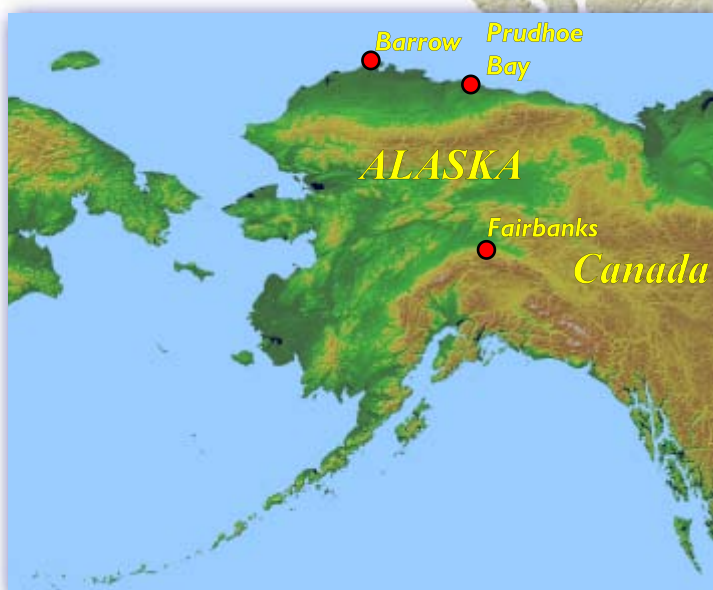


BRITISH GEOLOGICAL SURVEY

**Jim Carrigan
Observatory
Prudhoe Bay
Monthly
Magnetic
Bulletin**

December 2015

15/12/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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Earth Hazards and Systems
British Geological Survey
Murchison House, West Mains Road
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Scotland, UK

Tel: +44 (0) 131 667 1000

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° 23'10"N 256° 28'01" 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 12th generation International Geomagnetic Reference Field (IGRF) at epoch 2015.5. 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

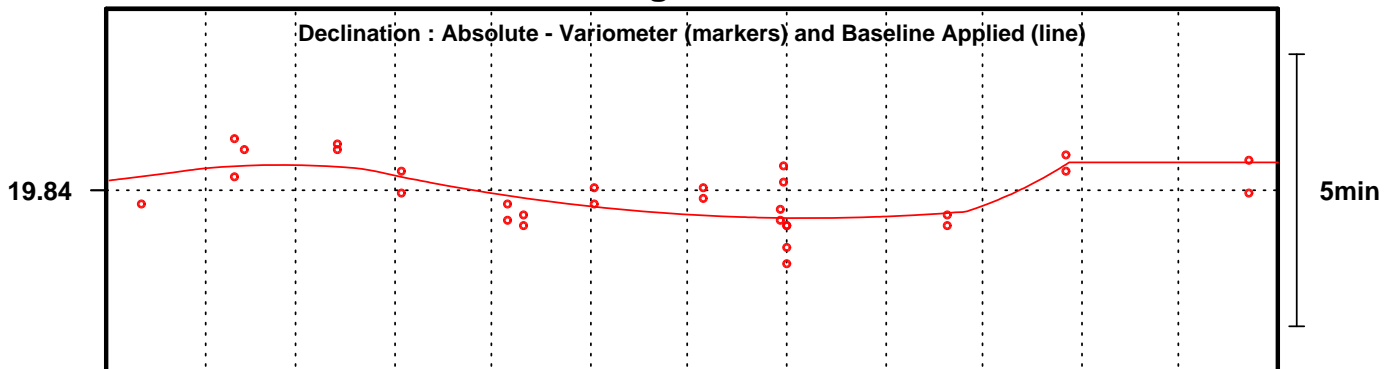
The data presented in this bulletin are provided for personal, academic, educational, non-commercial research or other non-commercial use and are not for sale or distribution to third parties without written permission from BGS.

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.'

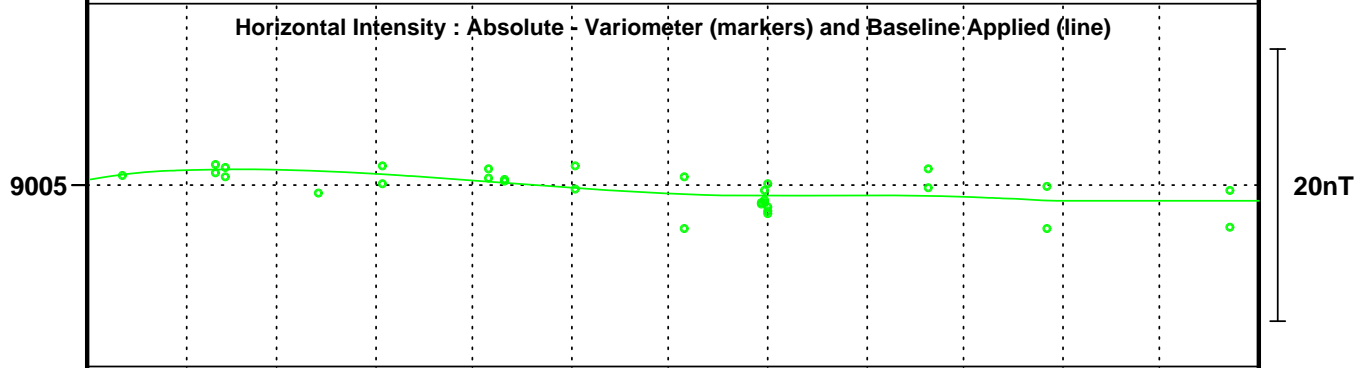
Commercial users can contact the geomagnetism team for information on the range of applications and services offered. Full contact details are available at www.geomag.bgs.ac.uk/contactus/staff

Jim Carrigan Obs 2015

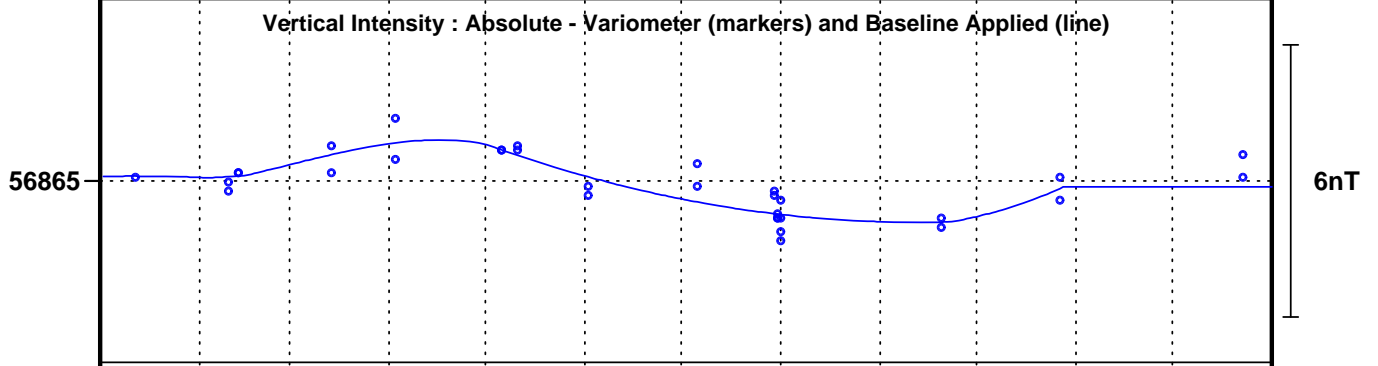
Declination : Absolute - Variometer (markers) and Baseline Applied (line)



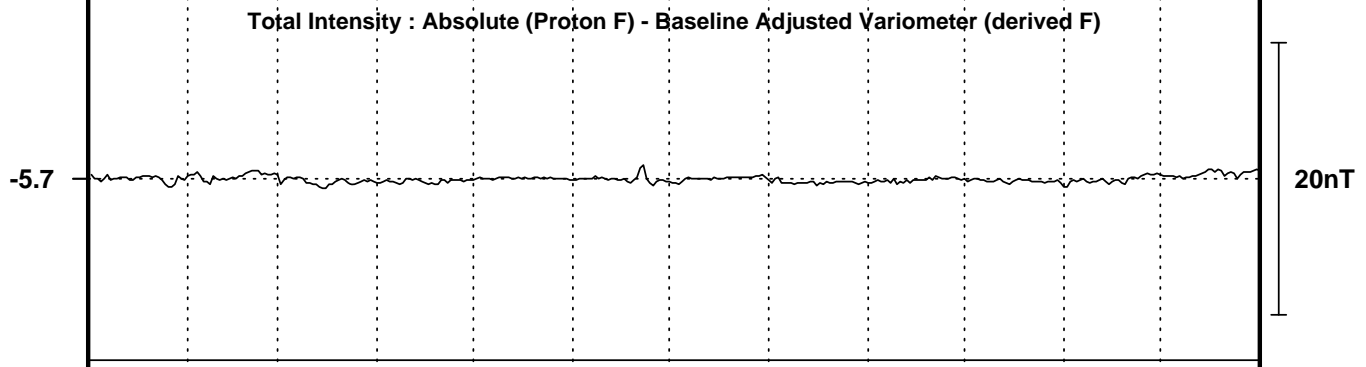
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)



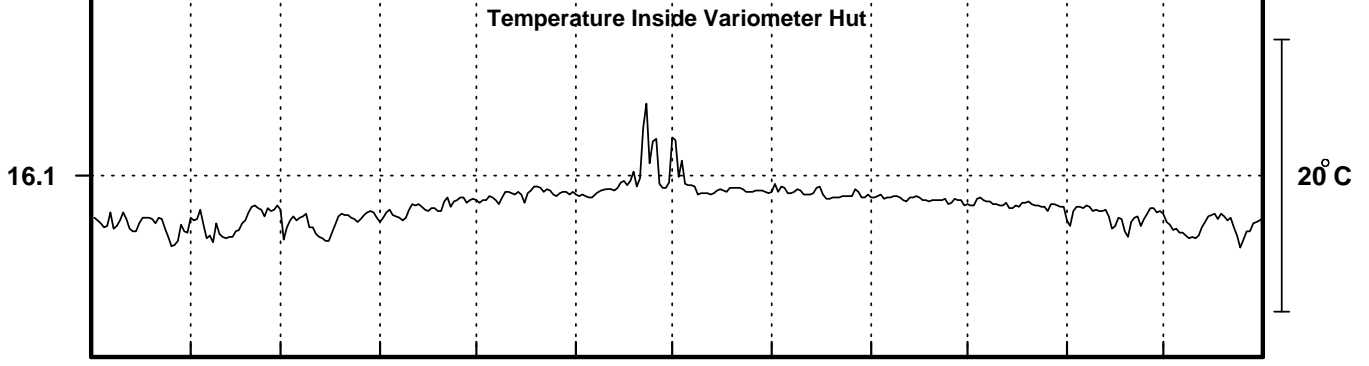
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)



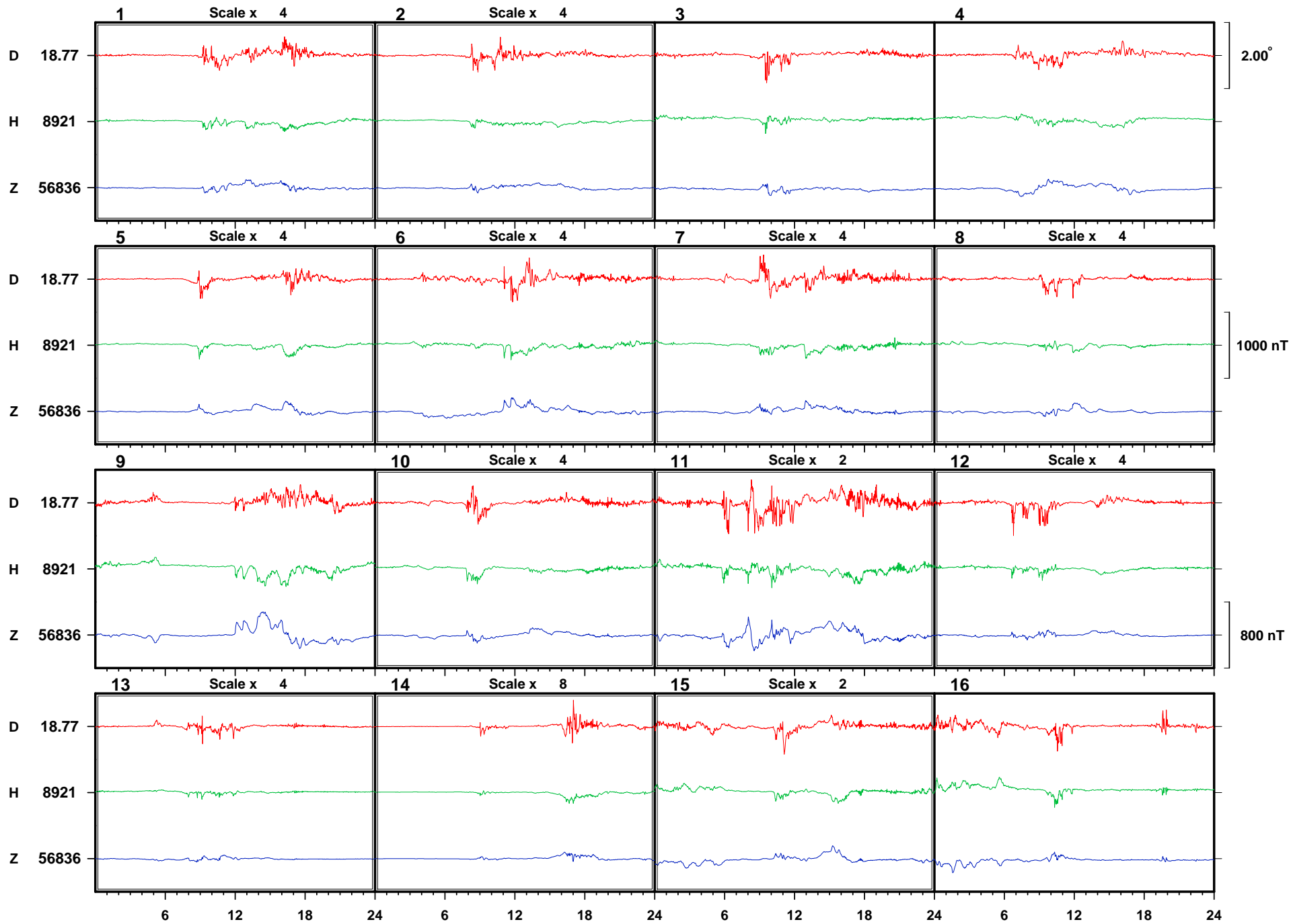
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)

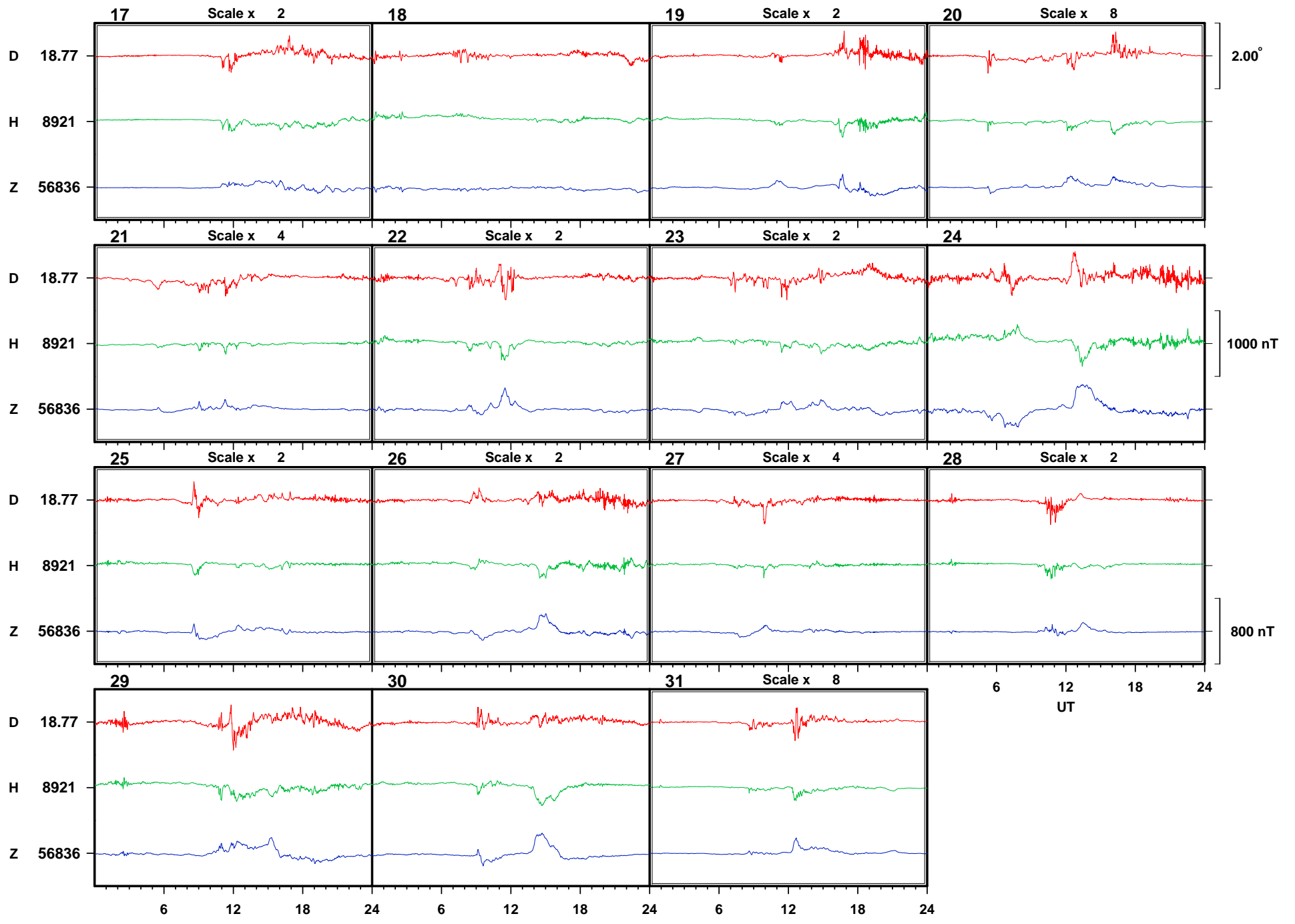


Temperature Inside Variometer Hut



Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec





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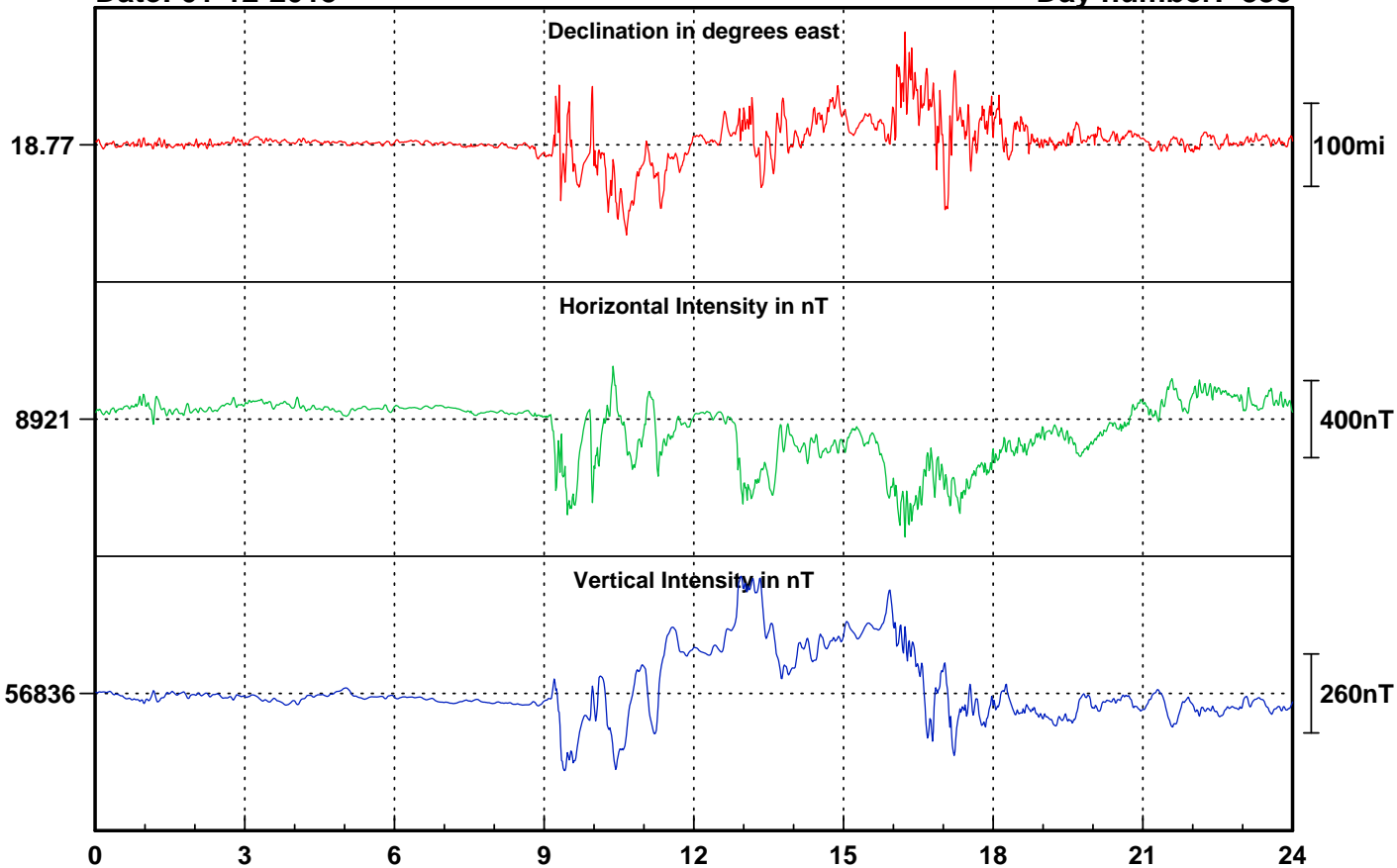
December

