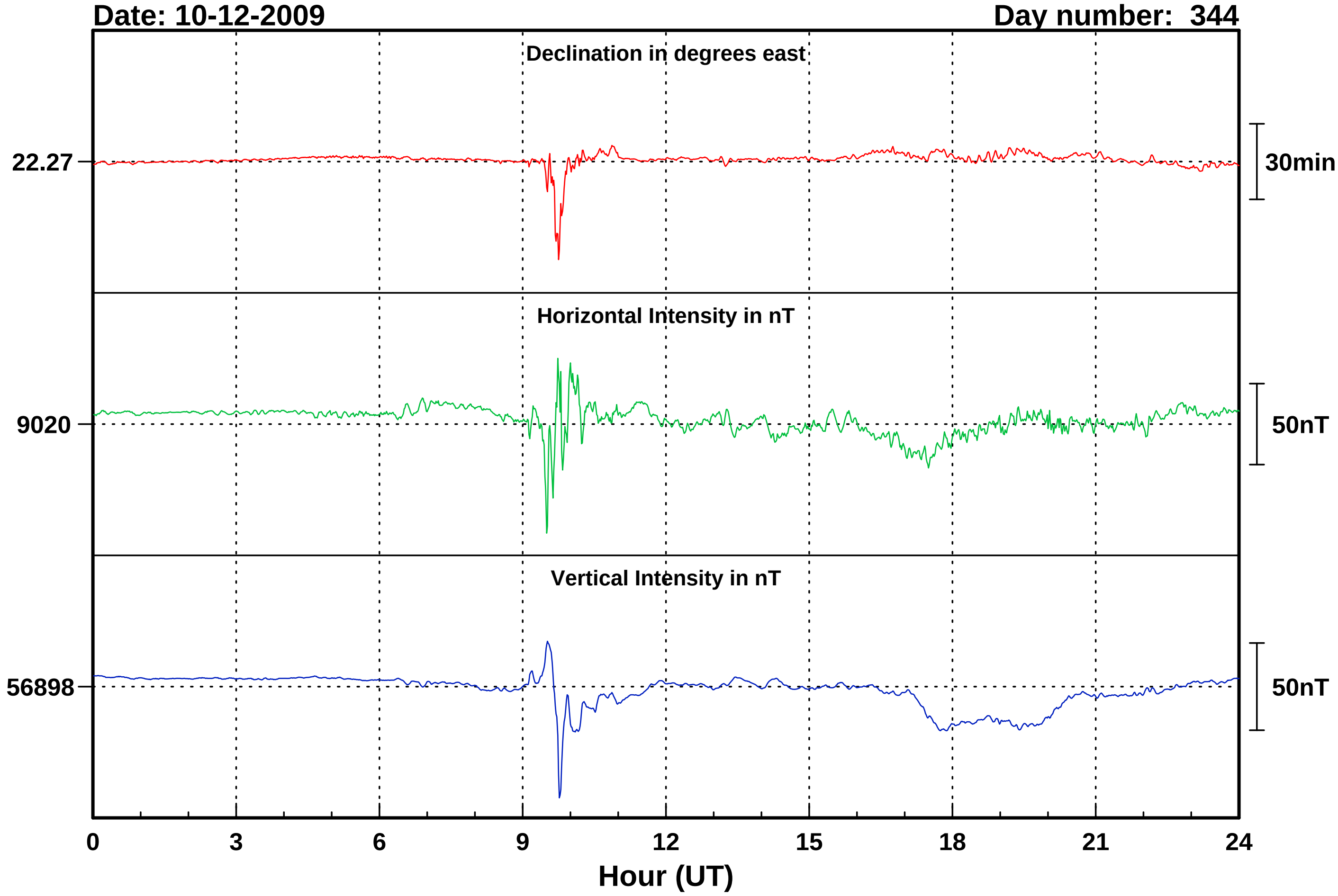


Jim Carrigan

Date: 09-12-2009 Day number: 343

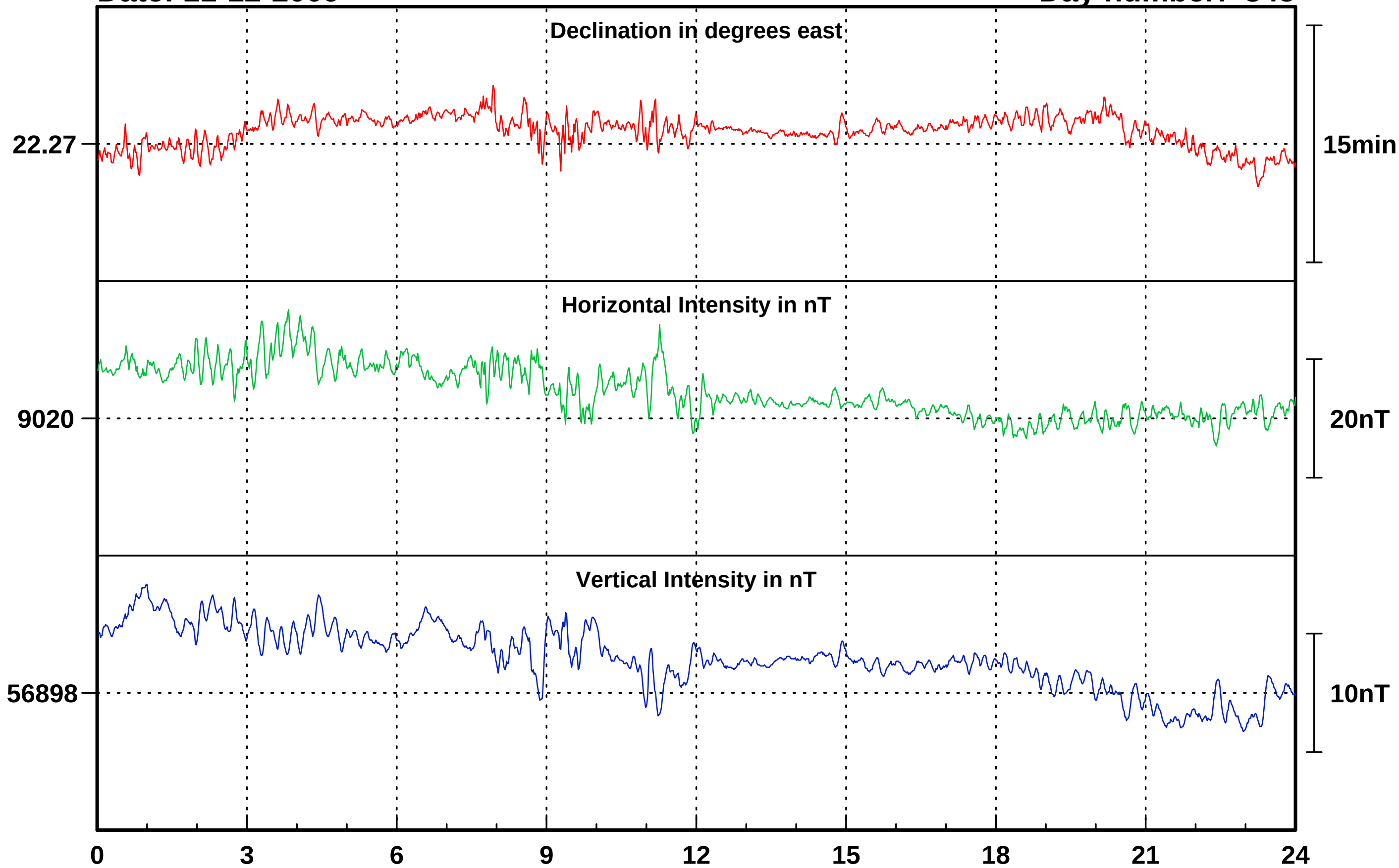


Date: 10-12-2009 Day number: 344

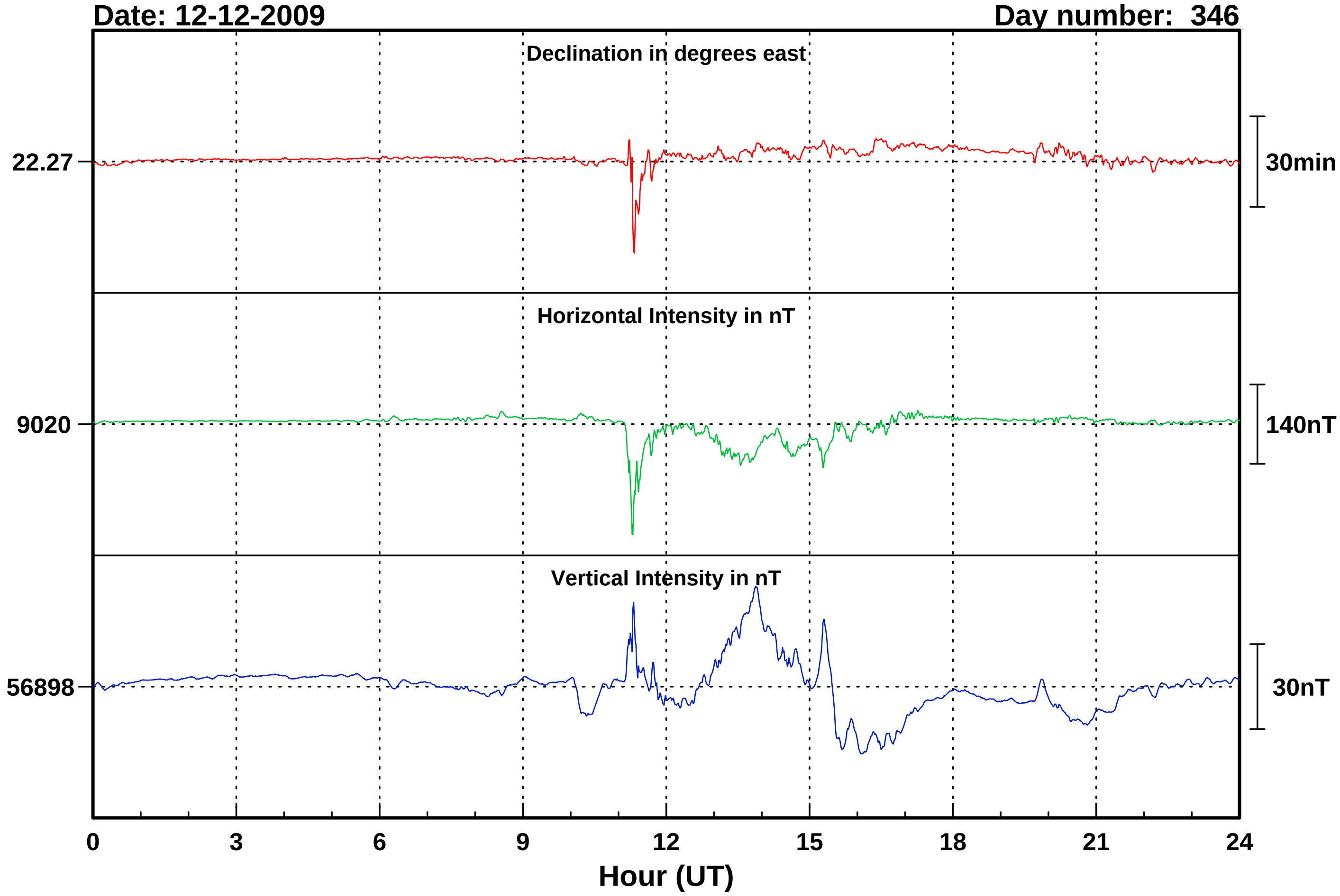


Jim Carrigan

Date: 11-12-2009 Day number: 345



Date: 12-12-2009 Day number: 346