2015

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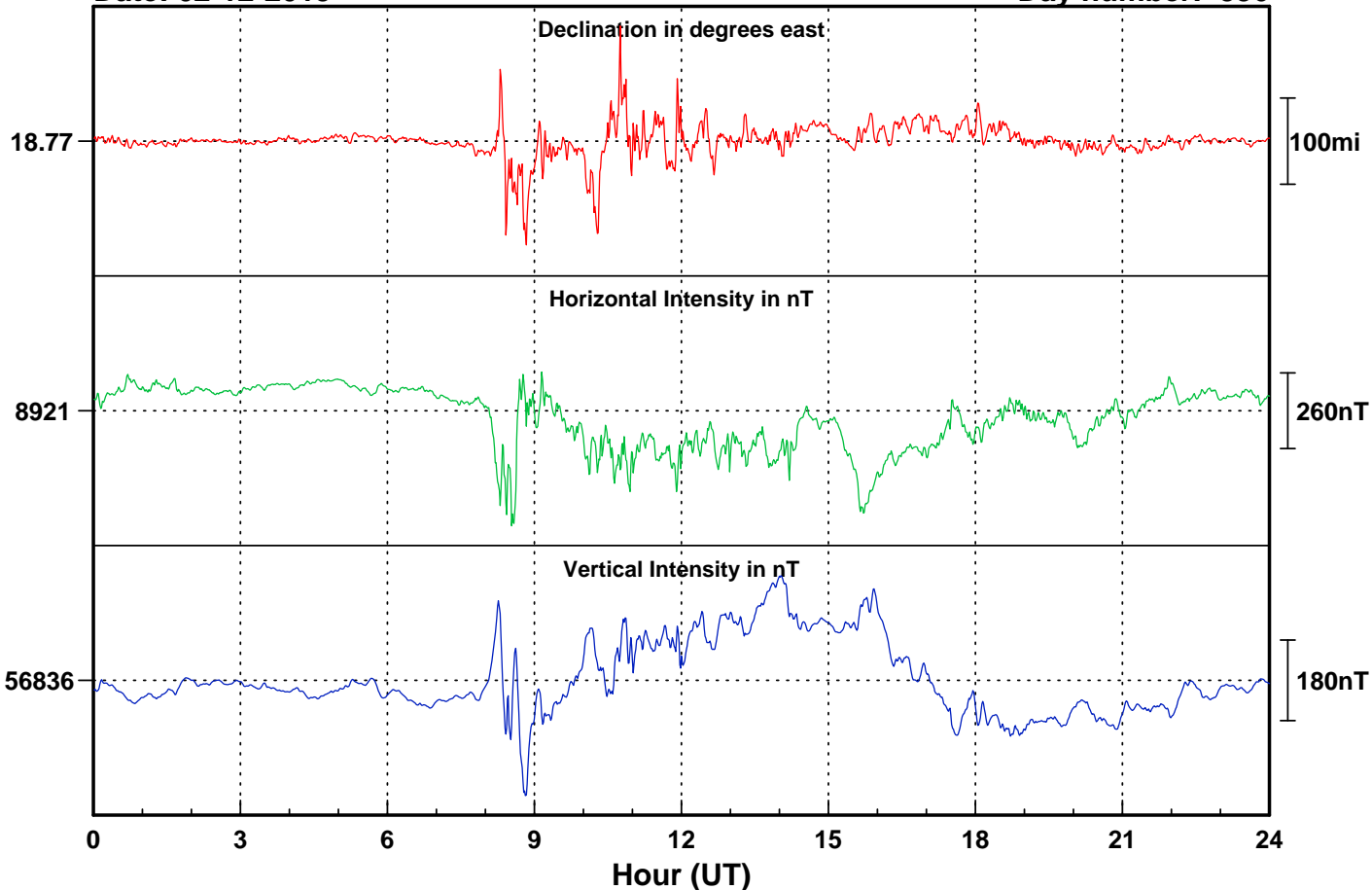
Jim Carrigan

Day number: 335



Date: 02-12-2015

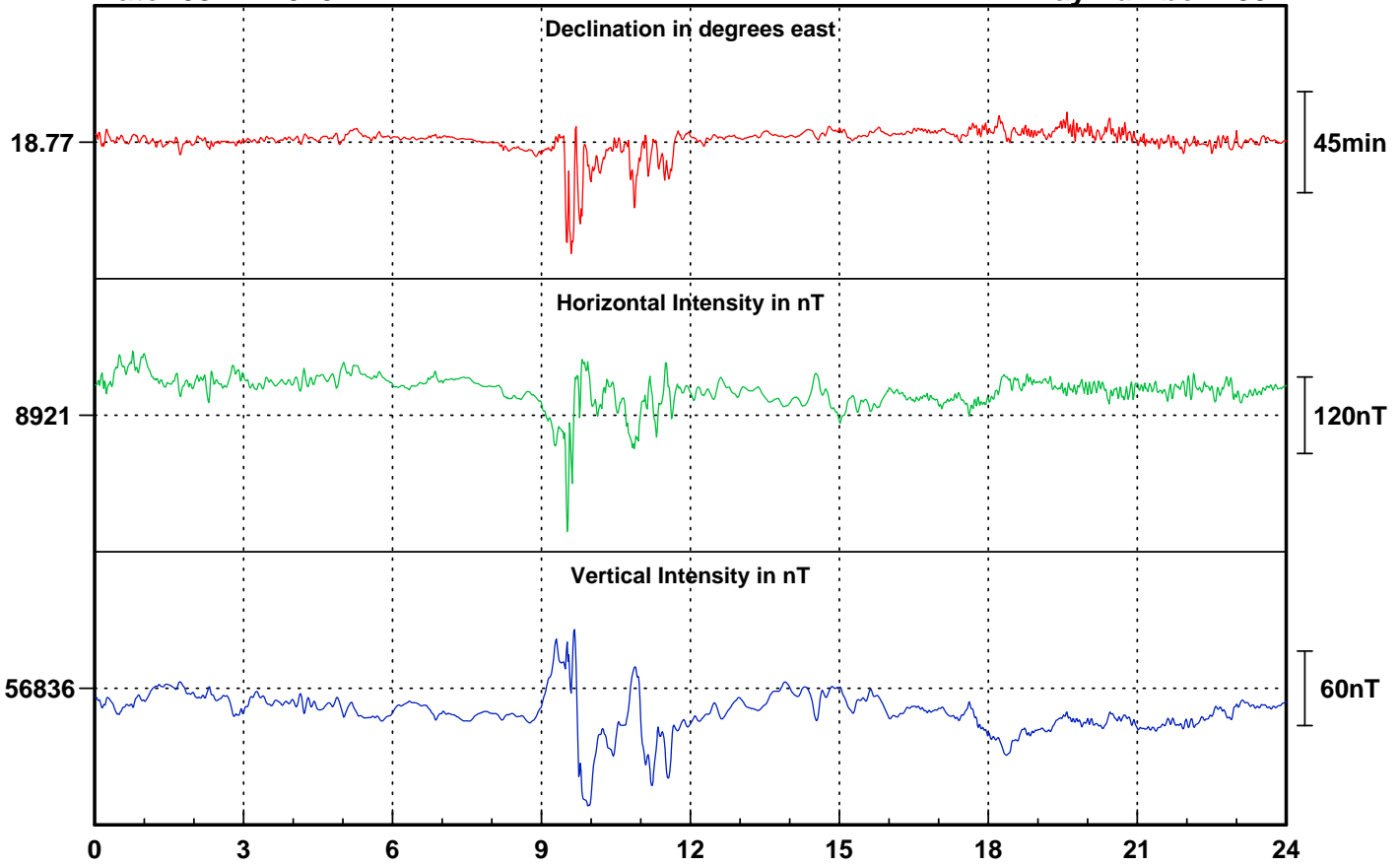
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Date: 03-12-2015

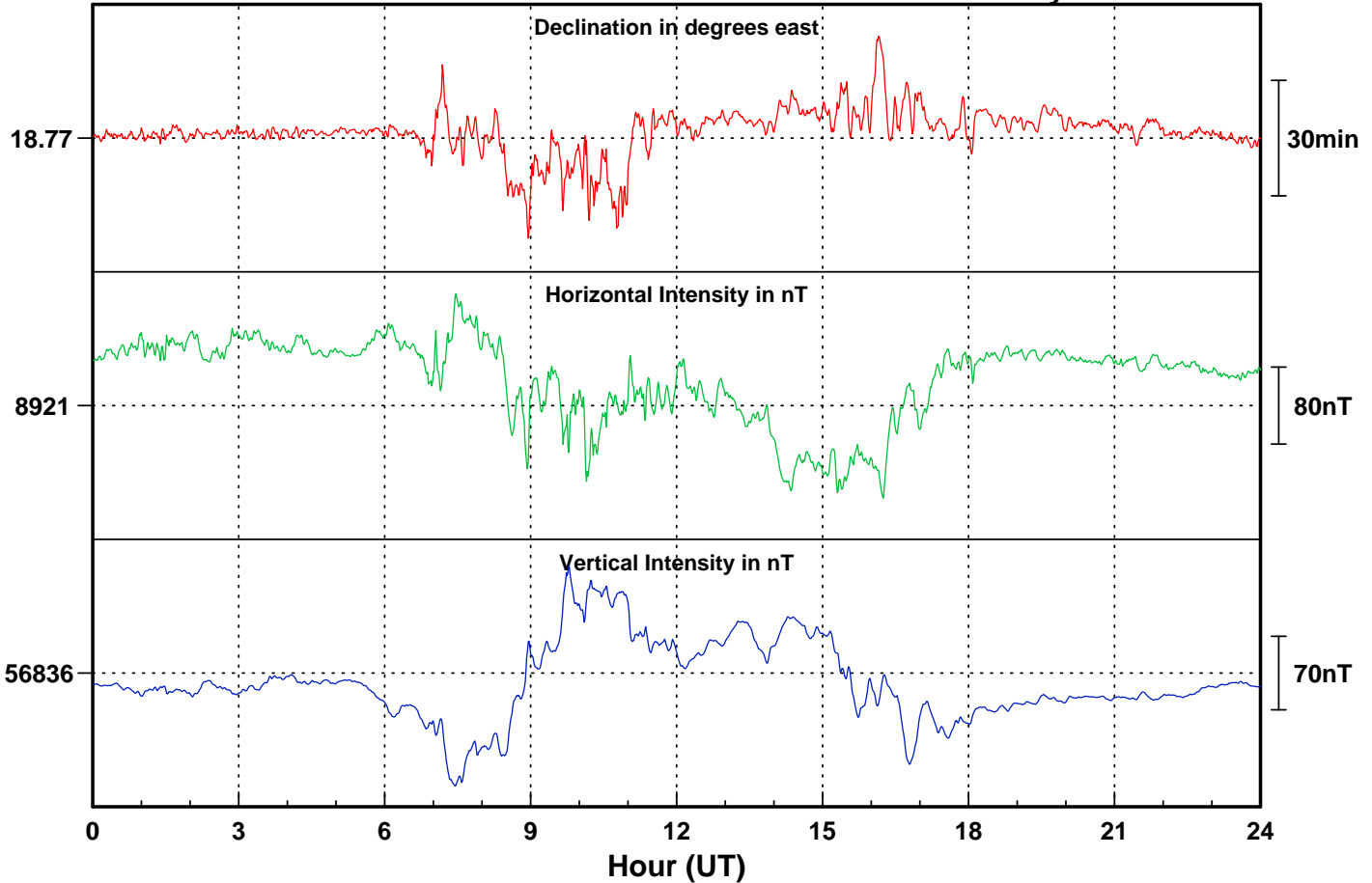
Jim Carrigan

Day number: 337



Date: 04-12-2015

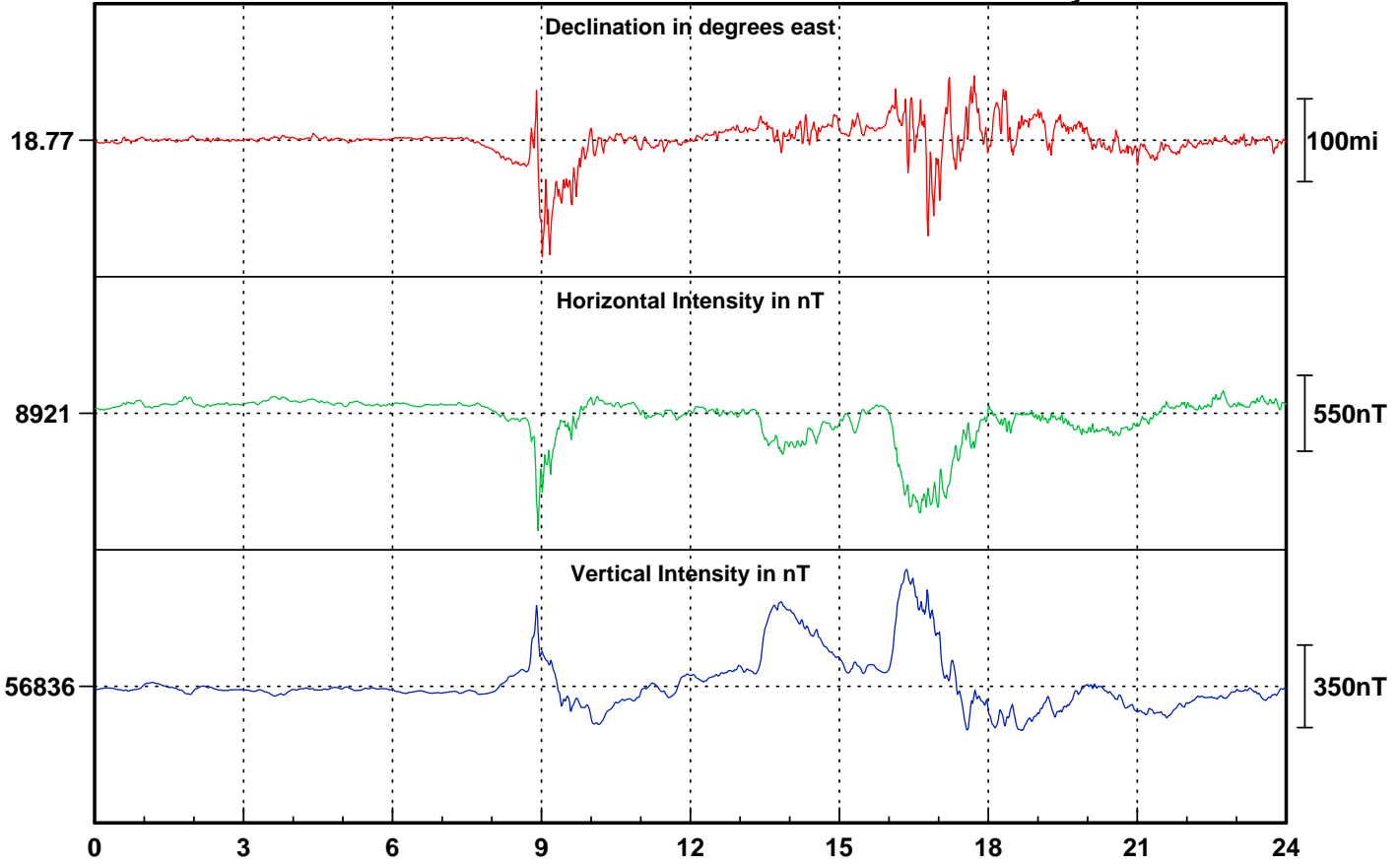
Day number: 338



Date: 05-12-2015

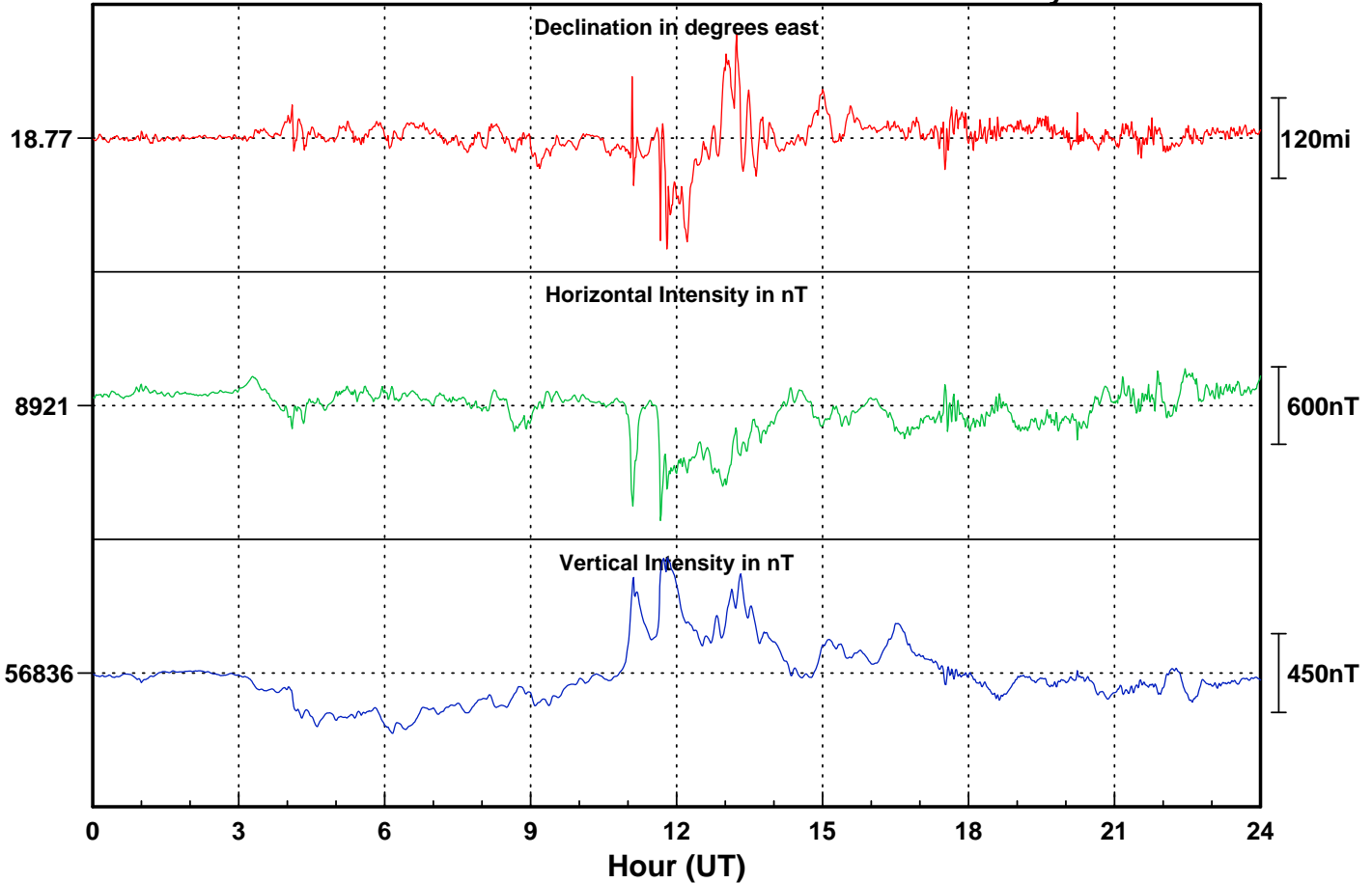
Jim Carrigan

Day number: 339



Date: 06-12-2015

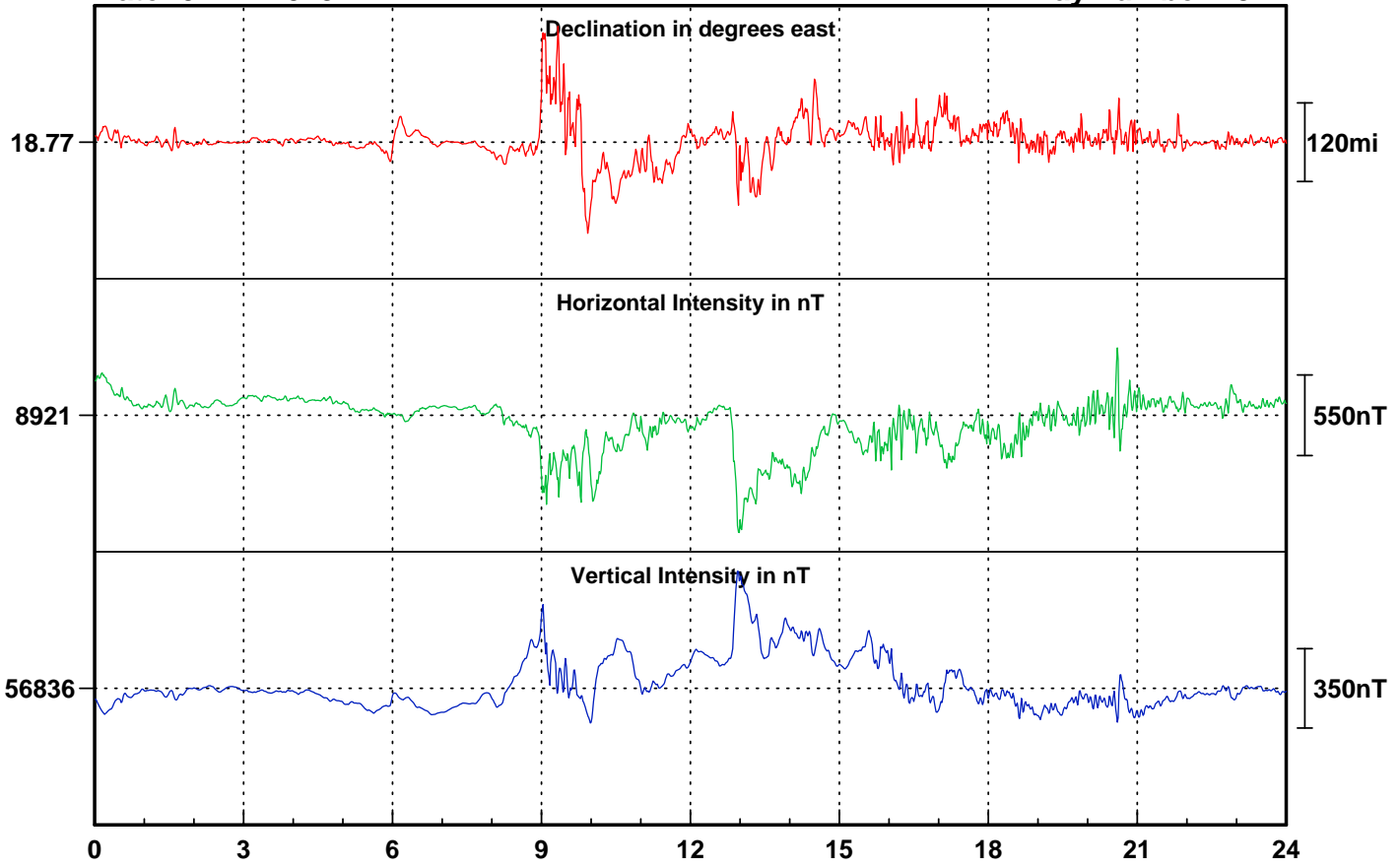
Day number: 340



Date: 07-12-2015

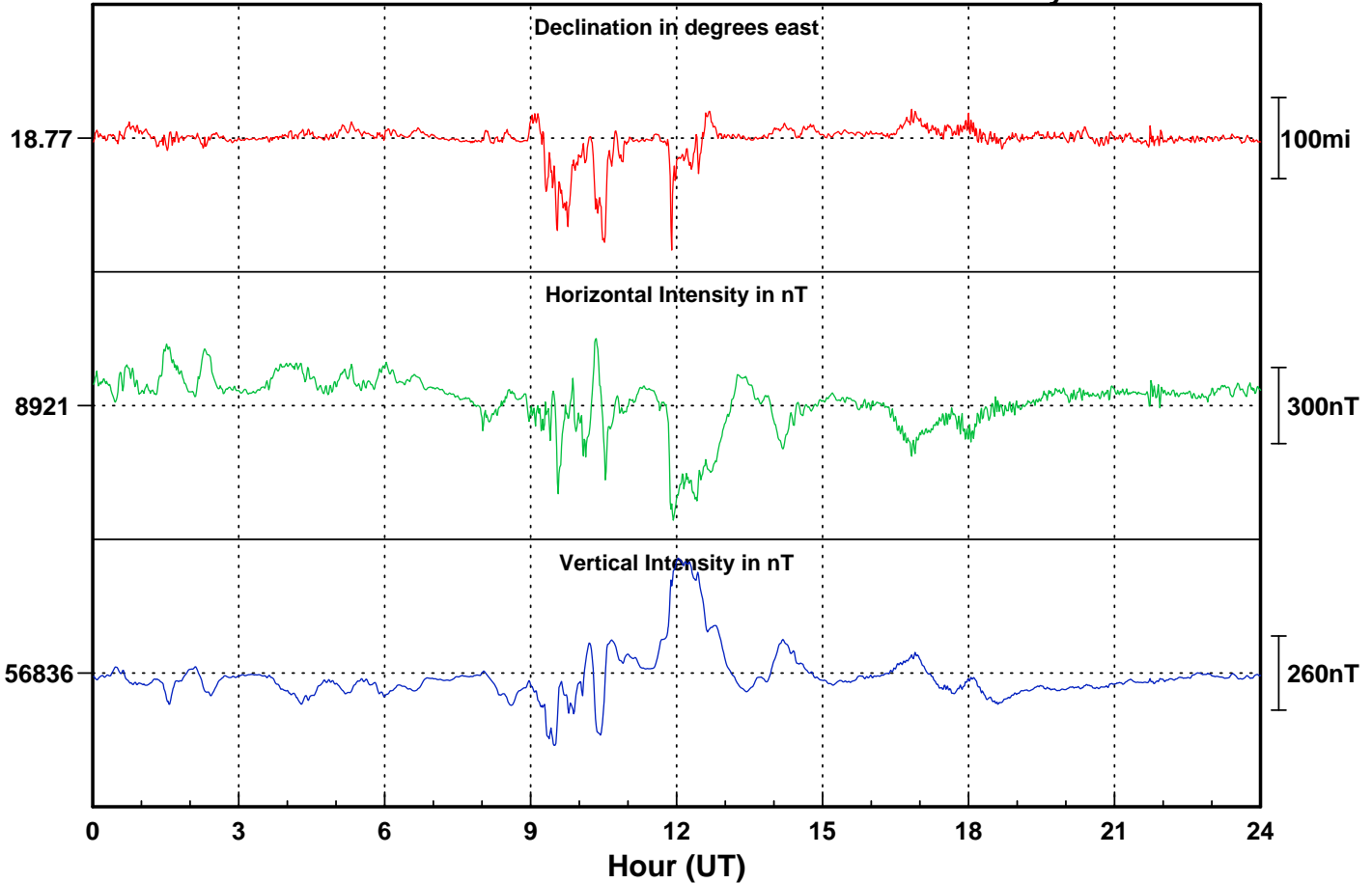
Jim Carrigan

Day number: 341



Date: 08-12-2015

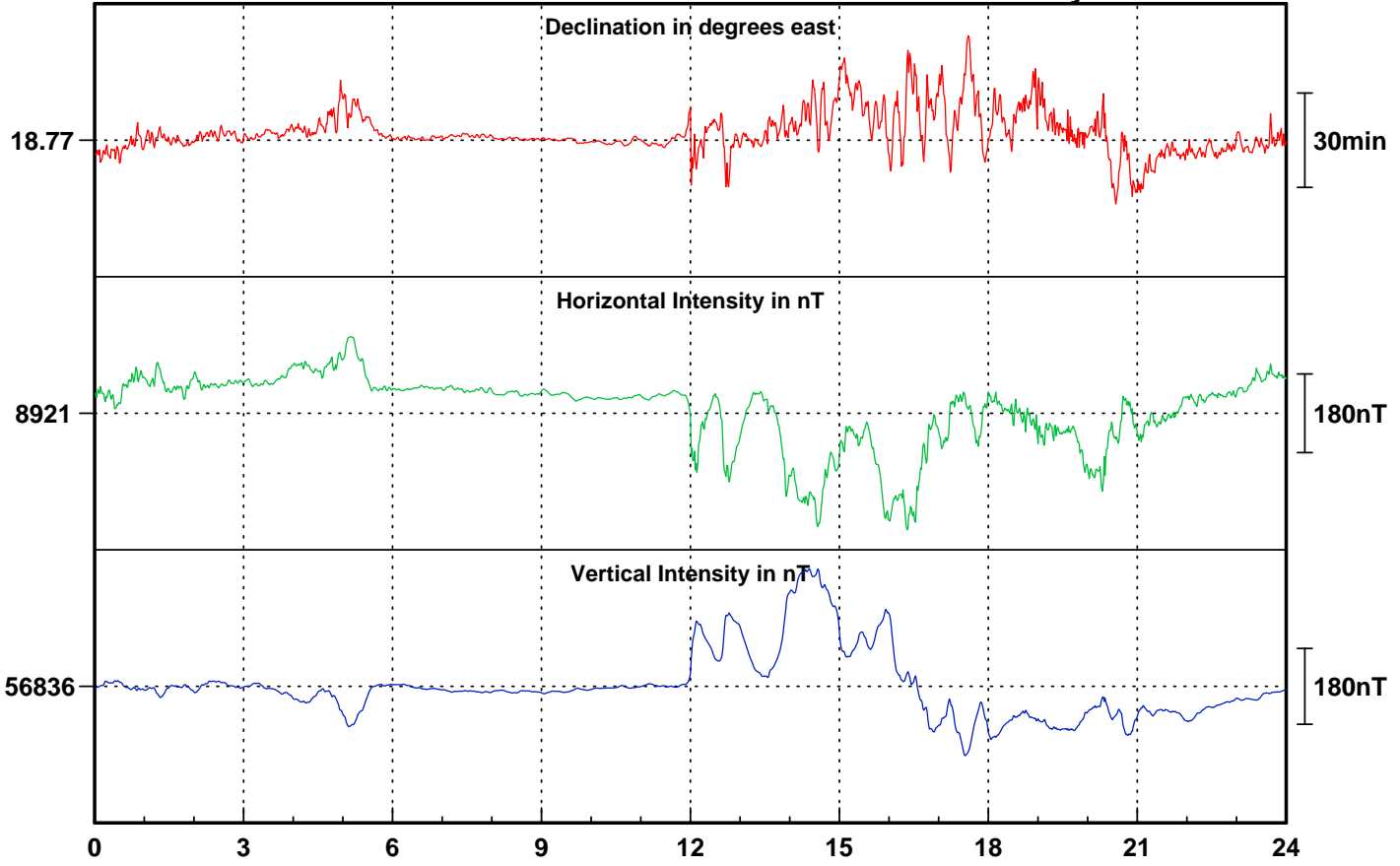
Day number: 342



Date: 09-12-2015

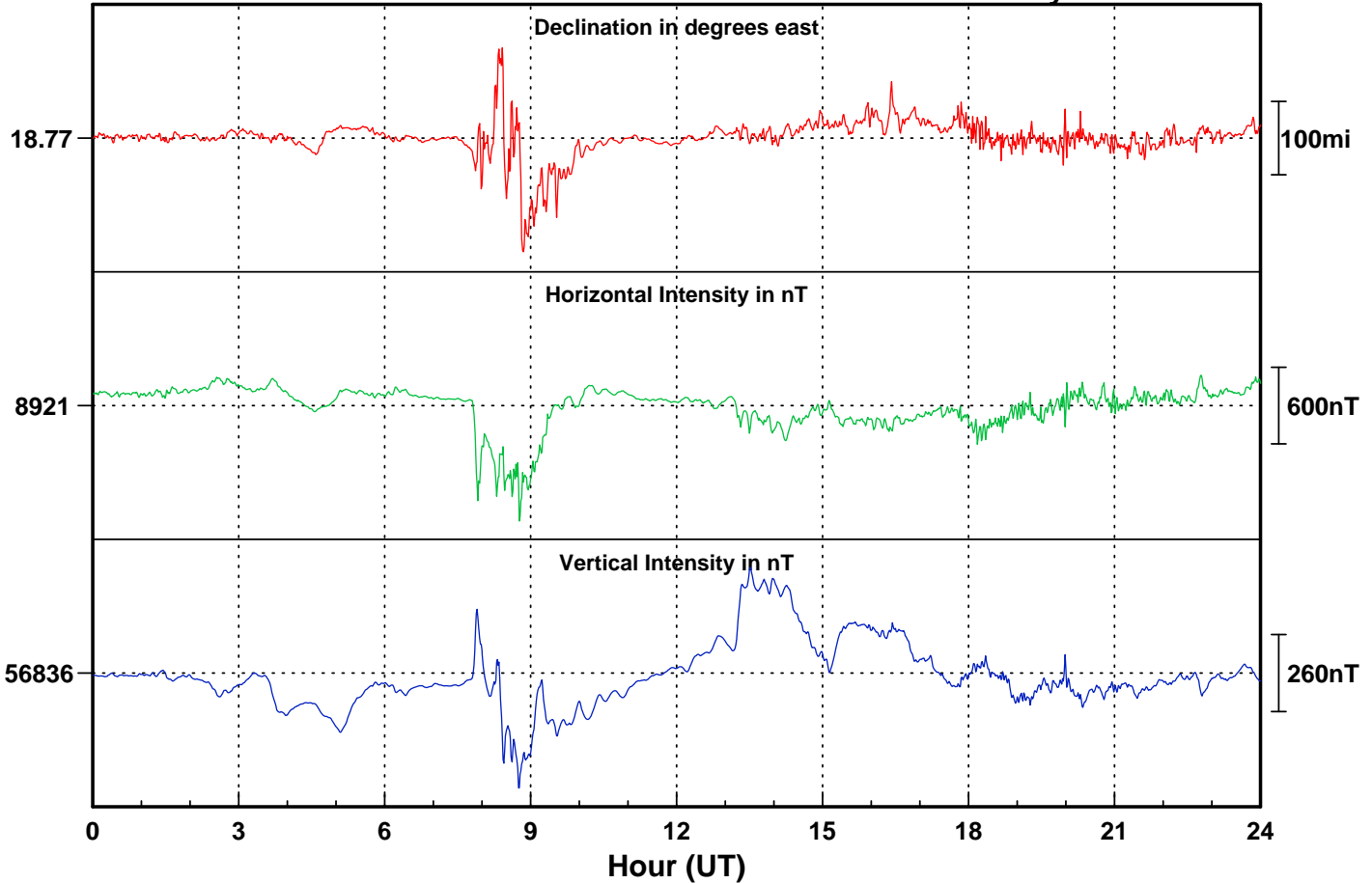
Jim Carrigan

Day number: 343



Date: 10-12-2015

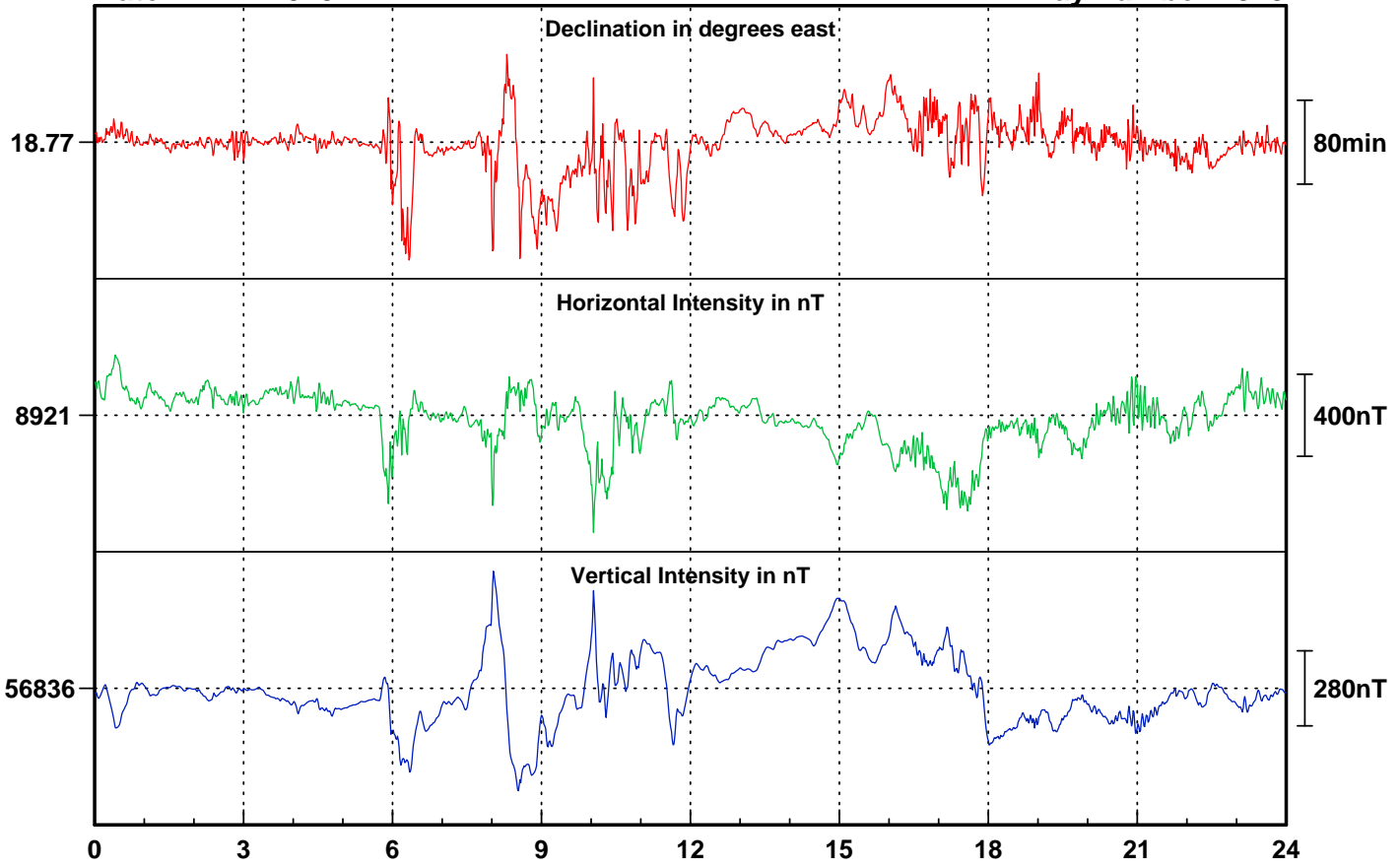
Day number: 344