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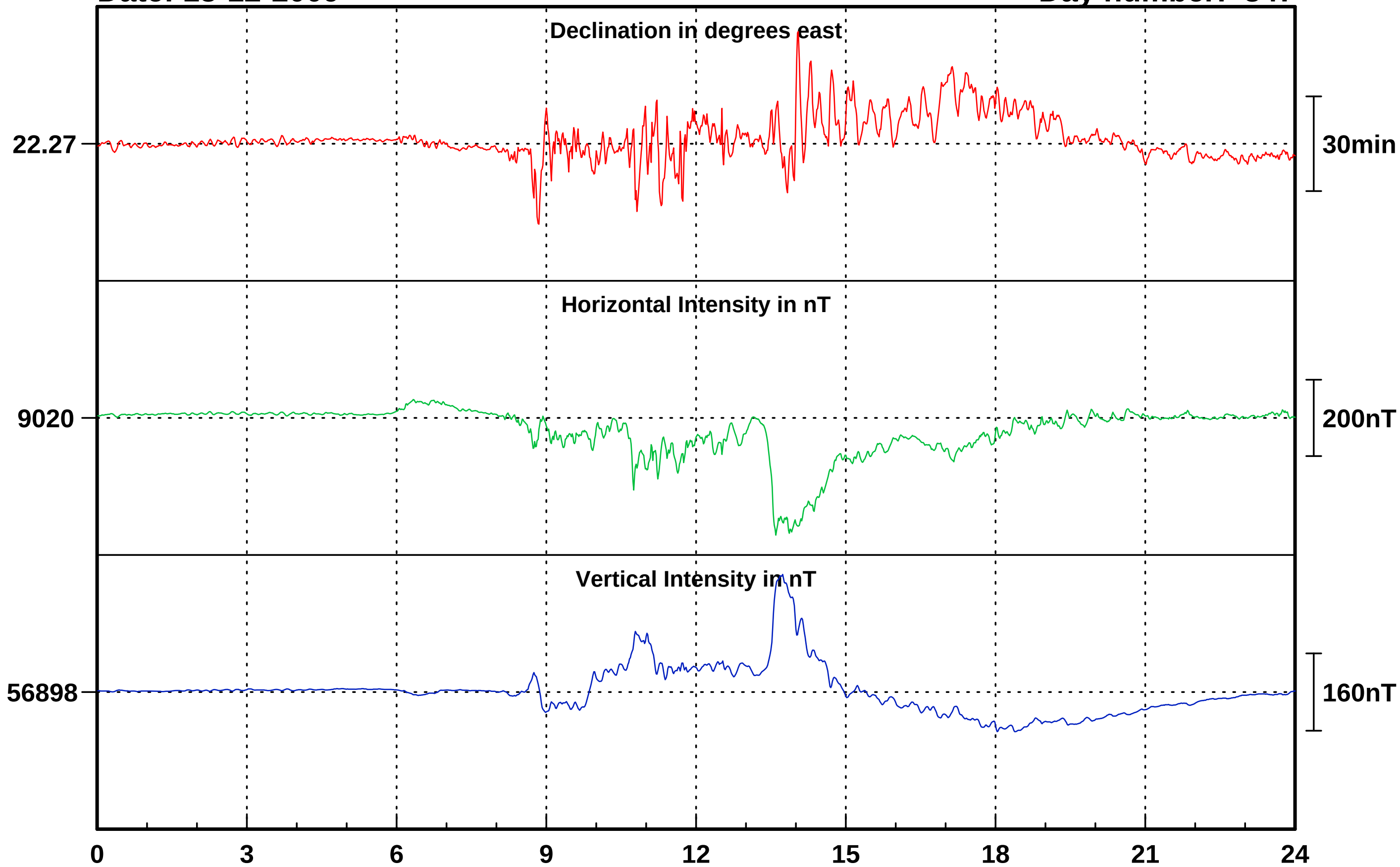
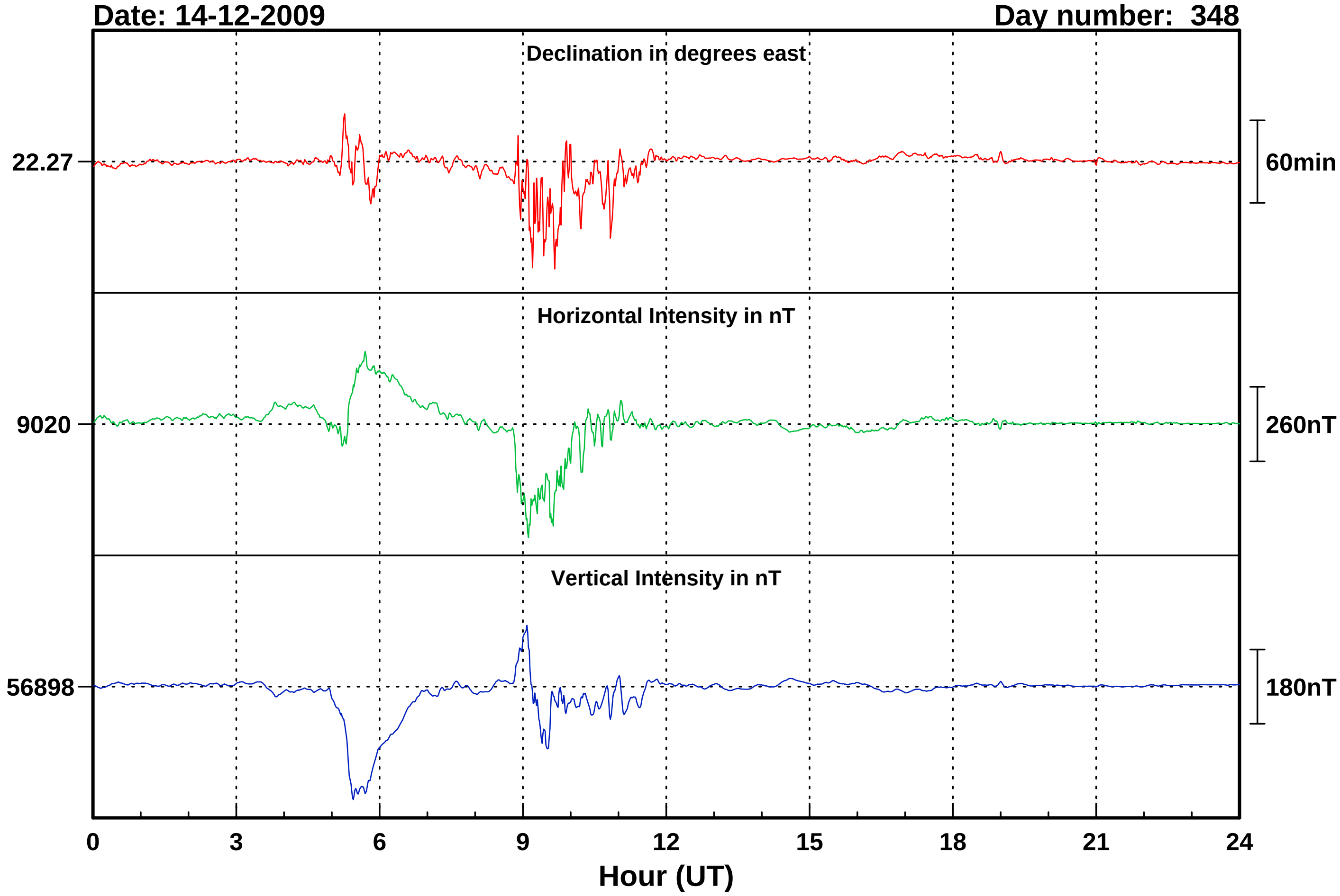
Date: 13-12-2009 Day number: 347



Date: 14-12-2009 Day number: 348



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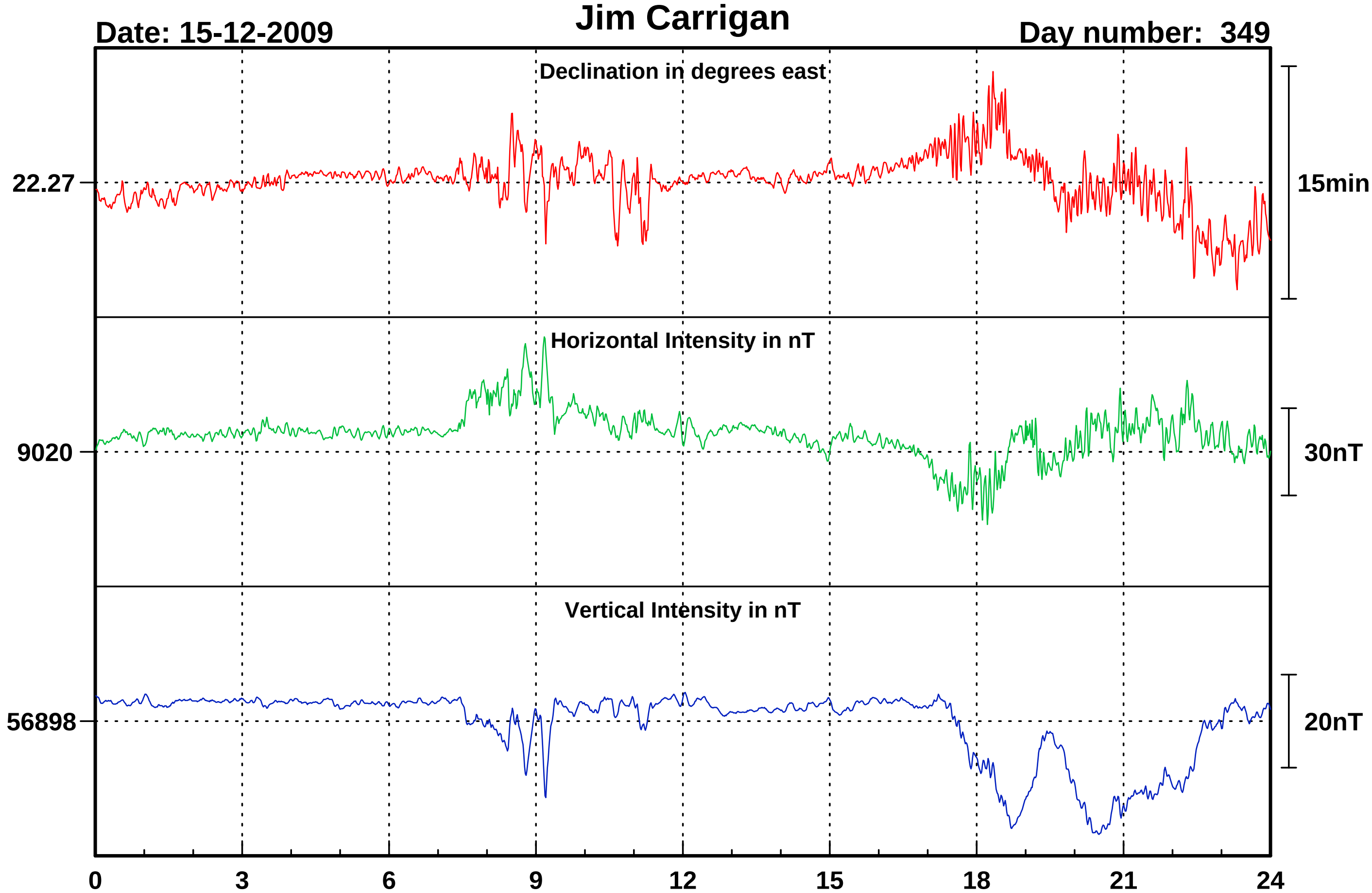