Date: 11-12-2015

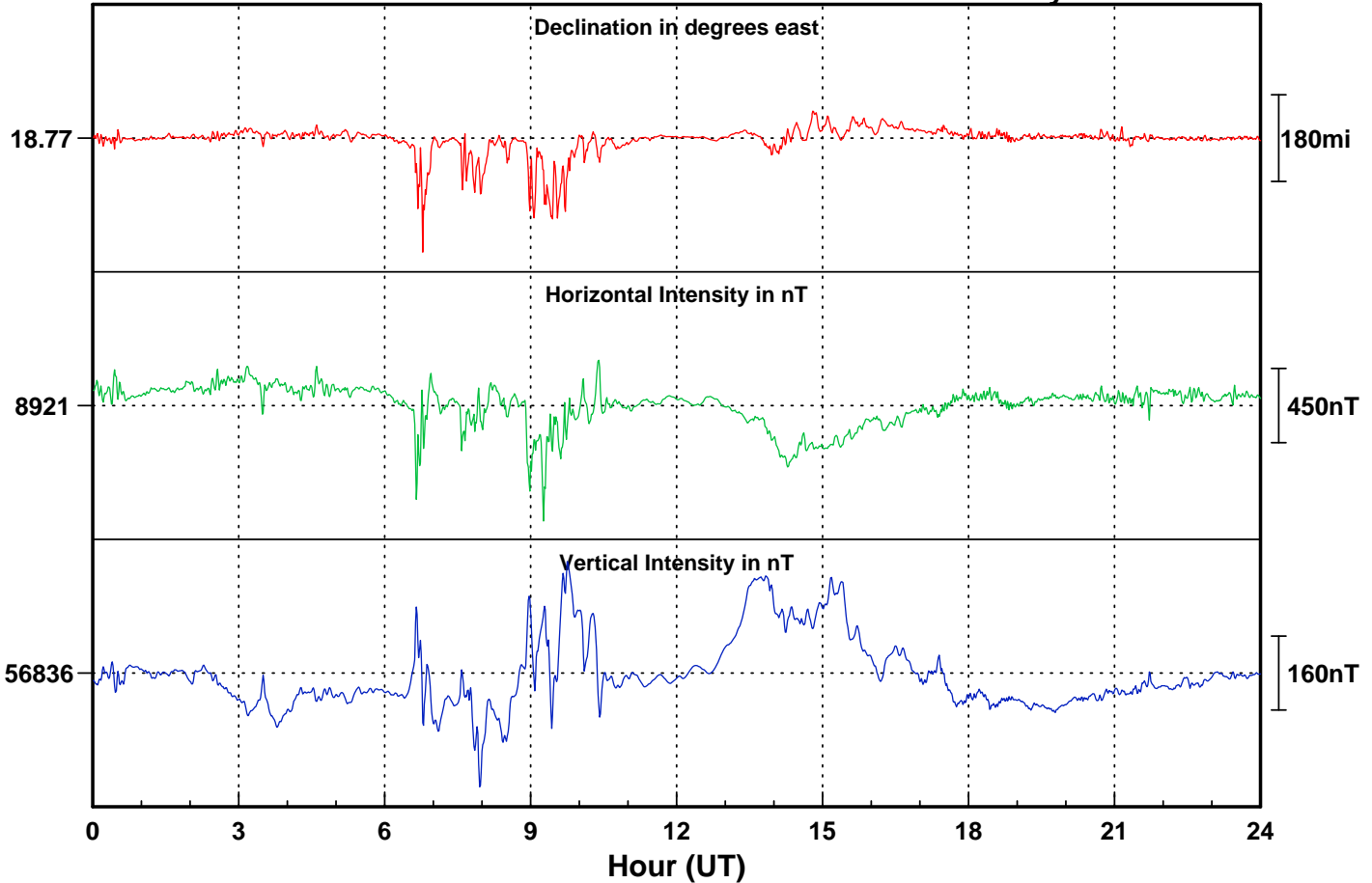
Jim Carrigan

Day number: 345



Date: 12-12-2015

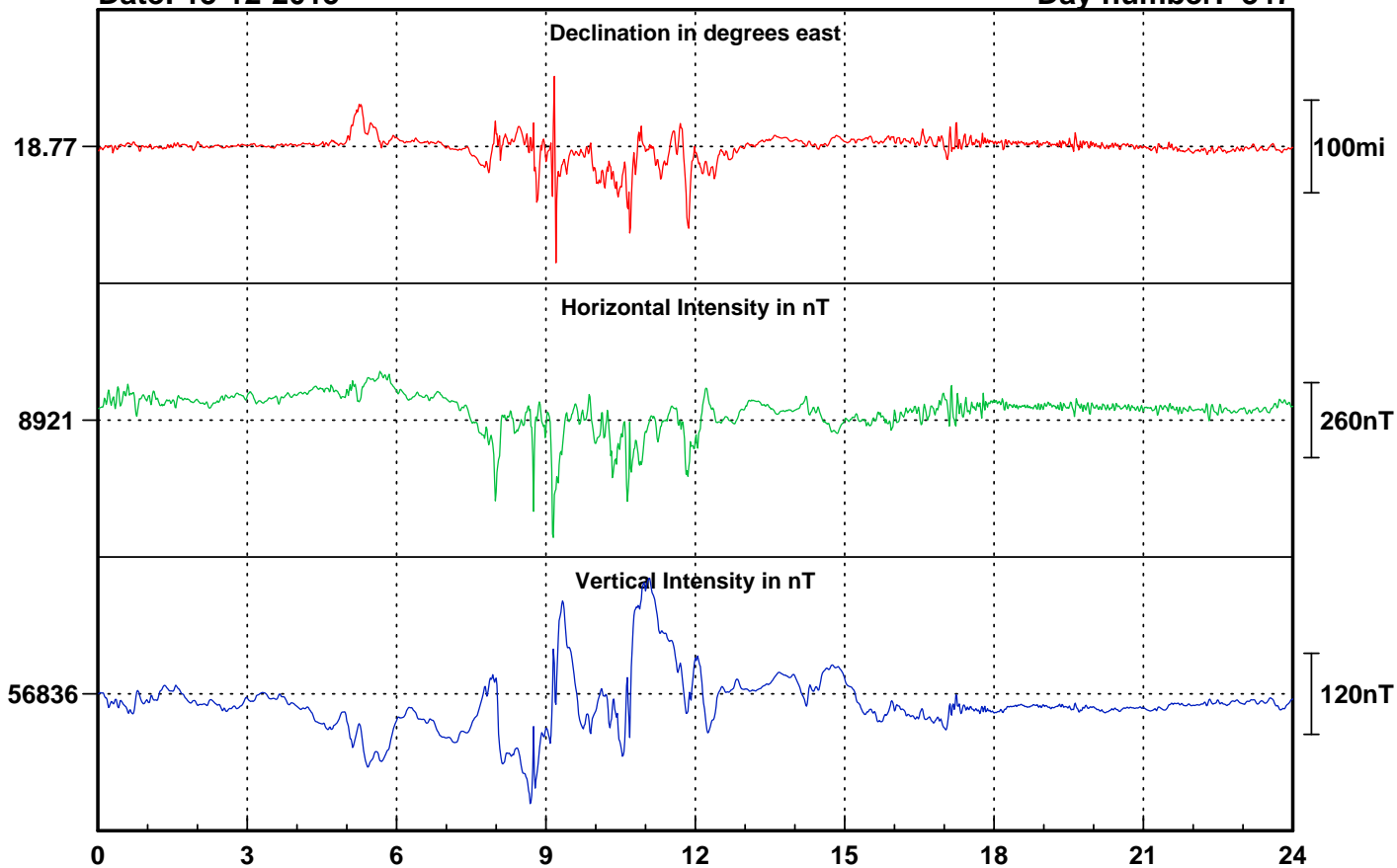
Day number: 346



Date: 13-12-2015

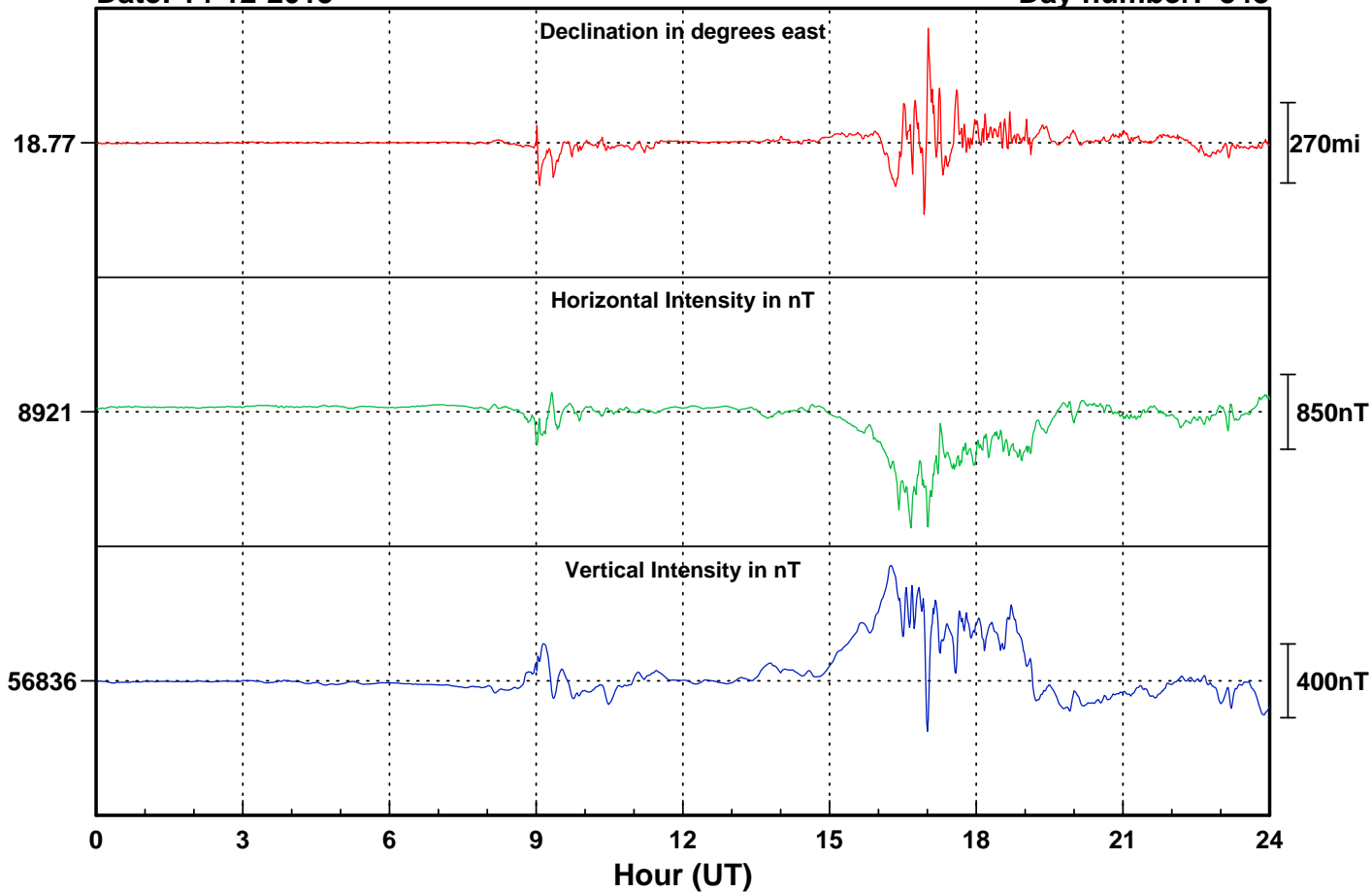
Jim Carrigan

Day number: 347



Date: 14-12-2015

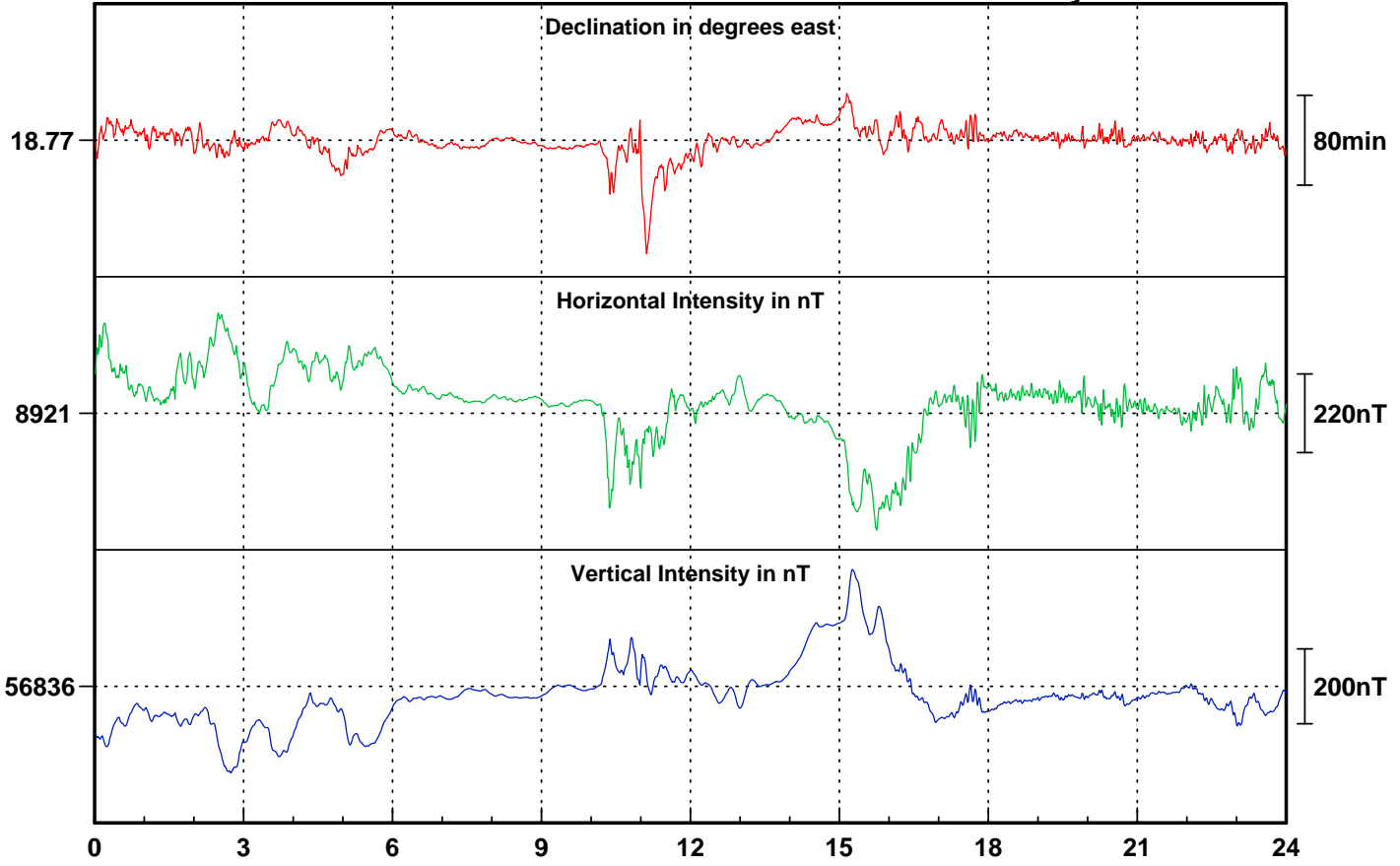
Day number: 348



Date: 15-12-2015

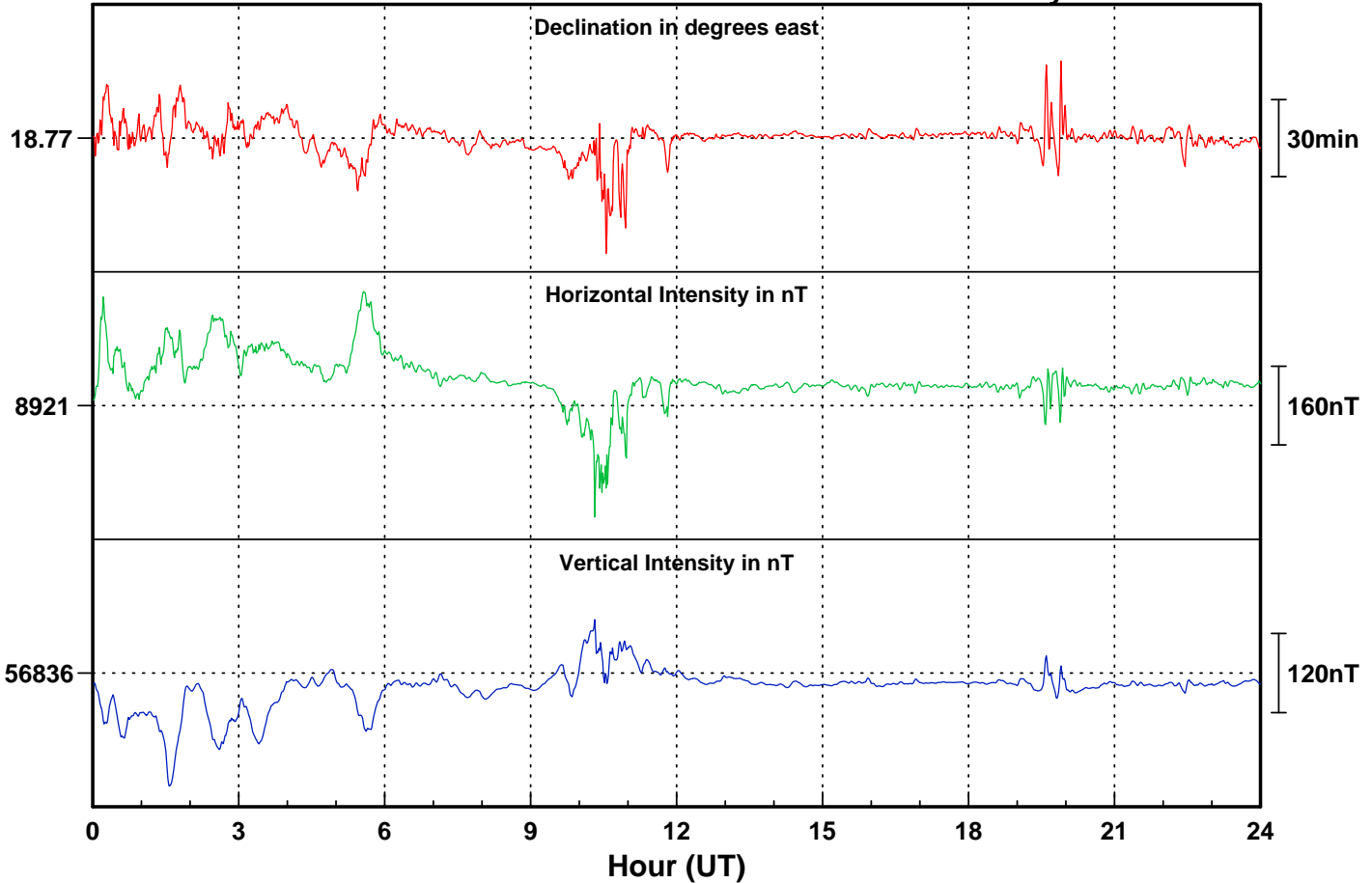
Jim Carrigan

Day number: 349



Date: 16-12-2015

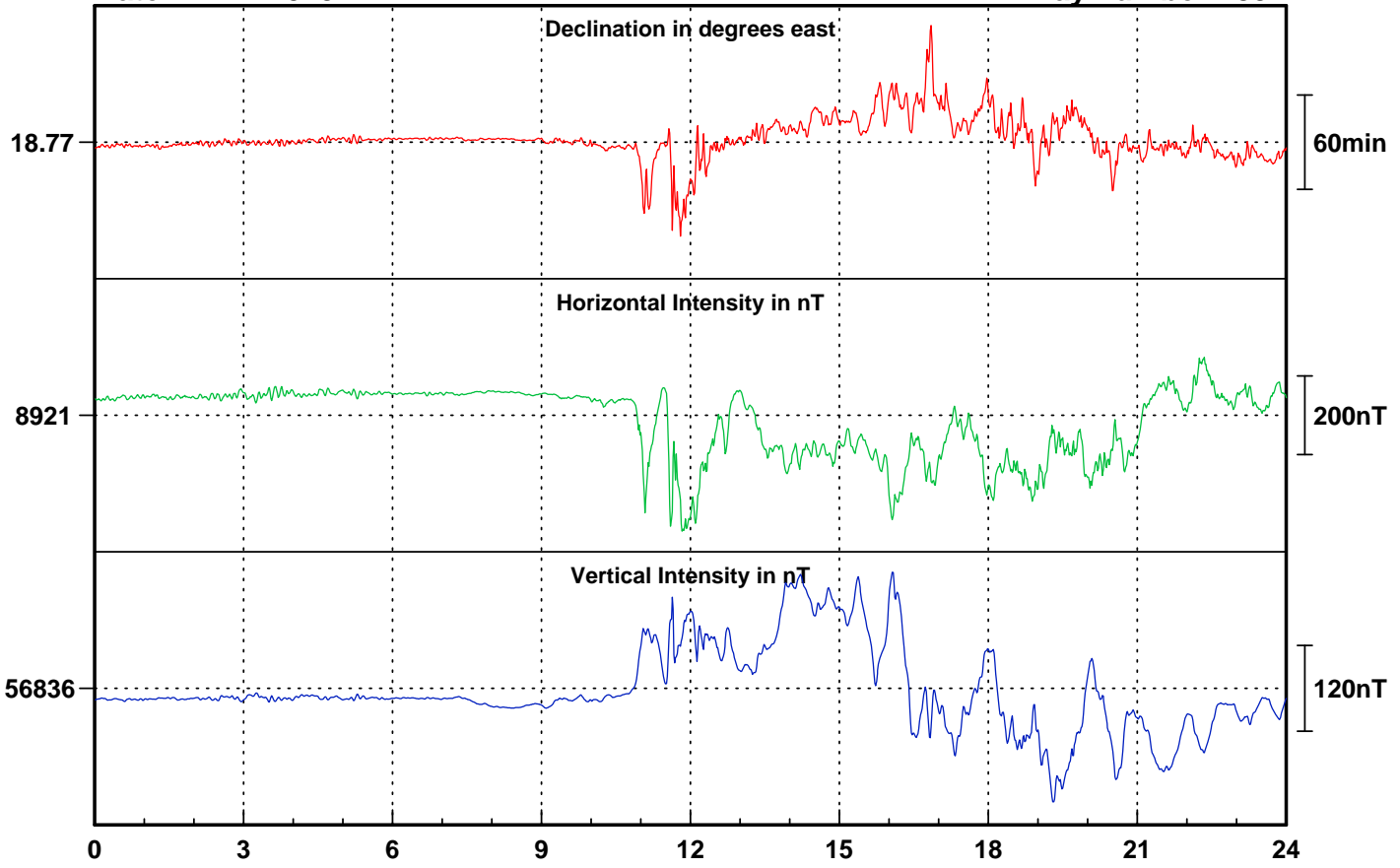
Day number: 350



Date: 17-12-2015

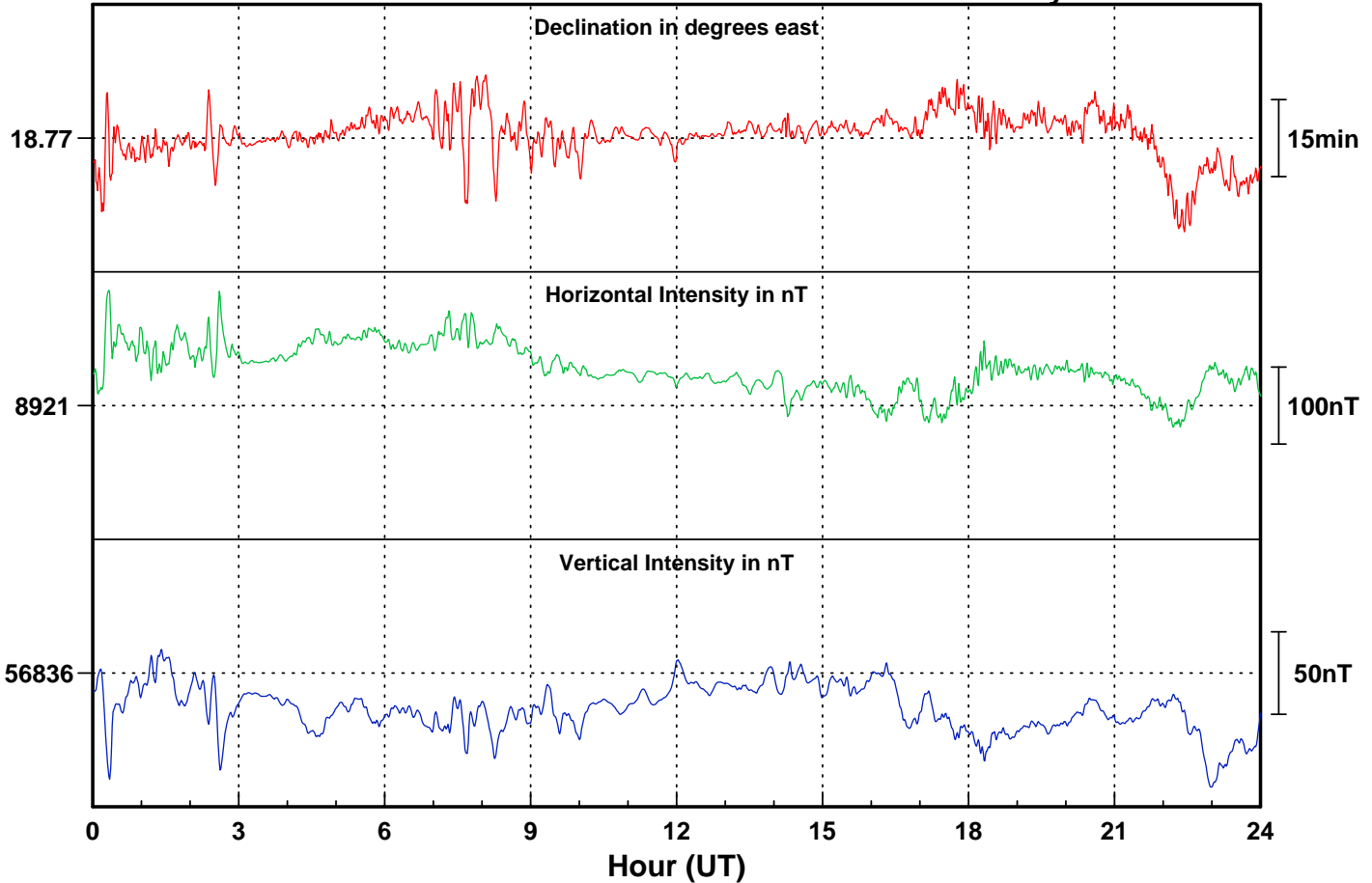
Jim Carrigan

Day number: 351



Date: 18-12-2015

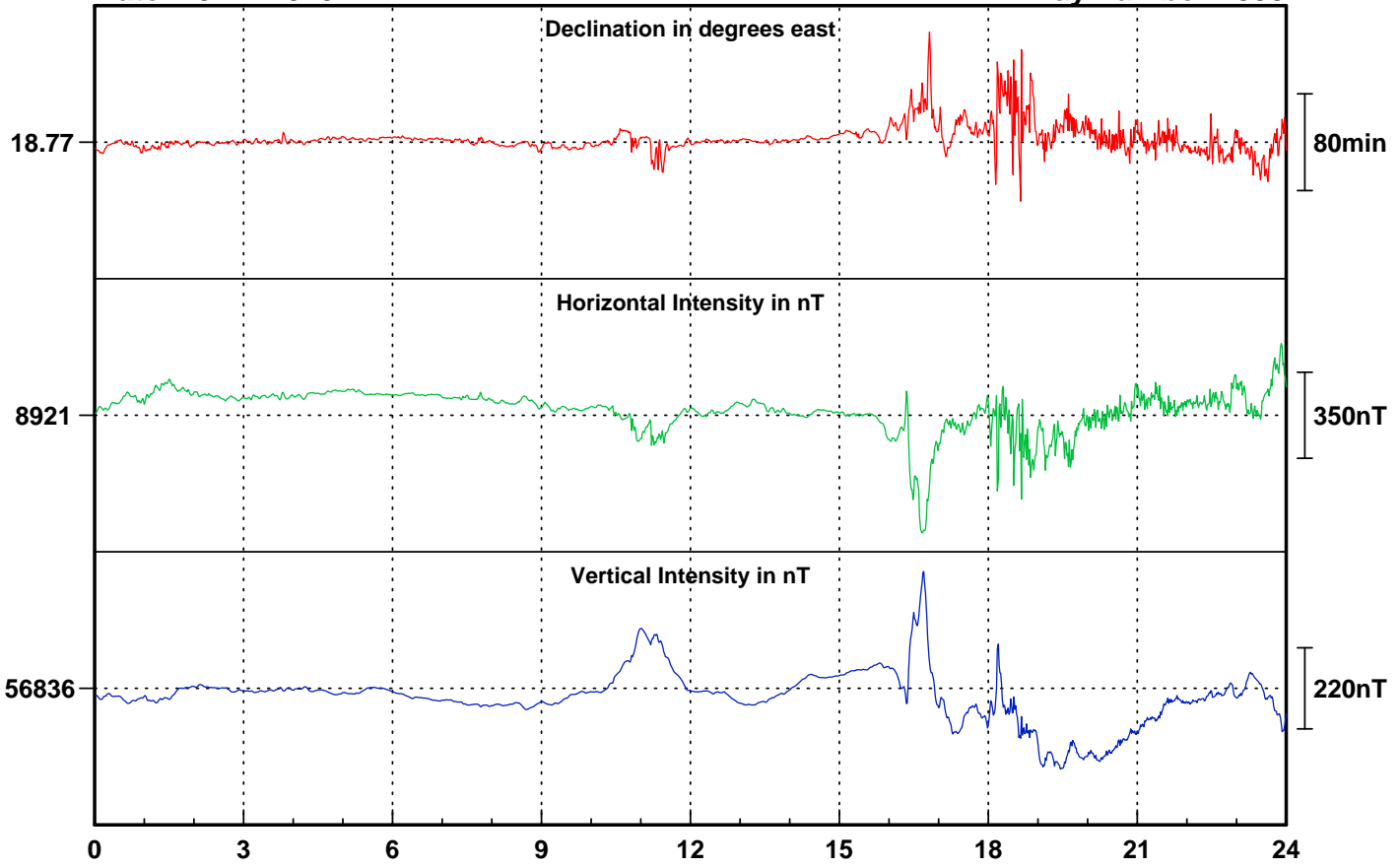