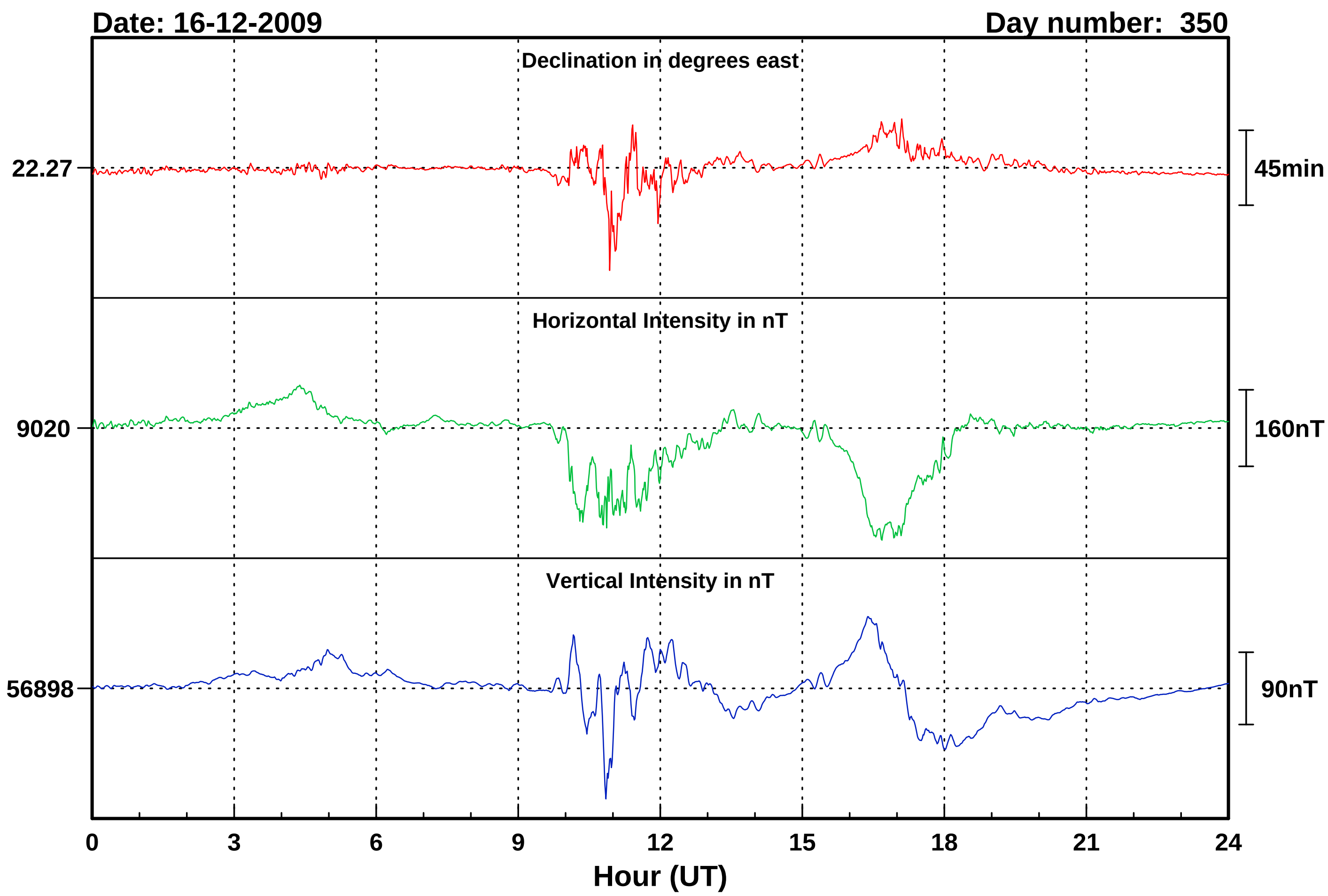

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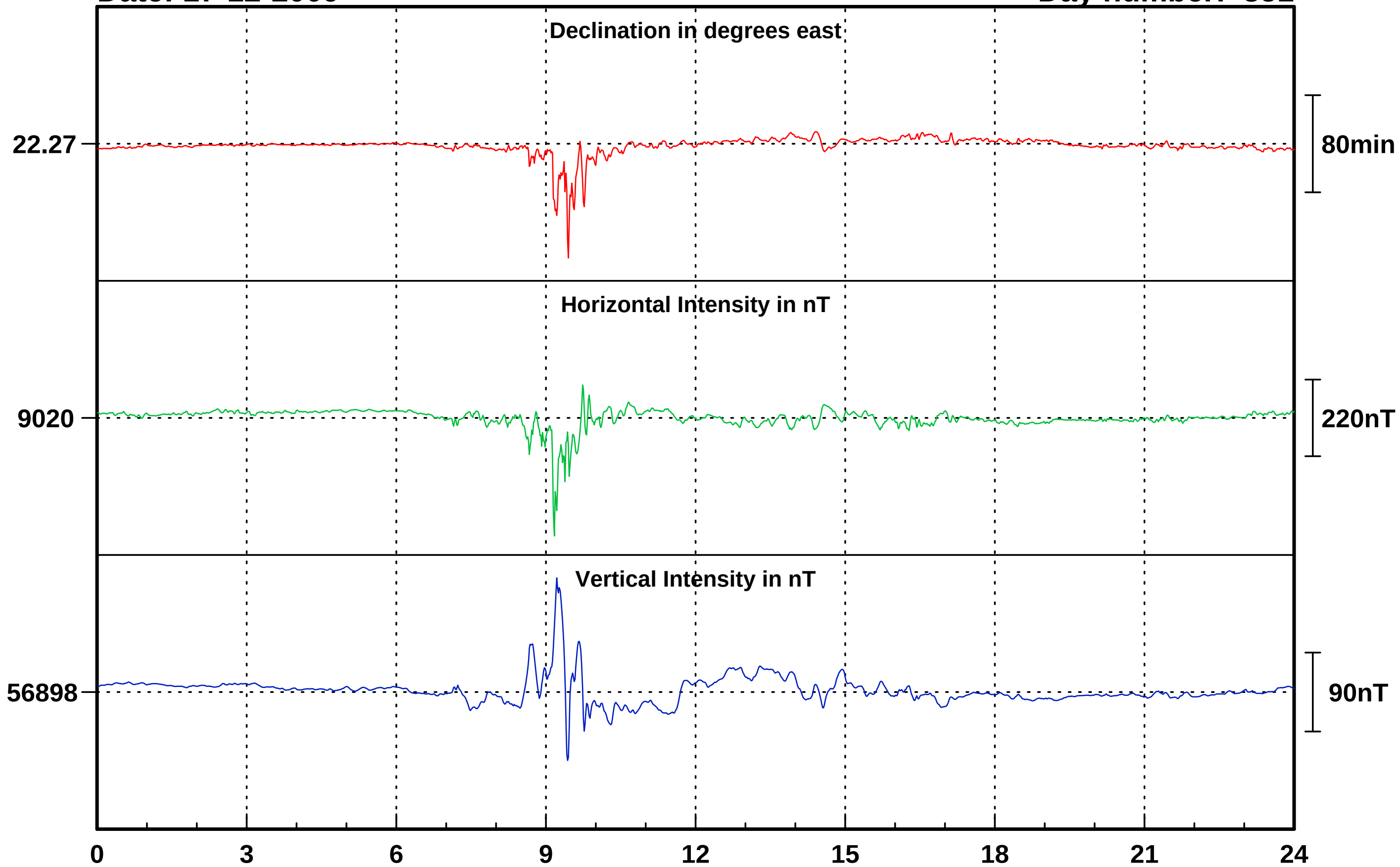
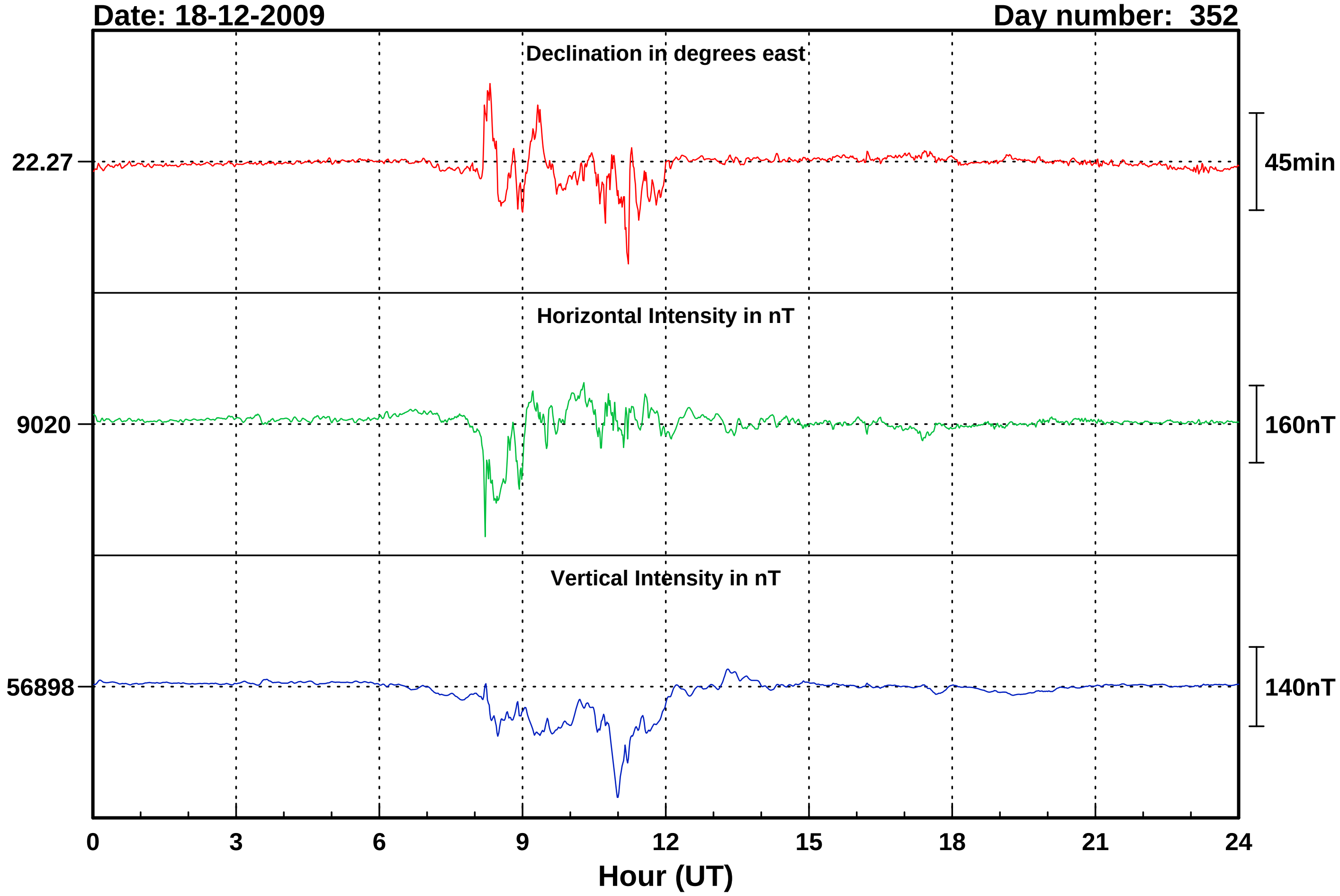
Date: 17-12-2009 Day number: 351



Date: 18-12-2009 Day number: 352



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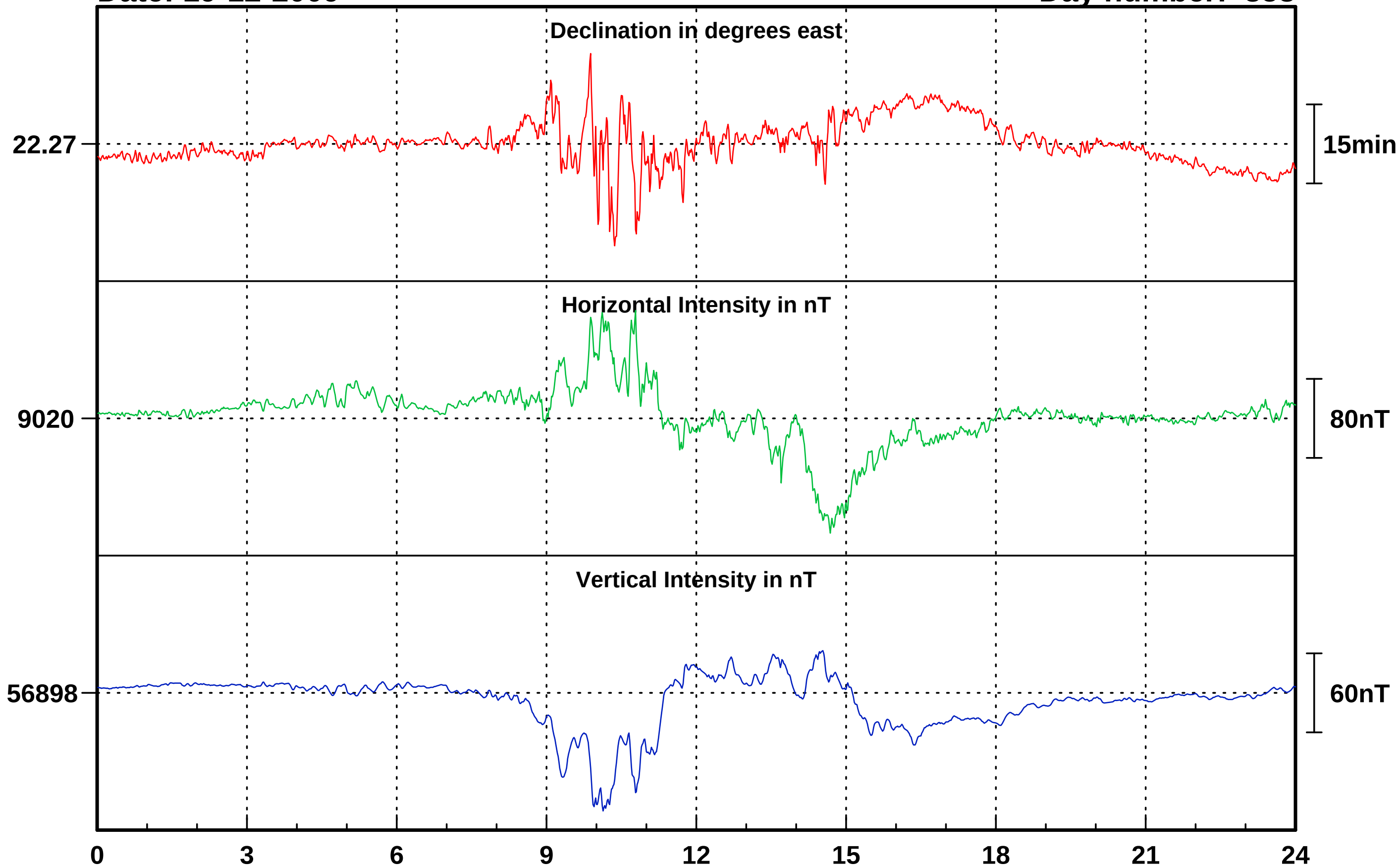
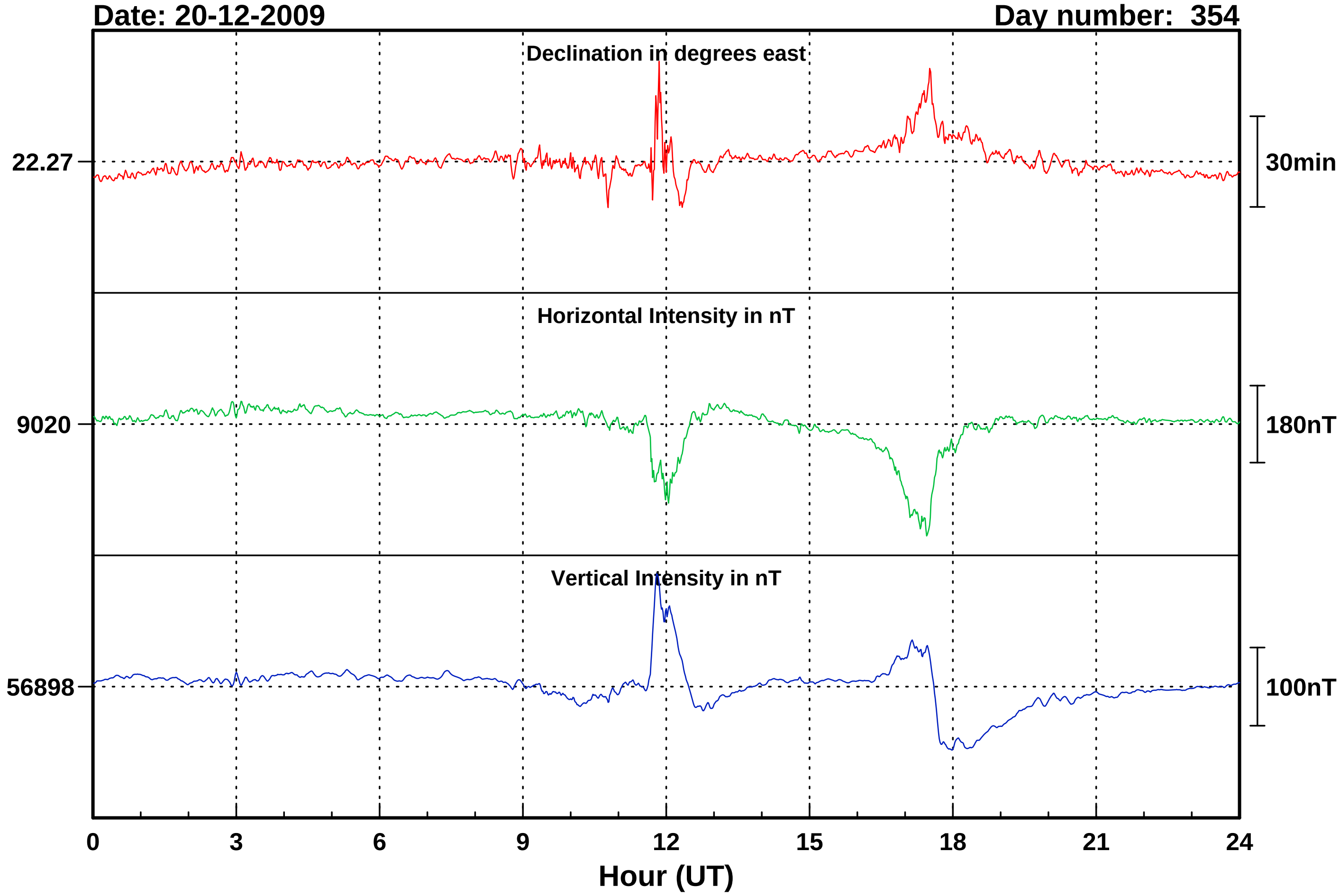
Date: 19-12-2009 **Day number: 353**

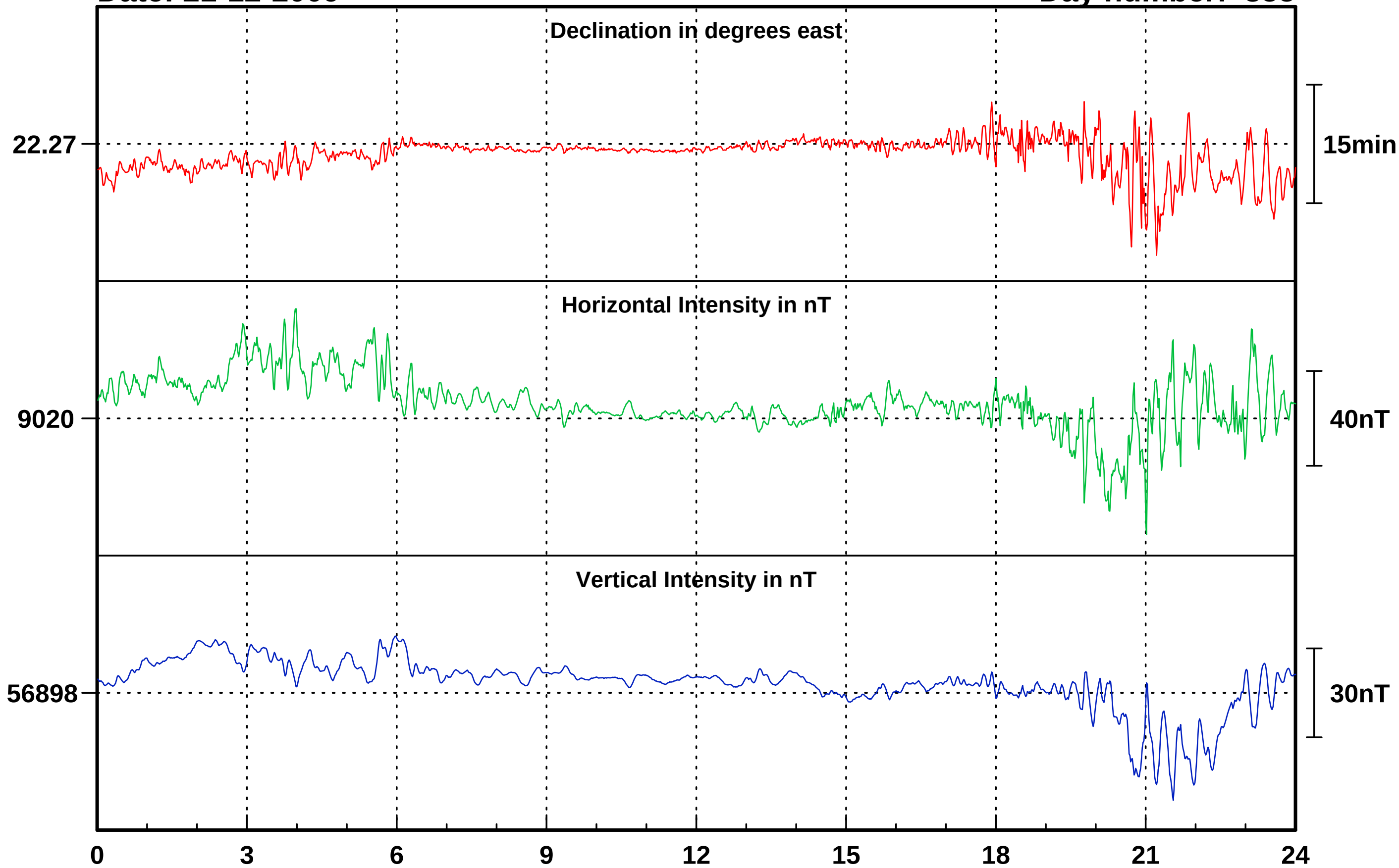


Date: 20-12-2009 **Day number: 354**



Jim Carrigan

Date: 21-12-2009 Day number: 355



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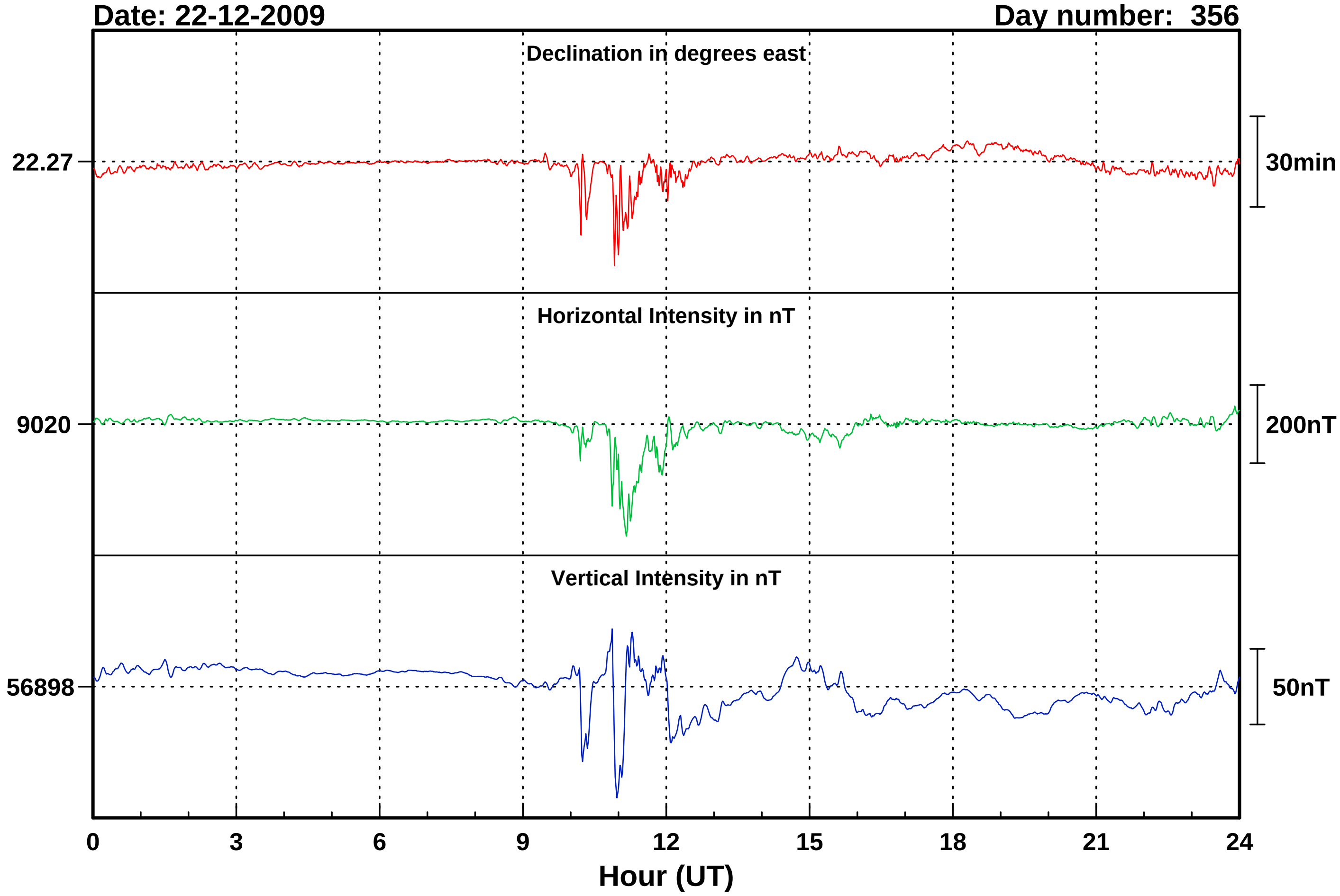