Day number: 352



Date: 19-12-2015

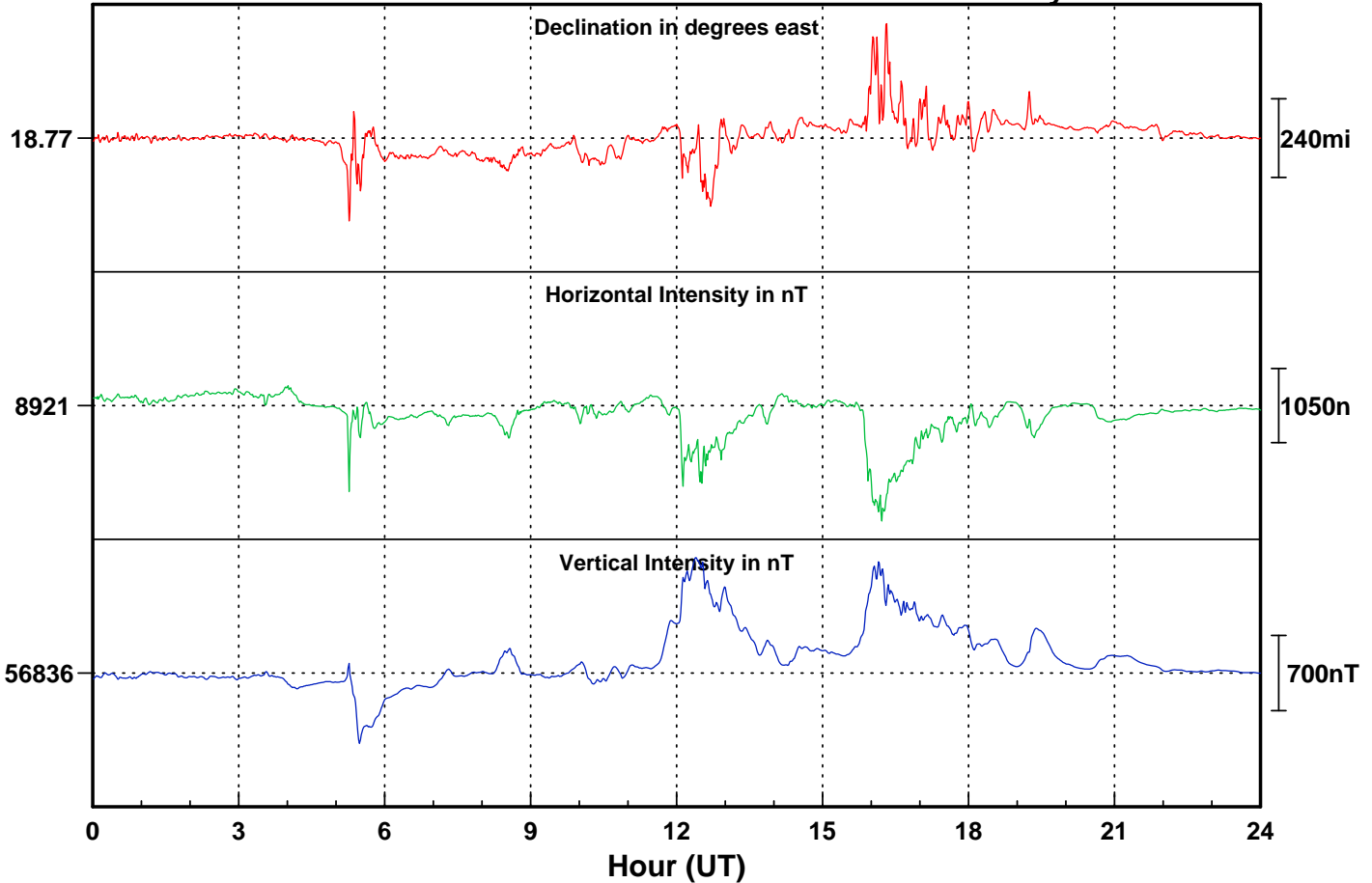
Jim Carrigan

Day number: 353



Date: 20-12-2015

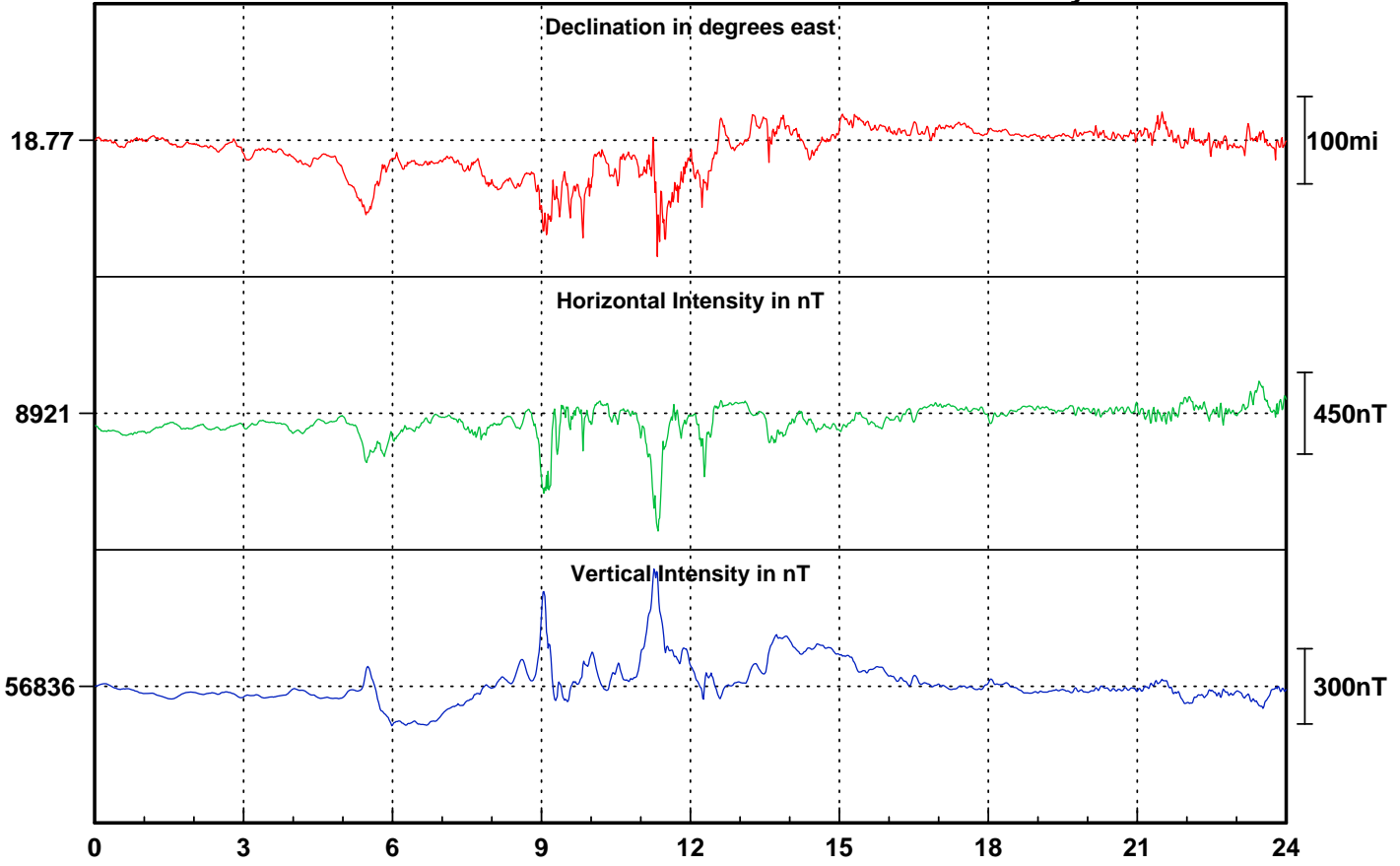
Day number: 354



Date: 21-12-2015

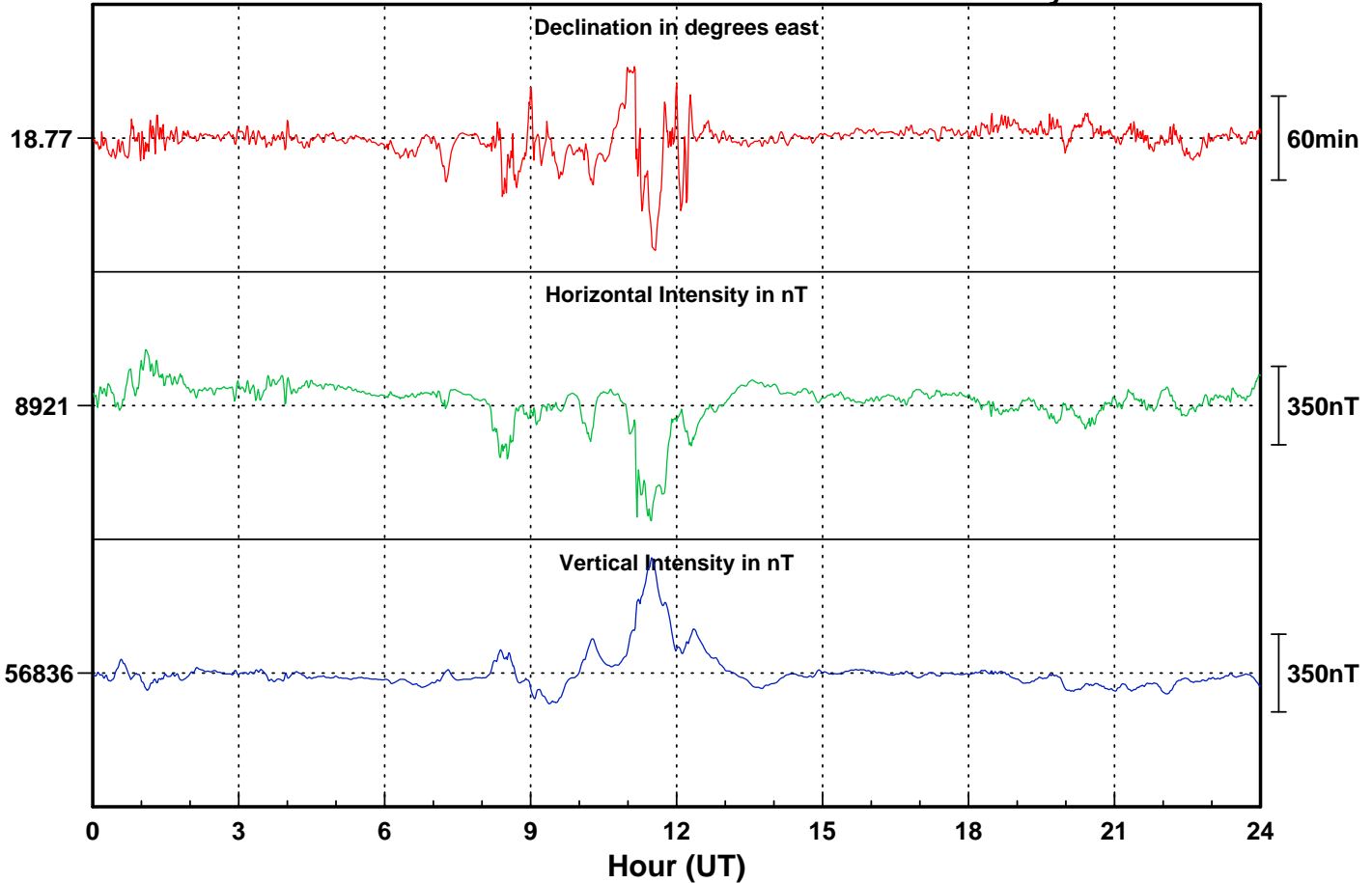
Jim Carrigan

Day number: 355



Date: 22-12-2015

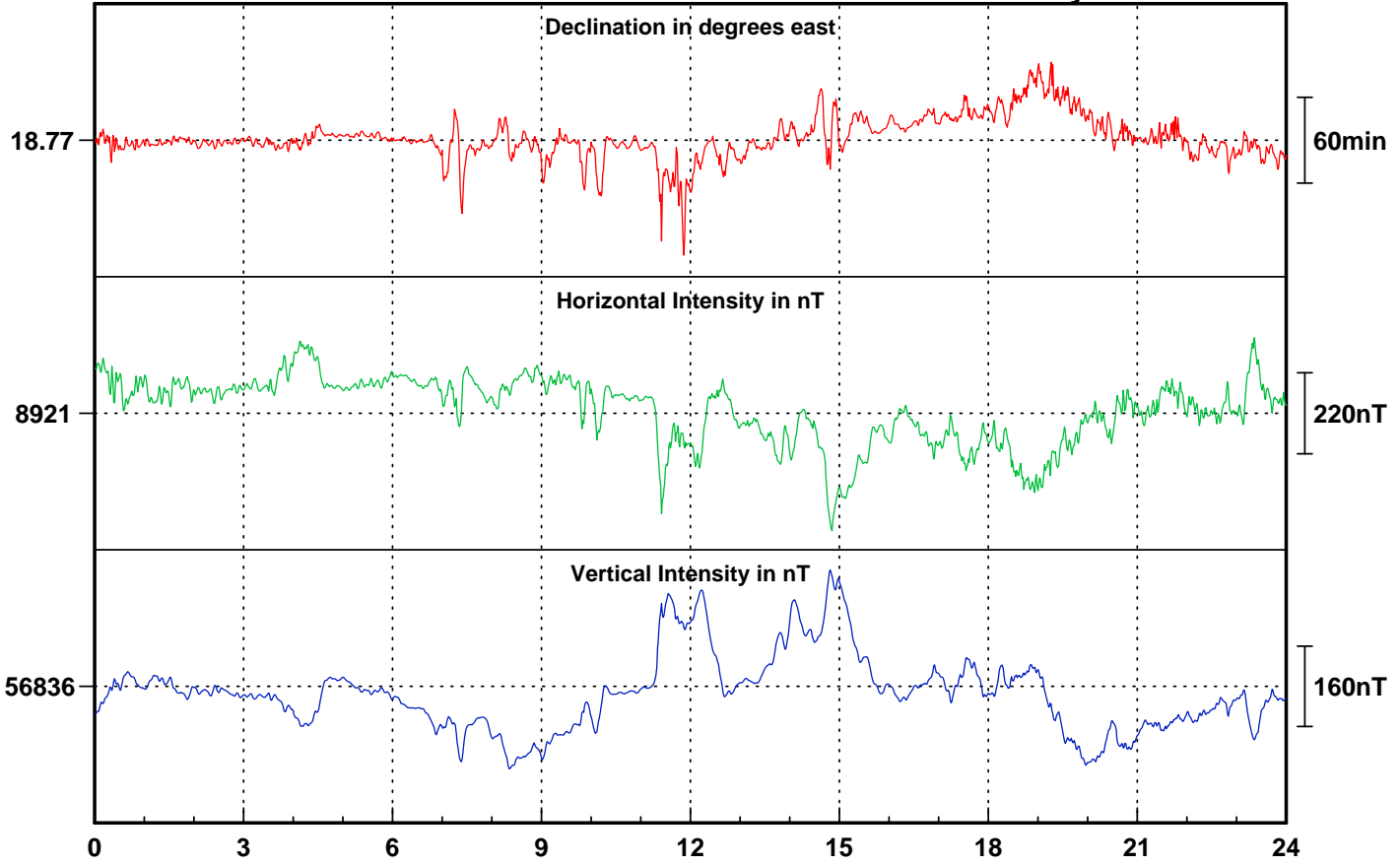
Day number: 356



Date: 23-12-2015

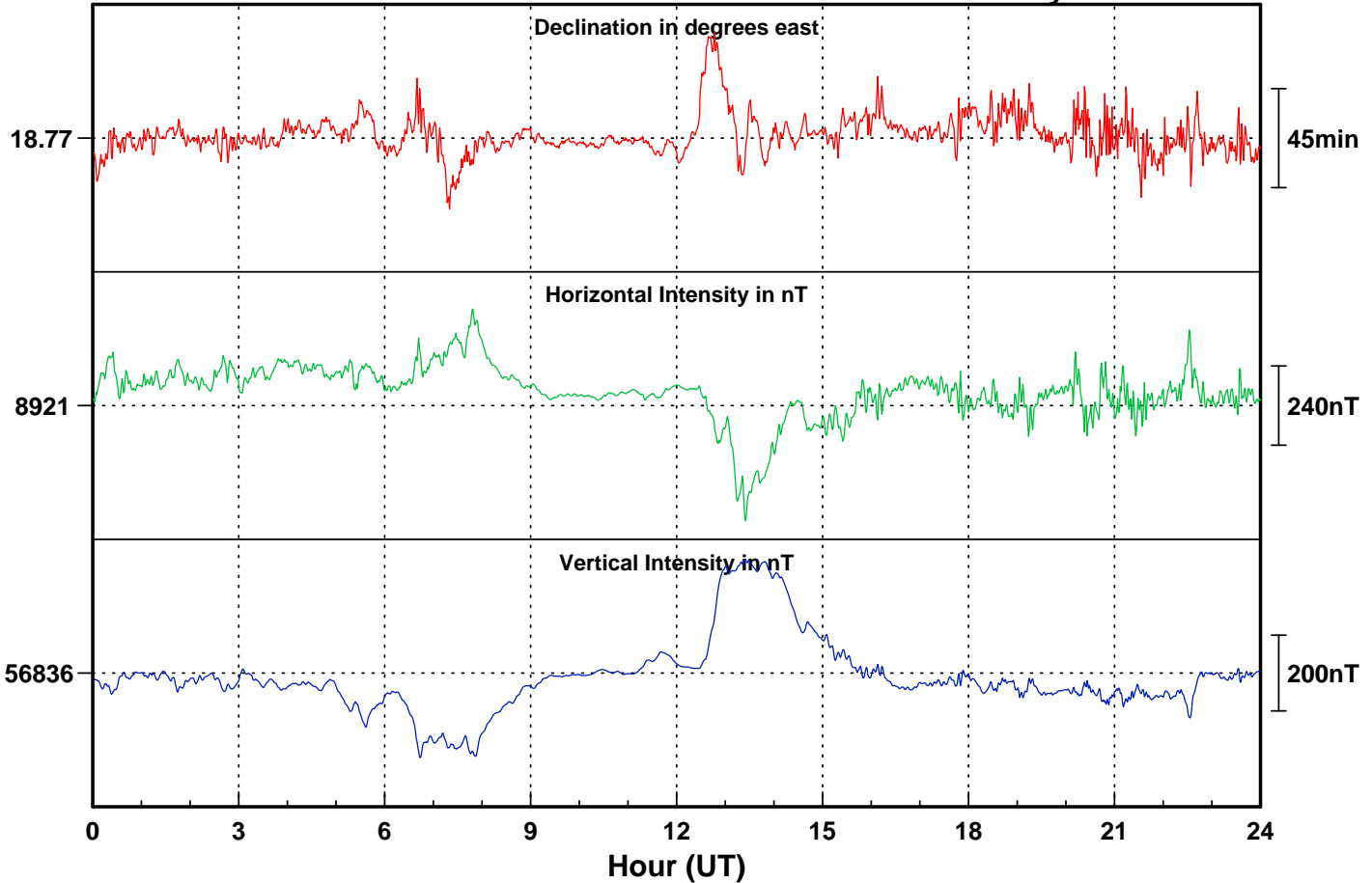
Jim Carrigan

Day number: 357



Date: 24-12-2015

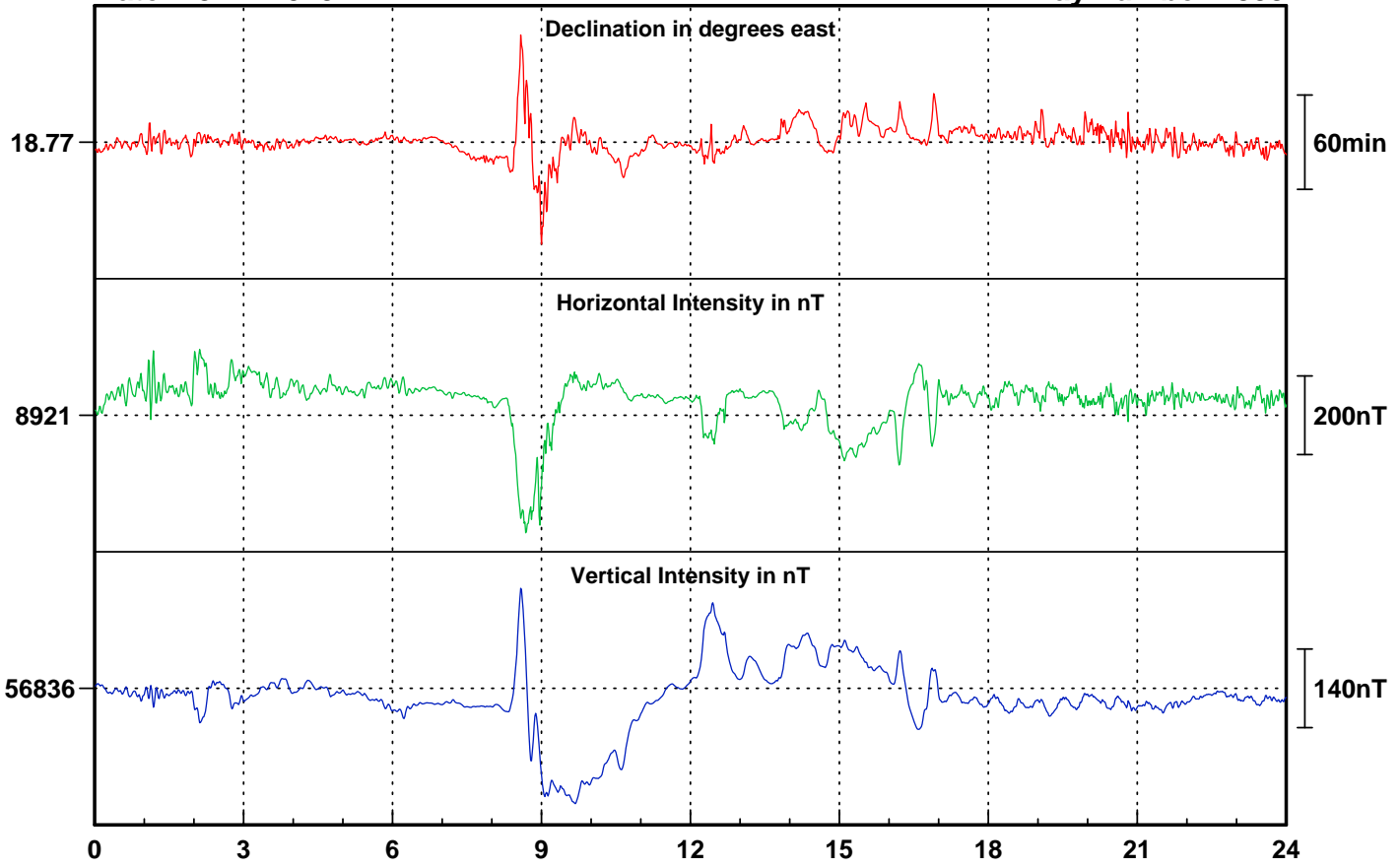
Day number: 358



Date: 25-12-2015

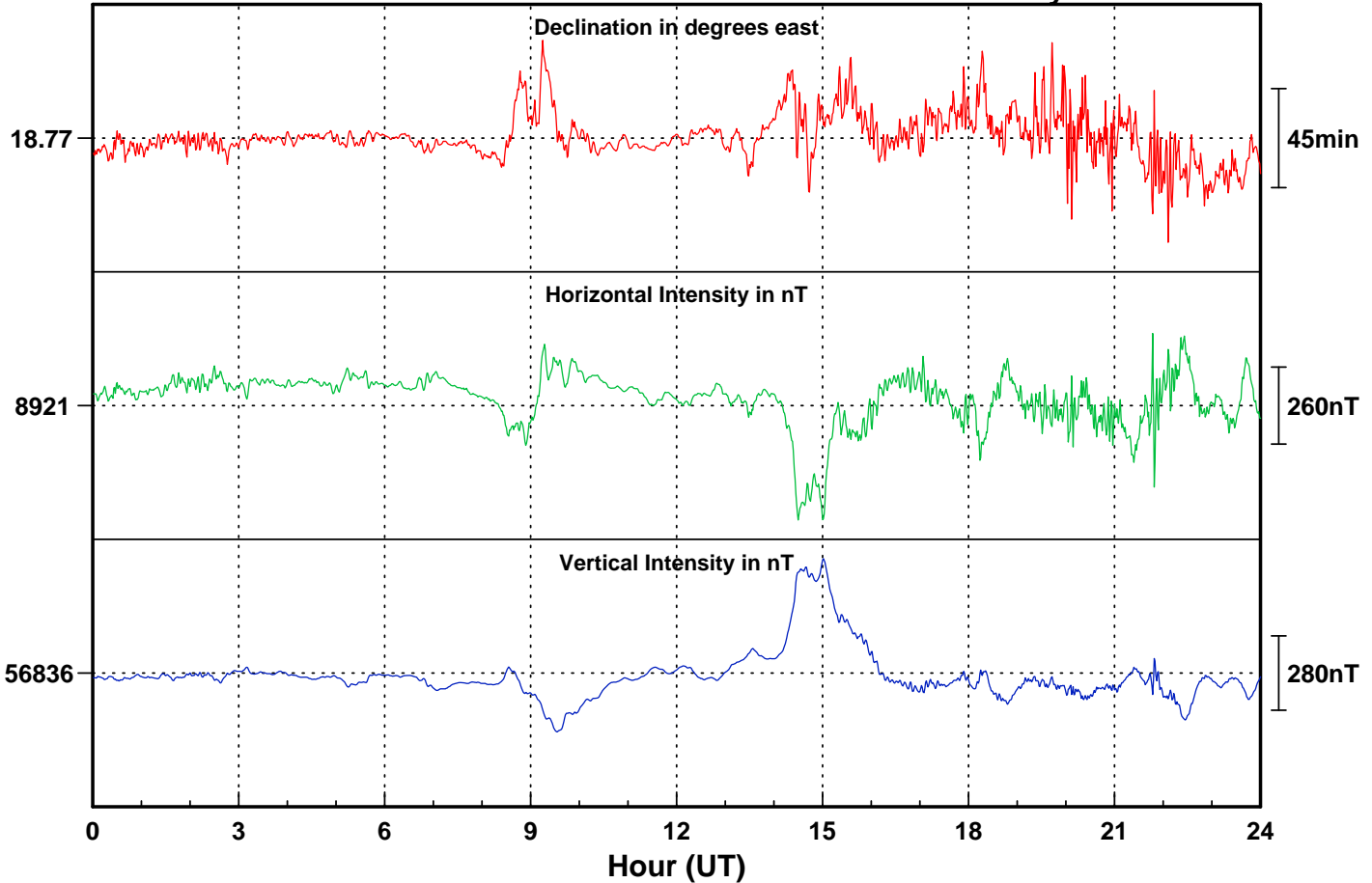
Jim Carrigan

Day number: 359



Date: 26-12-2015