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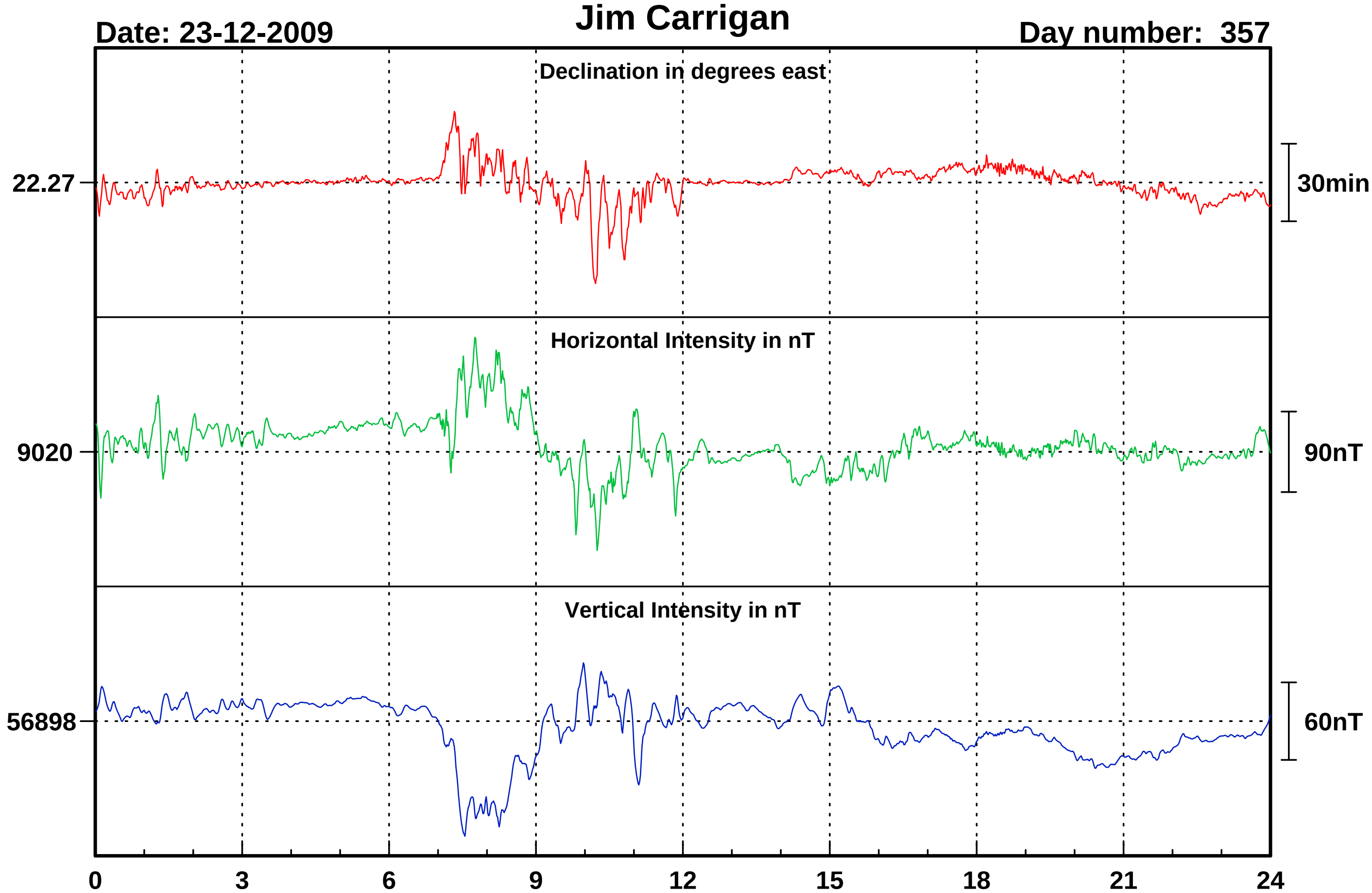

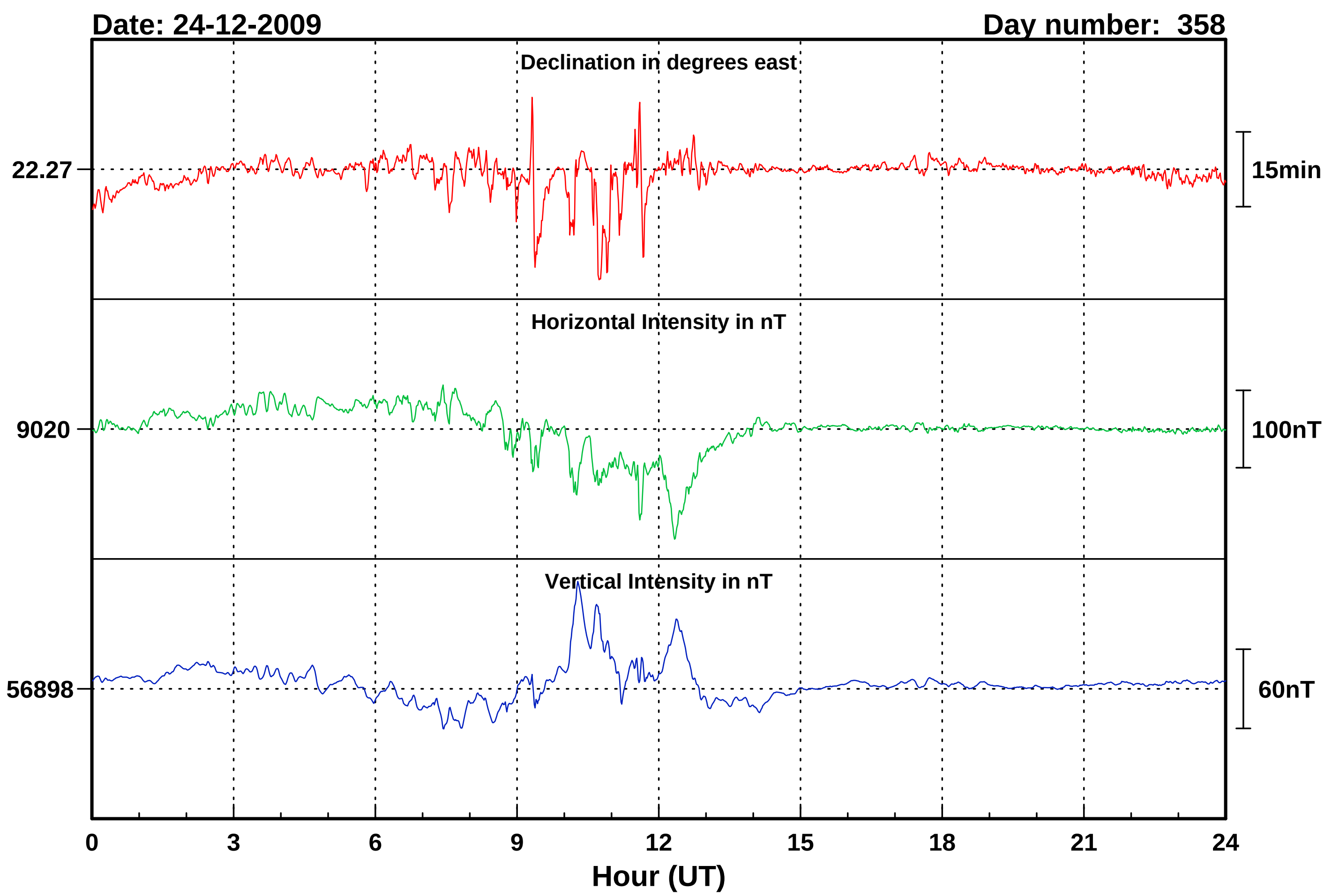

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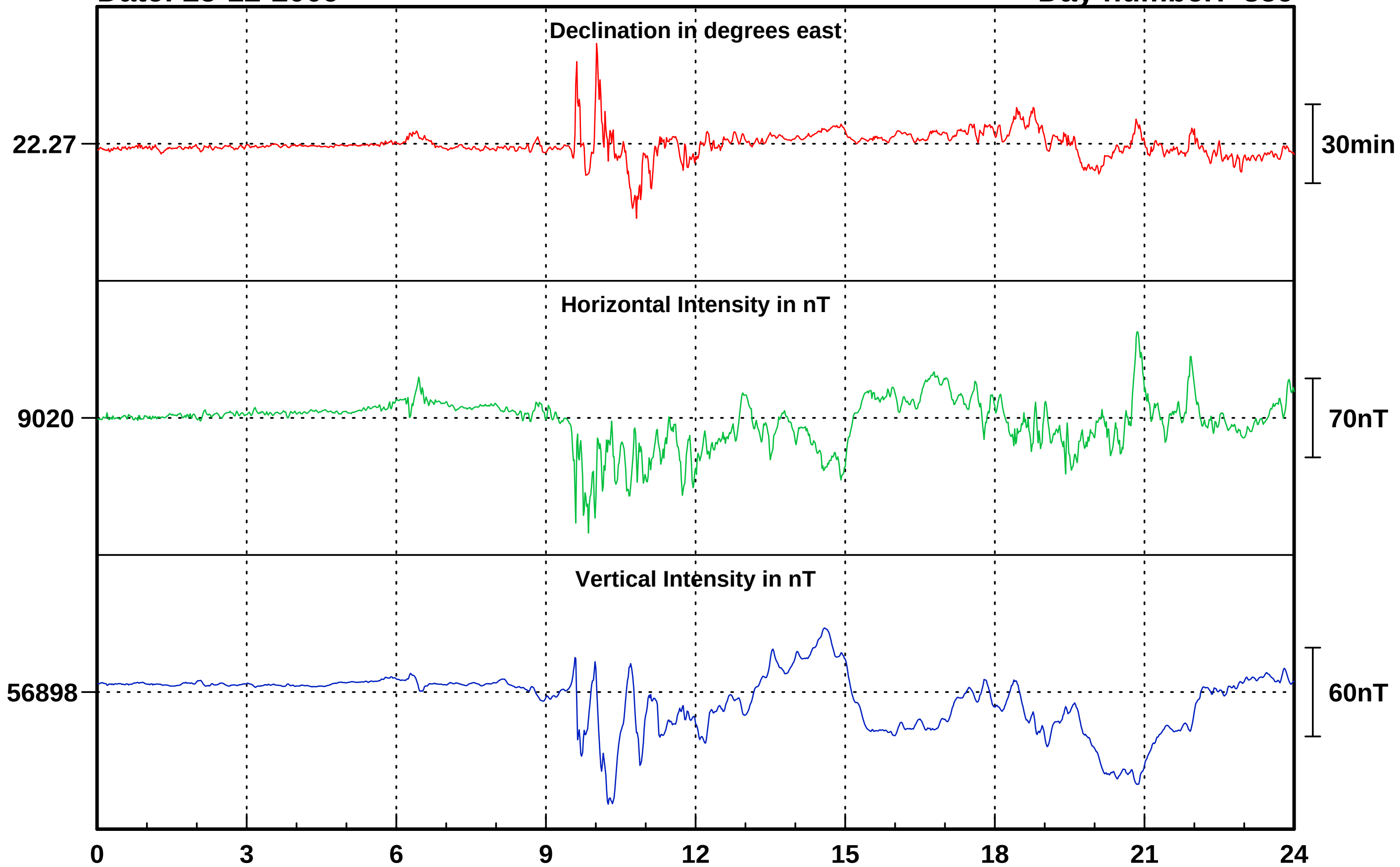
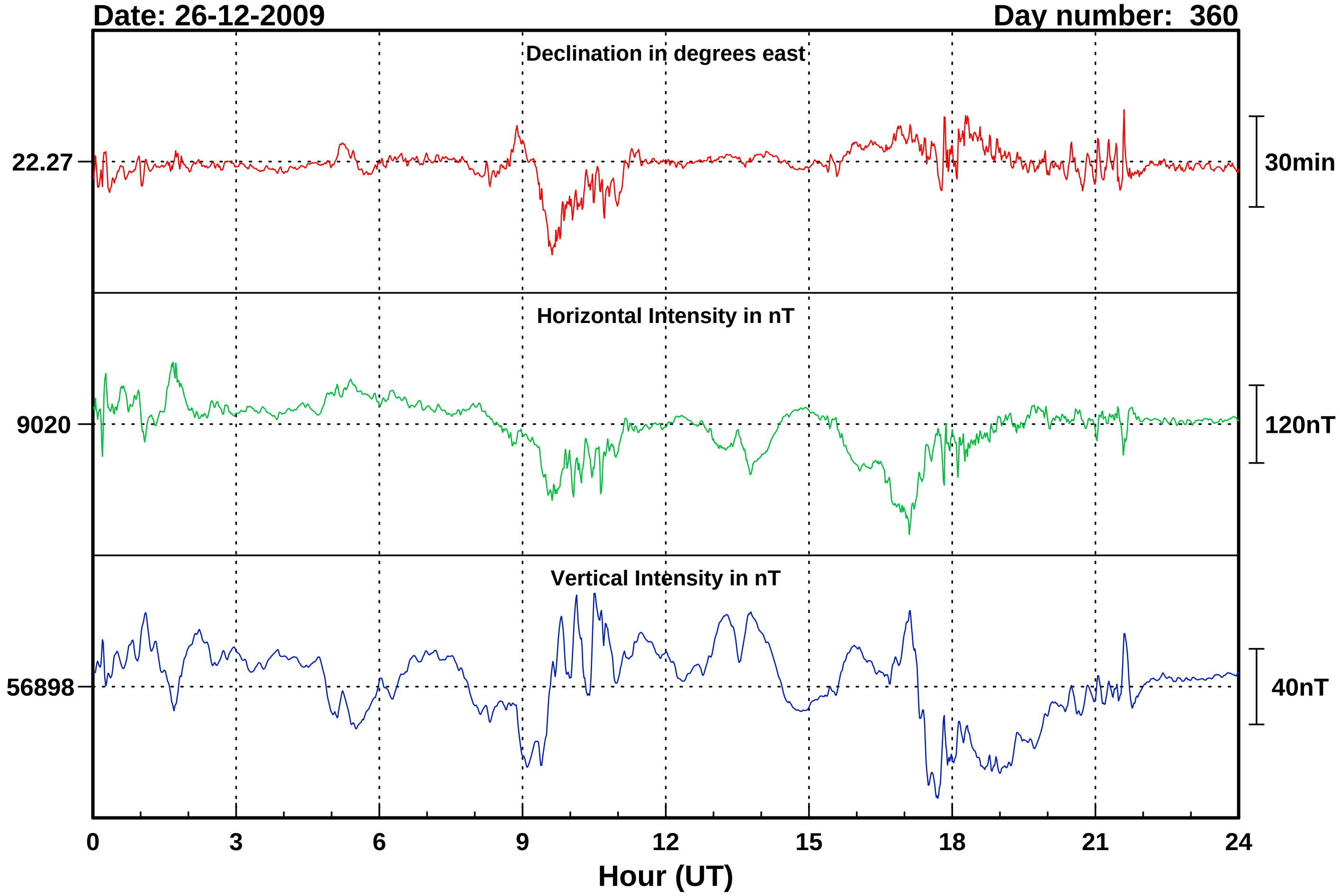
Date: 25-12-2009 Day number: 359

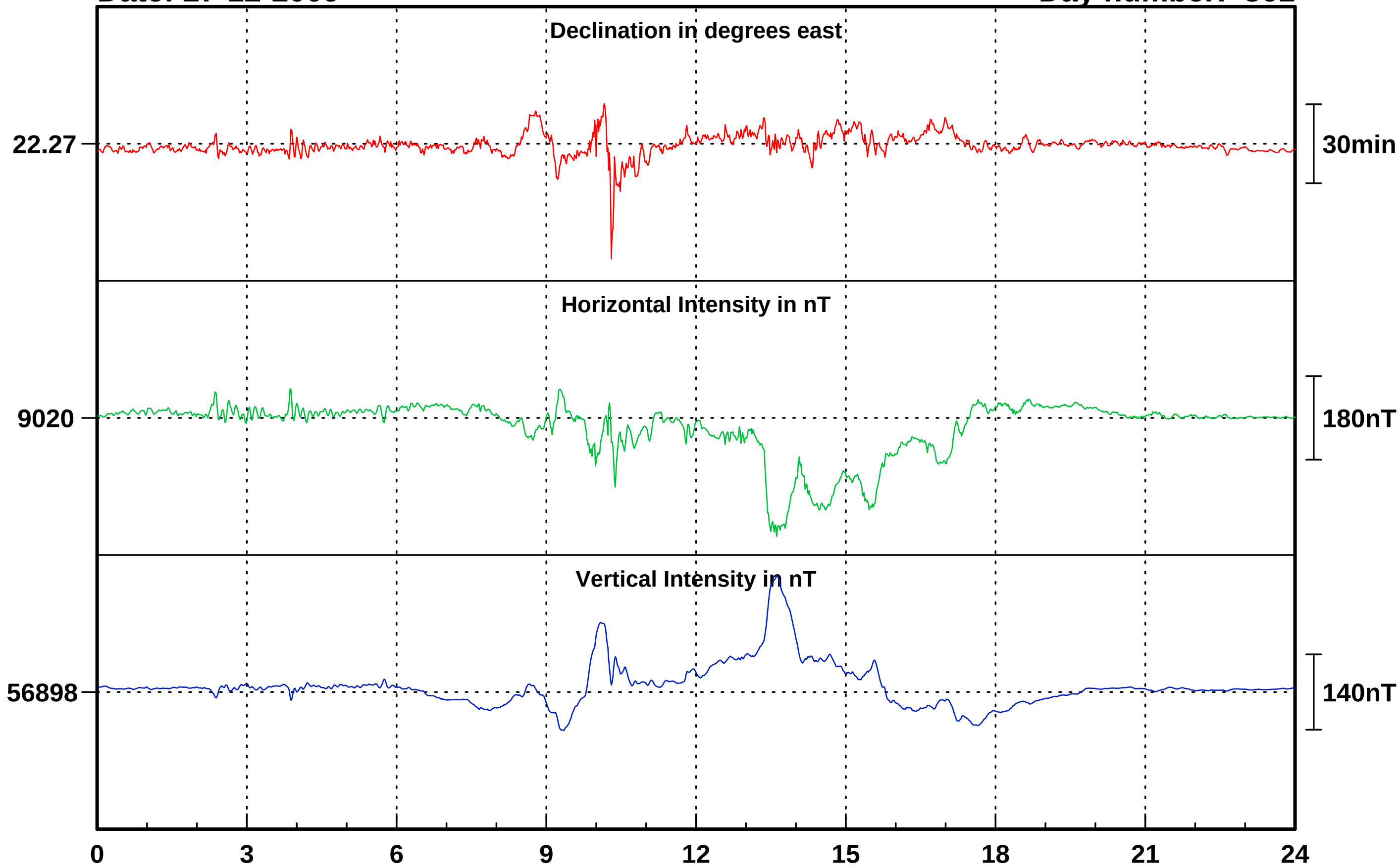


Date: 26-12-2009 Day number: 360

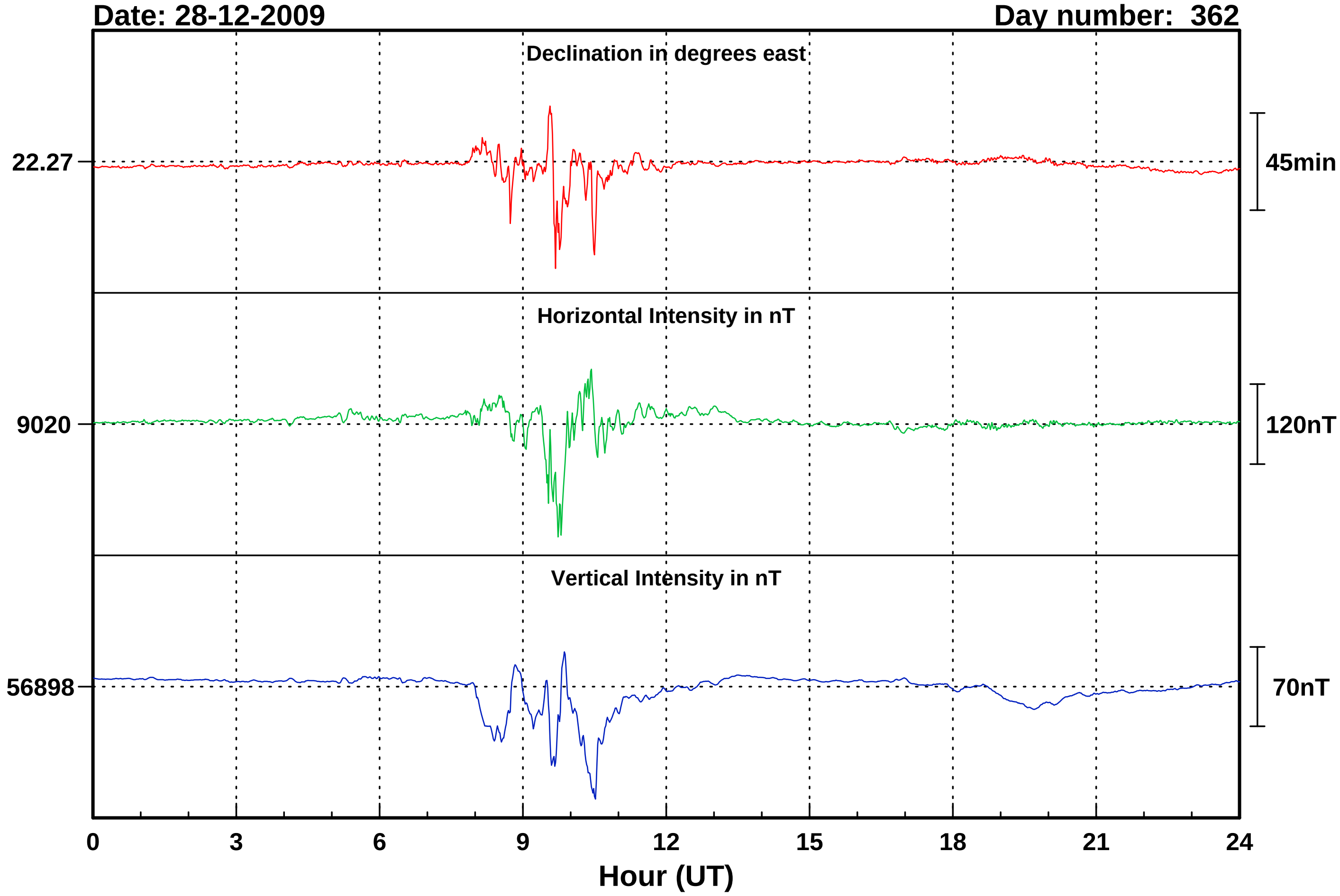


Jim Carrigan

Date: 27-12-2009 Day number: 361



Date: 28-12-2009 Day number: 362