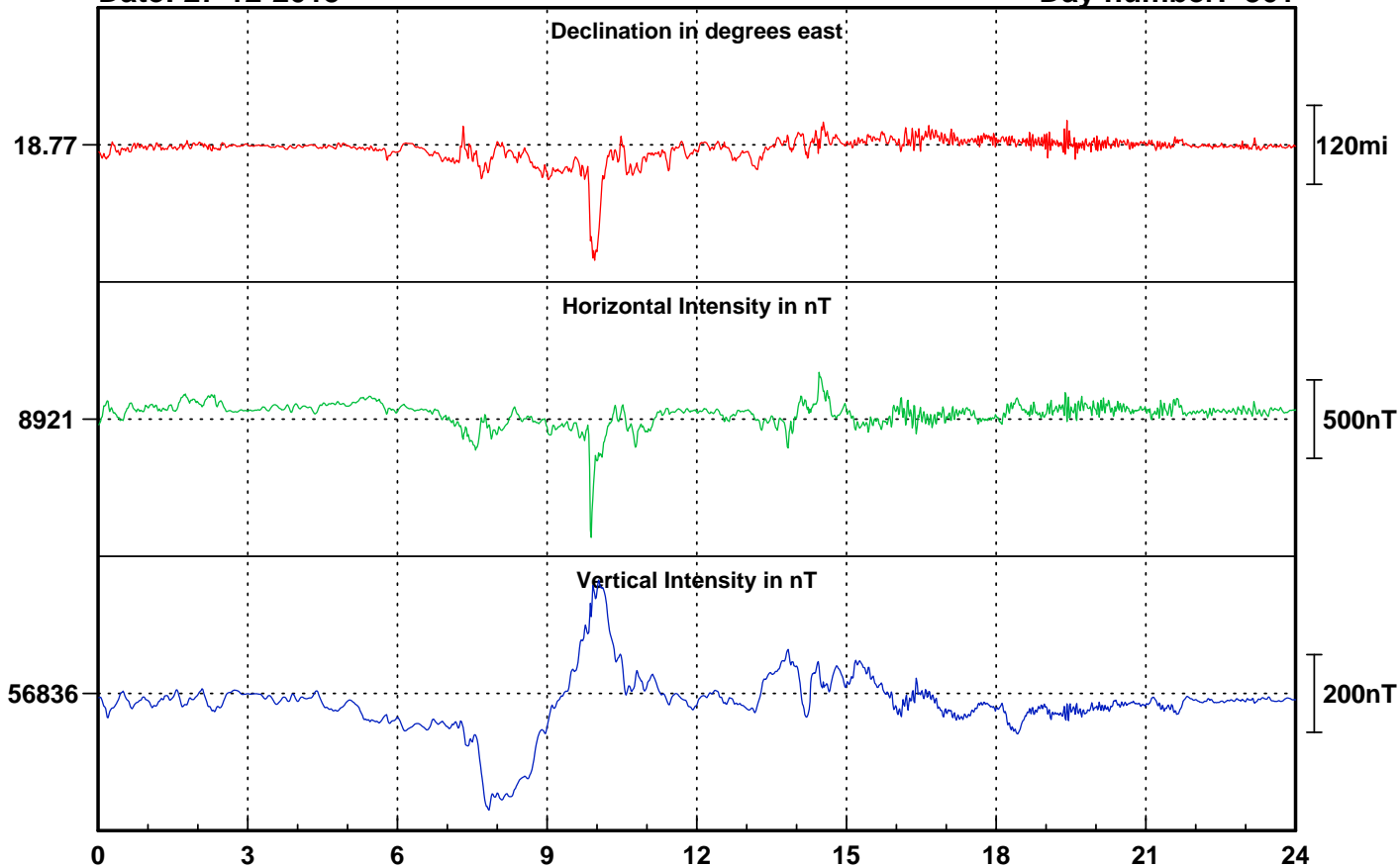
Day number: 360



Date: 27-12-2015

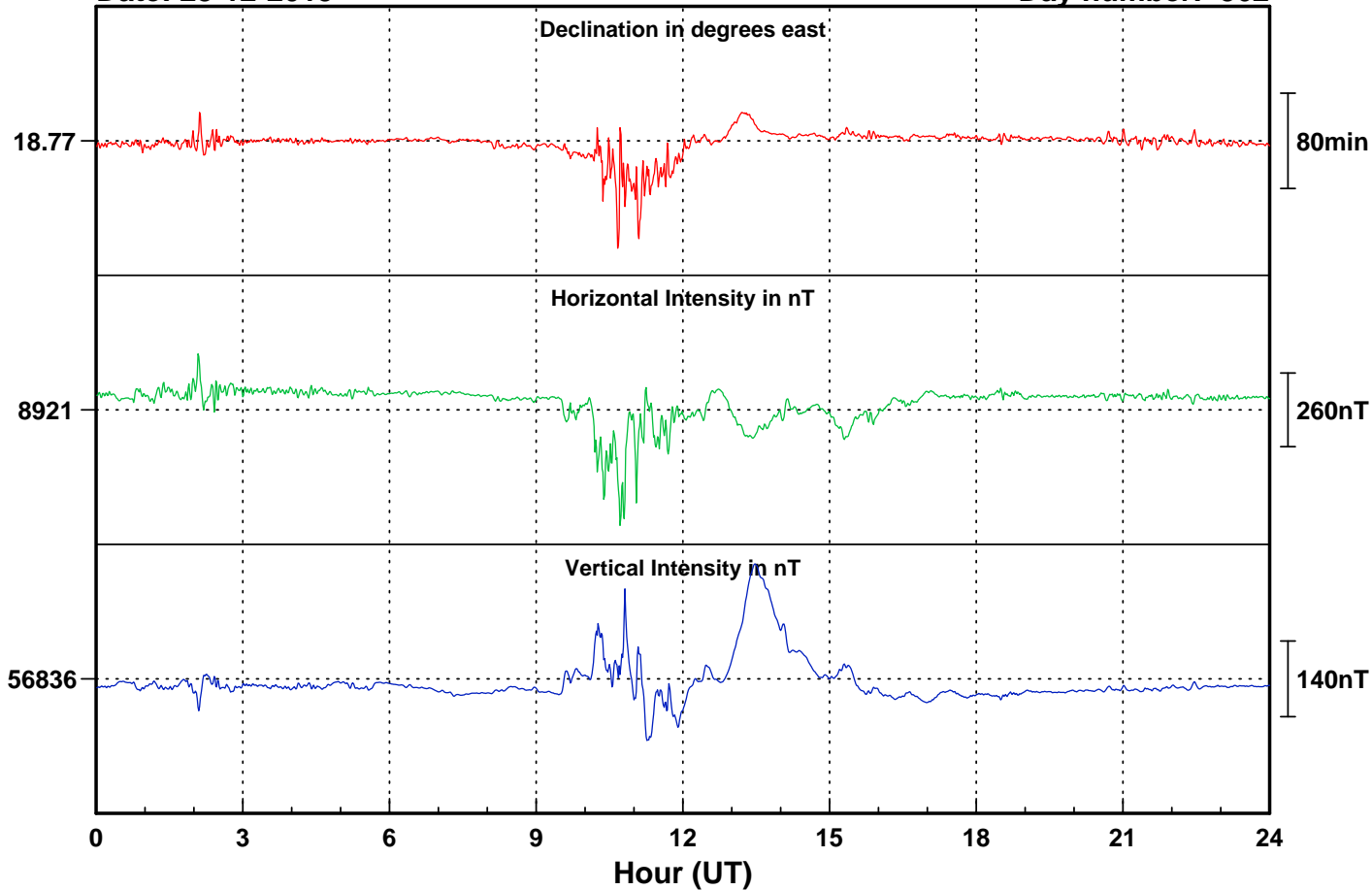
Jim Carrigan

Day number: 361



Date: 28-12-2015

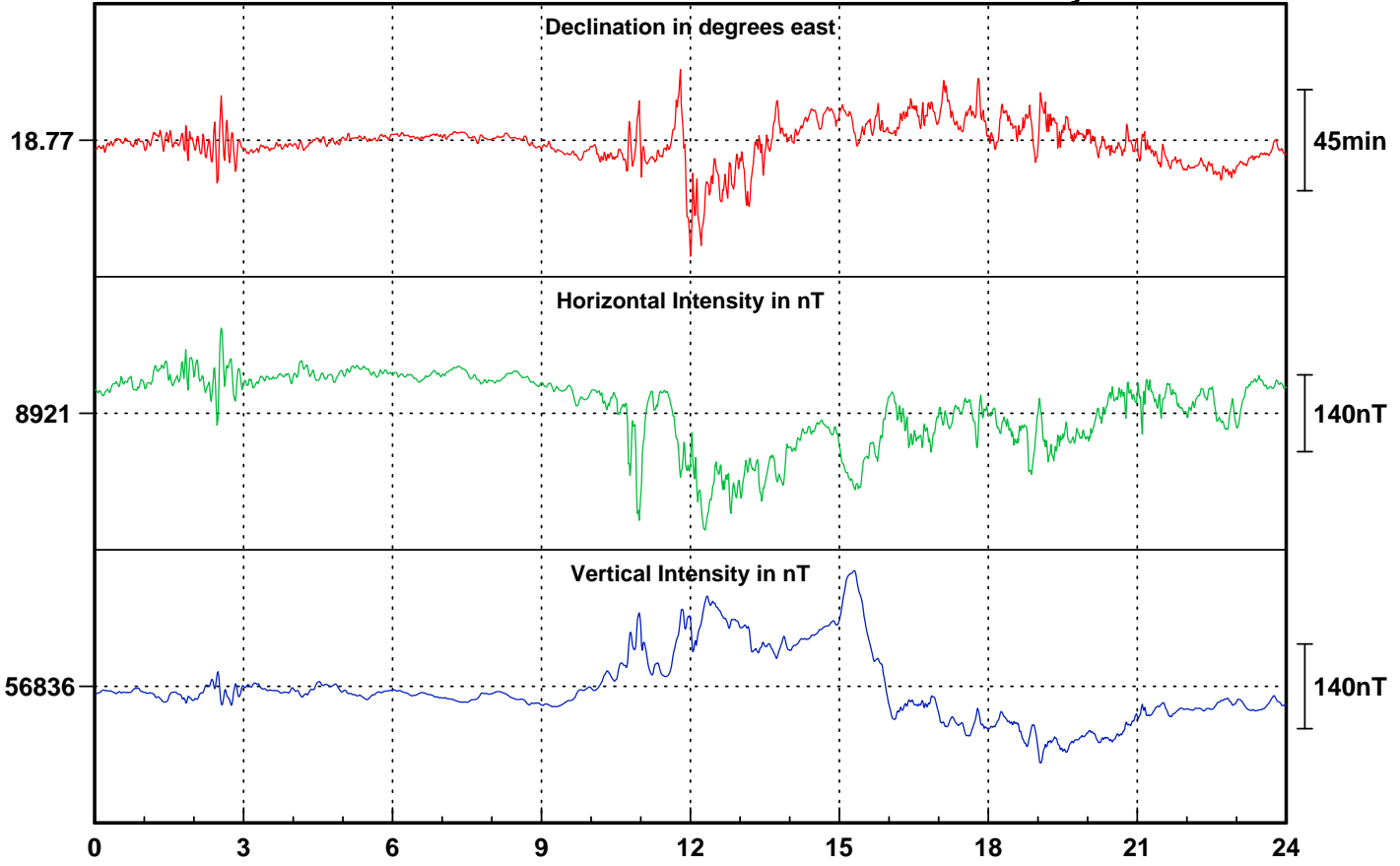
Day number: 362



Date: 29-12-2015

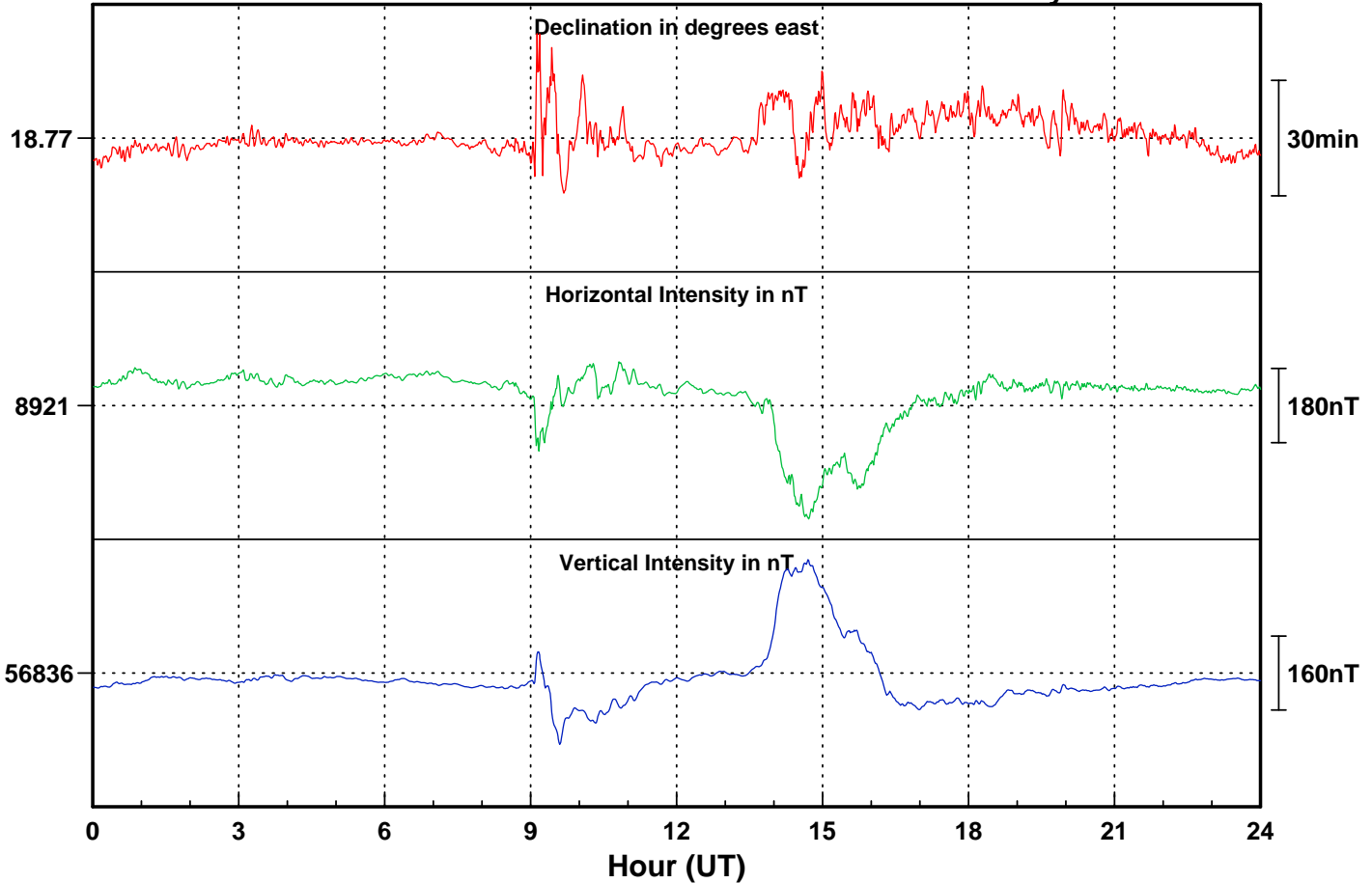
Jim Carrigan

Day number: 363



Date: 30-12-2015

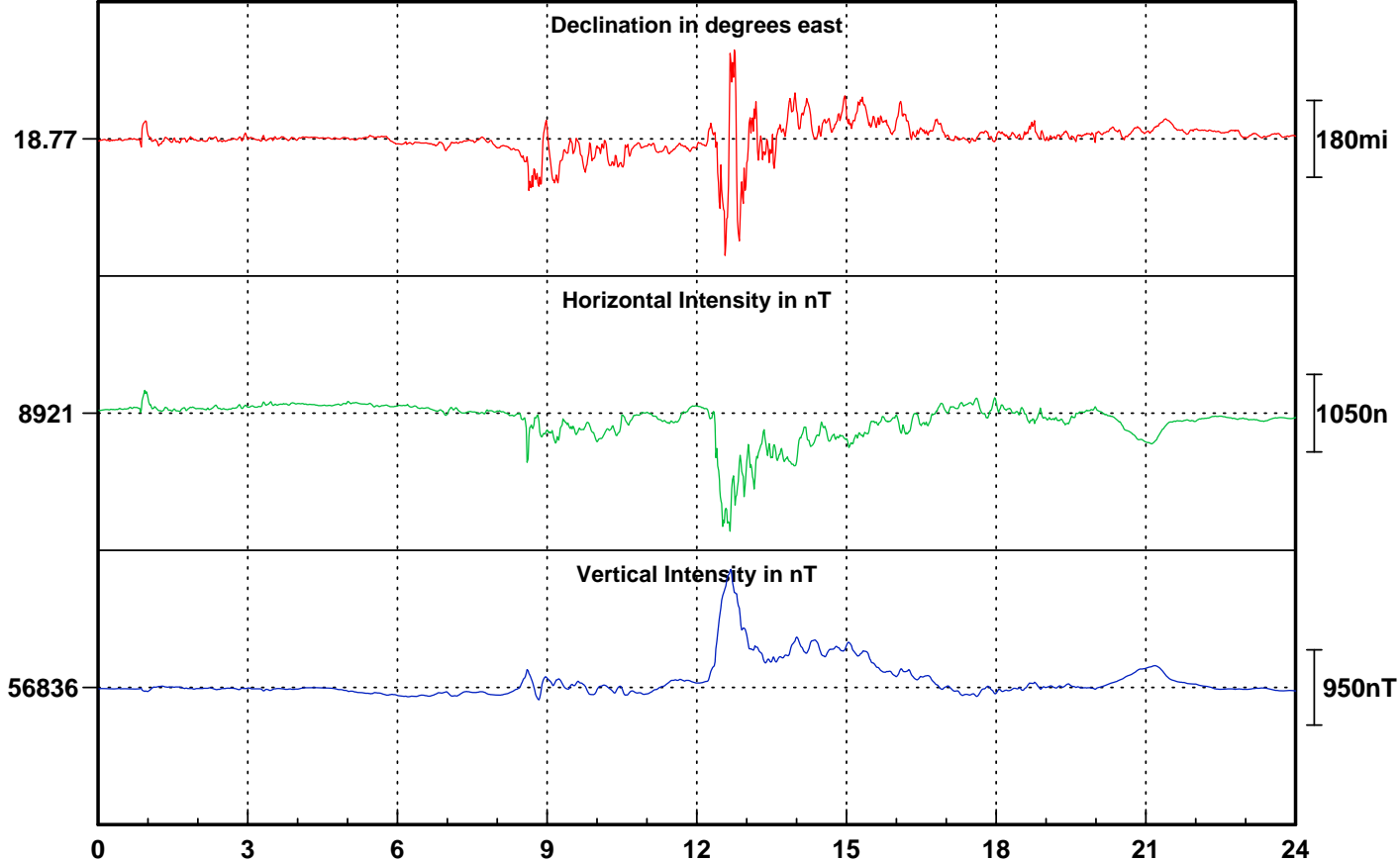
Day number: 364



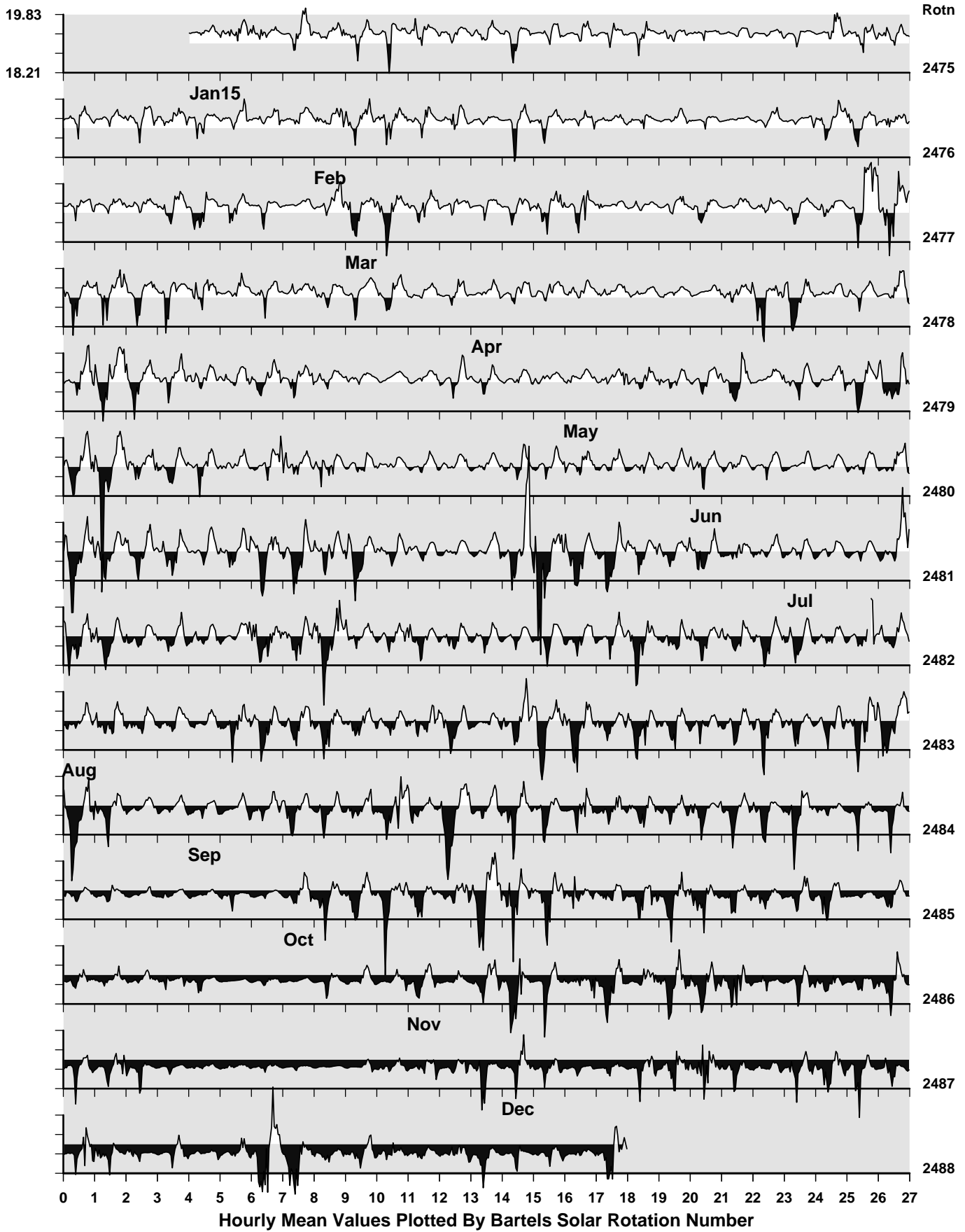
Date: 31-12-2015

Jim Carrigan

Day number: 365

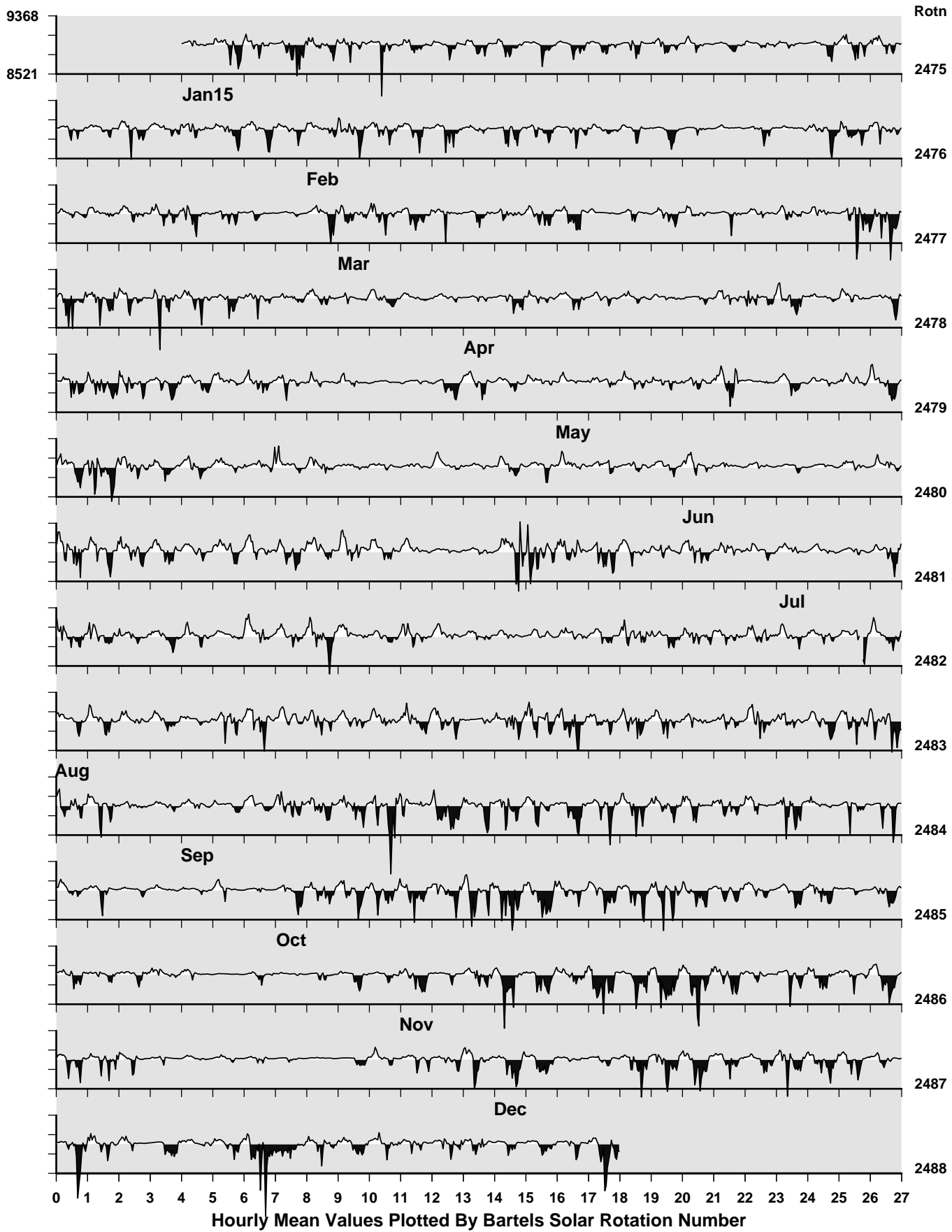


Jim Carrigan Observatory: Declination (degrees)



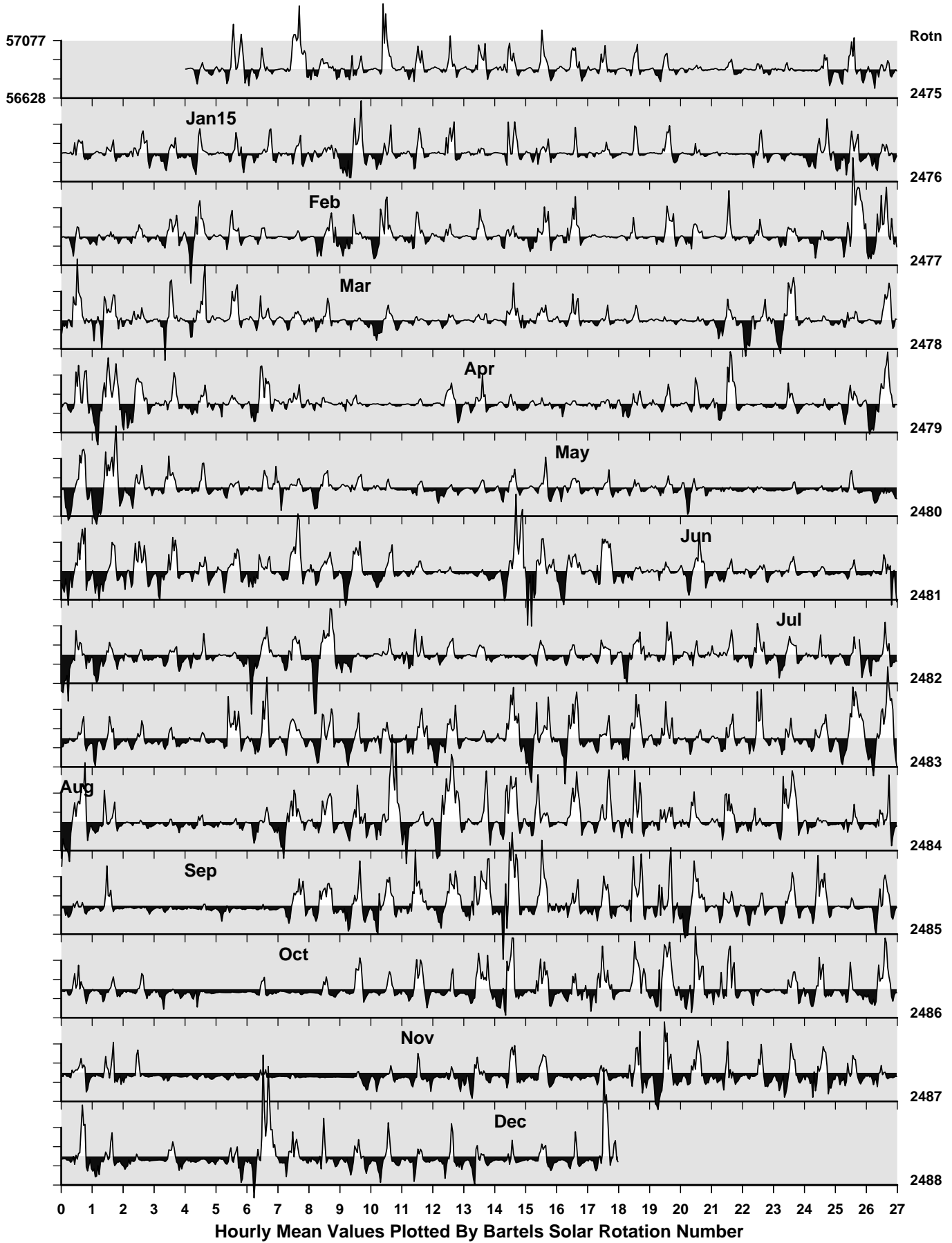