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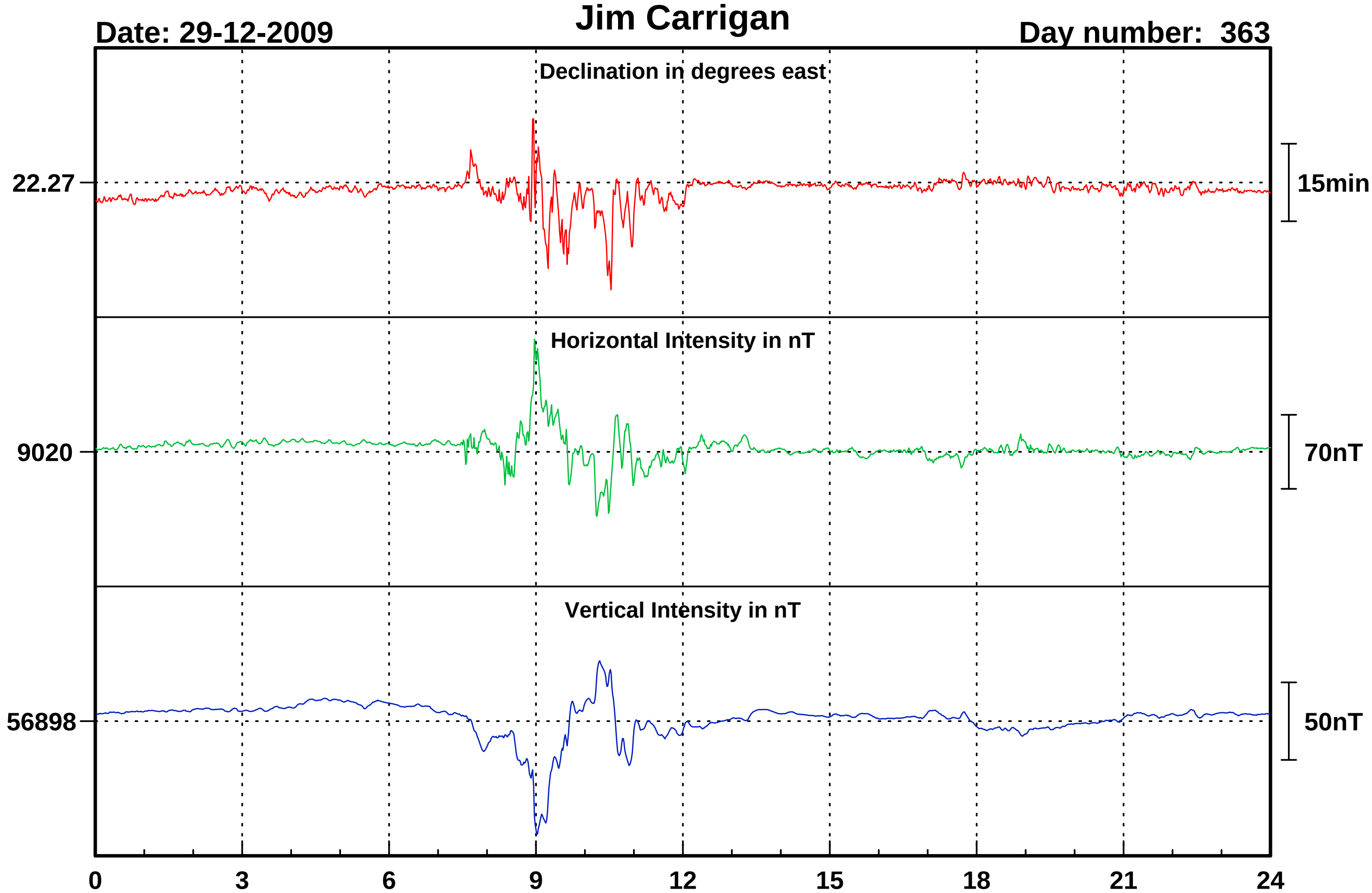
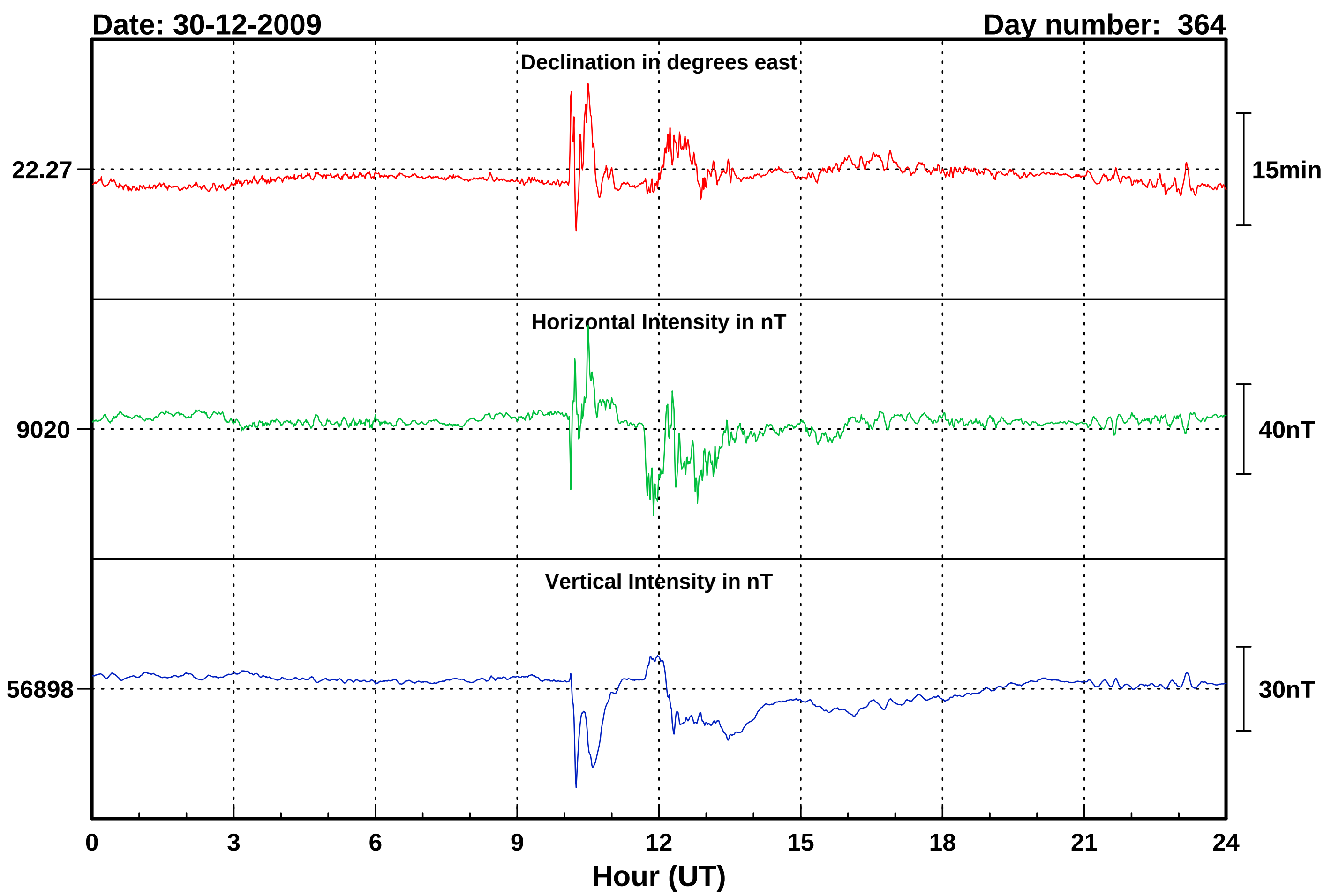
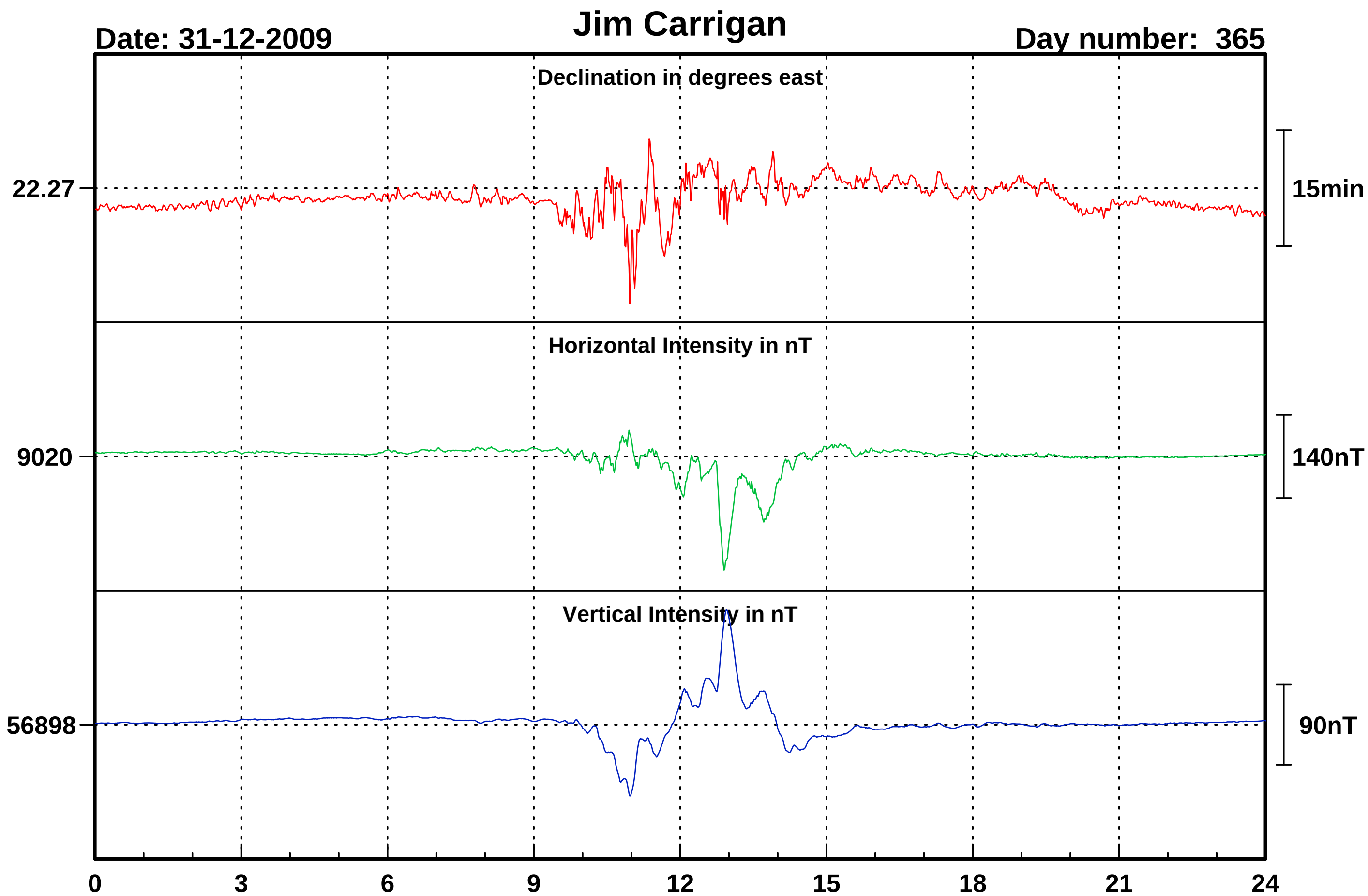
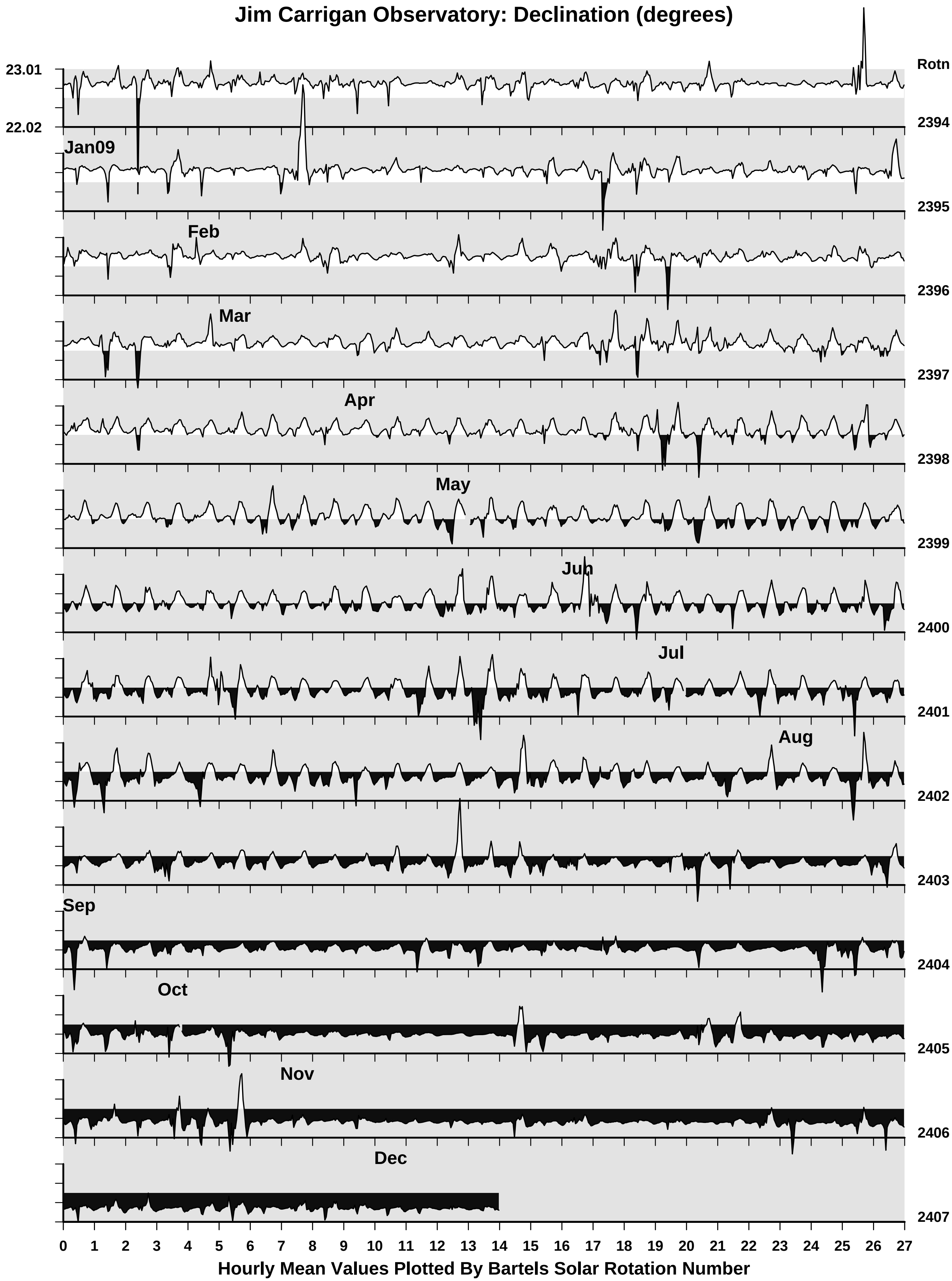




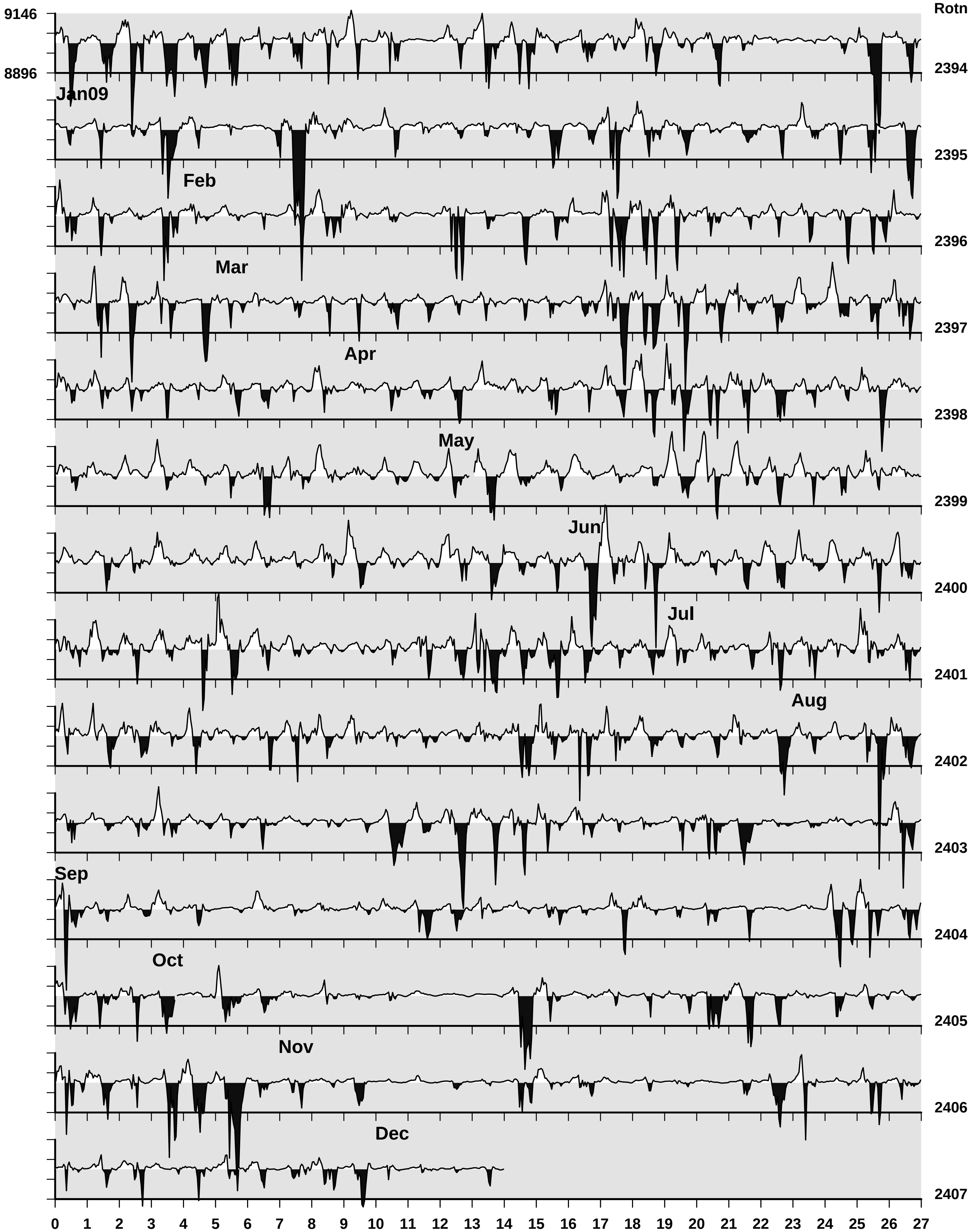


Date: 31-12-2009
Jim Carrigan
Day number: 365
Declination in degrees east
22.27
15min
Horizontal Intensity in nT
9020
140nT
Vertical Intensity in nT
56898
90nT
0
3
6
9
12
15
18
21
24

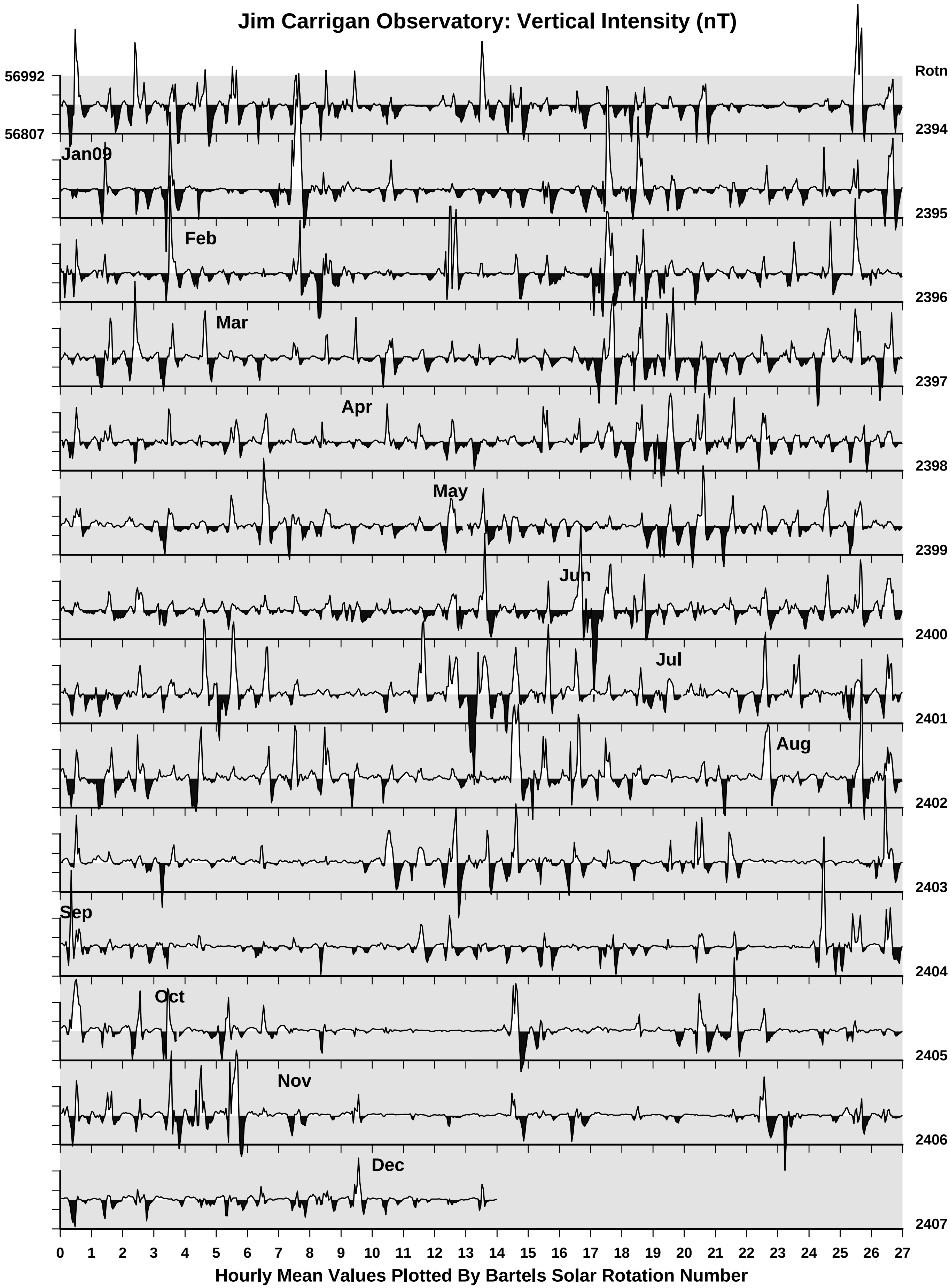


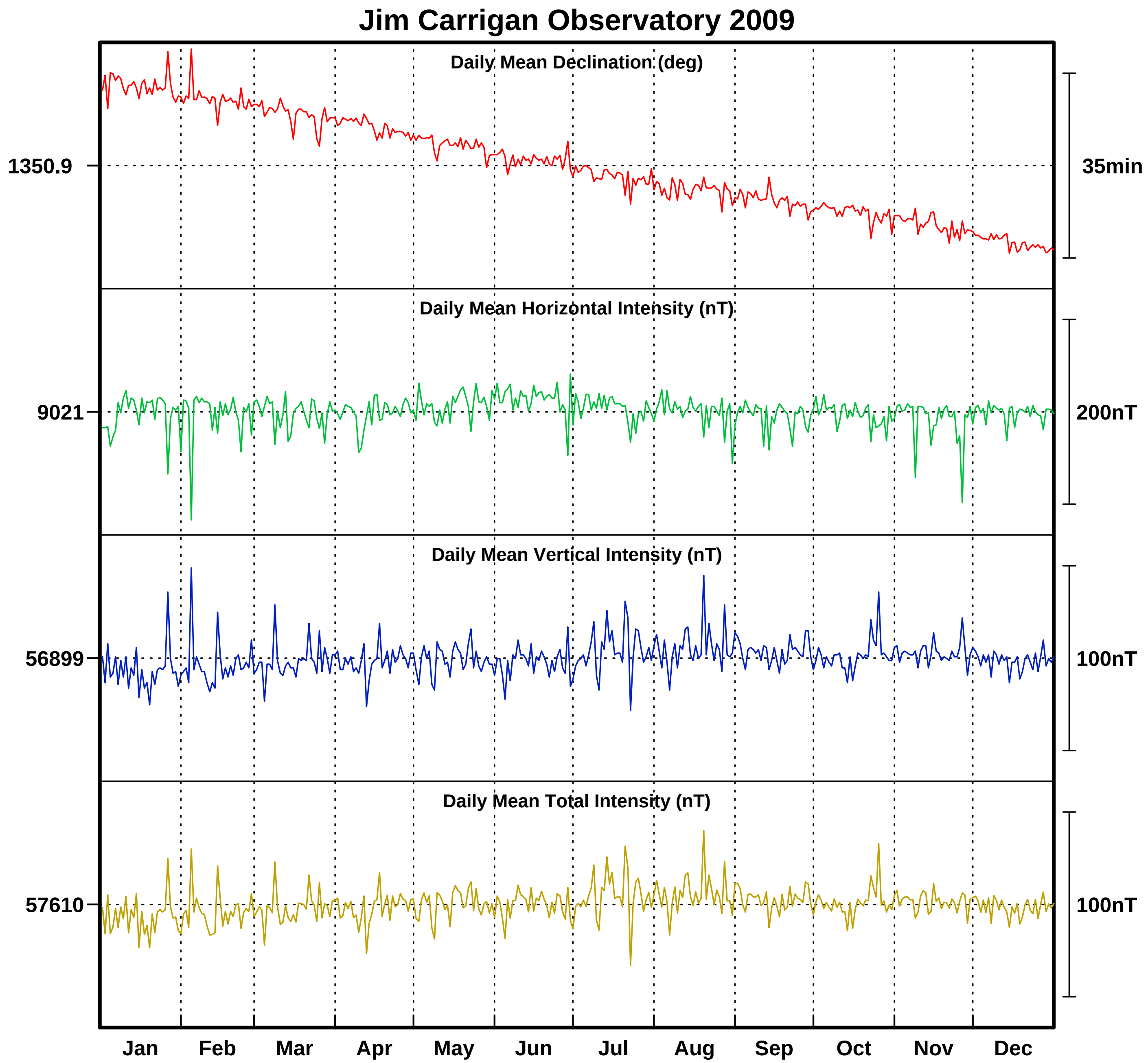
Jim Carrigan Observatory: Declination (degrees)
23.01
22.02
Rotn
2394
2395
2396
2397
2398
2399
2400
2401
2402
2403
2404
2405
2406
2407
Jan09
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Jim Carrigan Observatory: Horizontal Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number


Jim Carrigan Observatory: Vertical Intensity (nT)
56992
56807
Rotn
2394
2395
2396
2397
2398
2399
2400
2401
2402
2403
2404
2405
2406
2407
Jan09
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
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 2009
Daily Mean Declination (deg)
1350.9
35min
Daily Mean Horizontal Intensity (nT)
9021
200nT
Daily Mean Vertical Intensity (nT)
56899
100nT
Daily Mean Total Intensity (nT)
57610
100nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Jim Carrigan Observatory 2009

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	22° 45.9´	9018 nT	80° 59.6´	8316 nT	3490 nT	56893 nT	57603 nT
February	22° 43.5´	9019 nT	80° 59.6´	8319 nT	3484 nT	56896 nT	57606 nT
March	22° 40.6´	9019 nT	80° 59.6´	8322 nT	3477 nT	56898 nT	57608 nT
April	22° 38.1´	9020 nT	80° 59.5´	8325 nT	3471 nT	56898 nT	57608 nT
May	22° 34.7´	9028 nT	80° 59.0´	8336 nT	3467 nT	56898 nT	57610 nT
June	22° 31.9´	9035 nT	80° 58.6´	8345 nT	3462 nT	56897 nT	57610 nT
July	22° 28.8´	9025 nT	80° 59.3´	8339 nT	3451 nT	56904 nT	57615 nT
August	22° 26.3´	9021 nT	80° 59.5´	8338 nT	3443 nT	56905 nT	57616 nT
September	22° 24.2´	9017 nT	80° 59.7´	8336 nT	3437 nT	56902 nT	57612 nT
October	22° 22.0´	9018 nT	80° 59.6´	8340 nT	3432 nT	56901 nT	57611 nT
November	22° 19.6´	9012 nT	81° 0.0´	8337 nT	3424 nT	56902 nT	57611 nT
December	22° 16.2´	9020 nT	80° 59.5´	8348 nT	3419 nT	56898 nT	57608 nT

Note

i. The values shown here are provisional.