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Jim Carrigan Observatory: Horizontal Intensity fhT_L



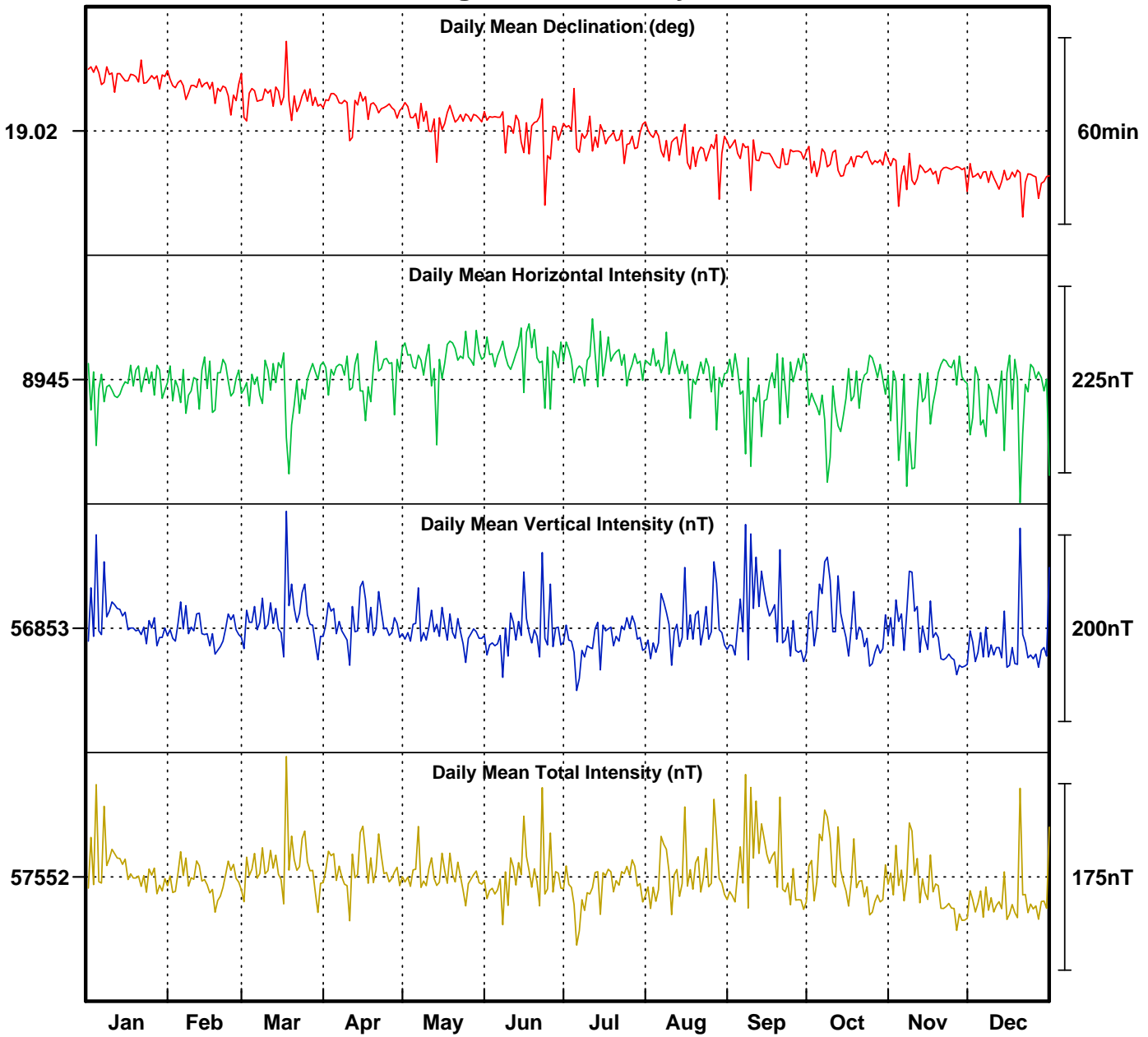
Hourly Mean Values Plotted By Bartels Solar Rotation Number

Jim Carrigan Observatory: Vertical Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

Jim Carrigan Observatory 2015



Monthly Mean Values for Jim Carrigan Observatory 2015

Month	<i>D</i>	<i>H</i>	<i>I</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>
January	19° 18.9′	8938 nT	81° 4.0′	8435 nT	2956 nT	56862 nT	57560 nT
February	19° 14.9′	8939 nT	81° 3.8′	8440 nT	2947 nT	56851 nT	57549 nT
March	19° 11.8′	8937 nT	81° 4.1′	8440 nT	2939 nT	56865 nT	57563 nT
April	19° 9.2′	8952 nT	81° 3.2′	8456 nT	2937 nT	56860 nT	57560 nT
May	19° 5.2′	8969 nT	81° 2.1′	8476 nT	2933 nT	56850 nT	57553 nT
June	19° 1.4′	8973 nT	81° 1.8′	8483 nT	2925 nT	56849 nT	57553 nT
July	18° 59.7′	8968 nT	81° 2.1′	8479 nT	2919 nT	56840 nT	57543 nT
August	18° 55.9′	8955 nT	81° 3.0′	8470 nT	2905 nT	56855 nT	57556 nT
September	18° 53.6′	8937 nT	81° 4.1′	8455 nT	2894 nT	56864 nT	57562 nT
October	18° 51.6′	8924 nT	81° 4.8′	8445 nT	2885 nT	56858 nT	57554 nT
November	18° 48.0′	8924 nT	81° 4.7′	8448 nT	2876 nT	56844 nT	57541 nT
December	18° 46.0′	8921 nT	81° 4.8′	8447 nT	2870 nT	56836 nT	57532 nT

Note

i. The values shown here are provisional.