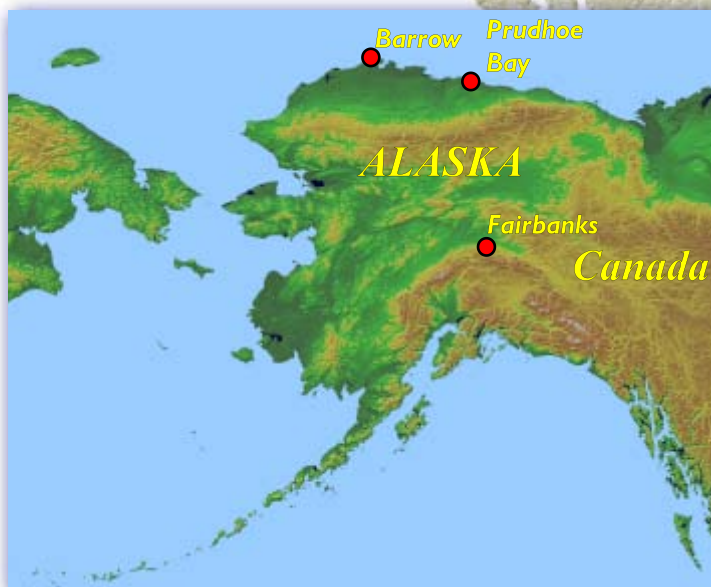


**BRITISH GEOLOGICAL SURVEY**

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

**December 2018**

**18/12/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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Research Avenue South  
Edinburgh EH9 3LA  
Scotland, UK

Tel: +44 (0) 131 667 1000  
E-mail: [enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)  
Internet: [www.geomag.bgs.ac.uk](http://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° 21'21.6"N 211° 12' 03.7" E  
*Geomagnetic:* 70° 29' 24"N 257° 22' 48" E  
*Height above mean sea level:* 20m (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 2018.5. 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](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

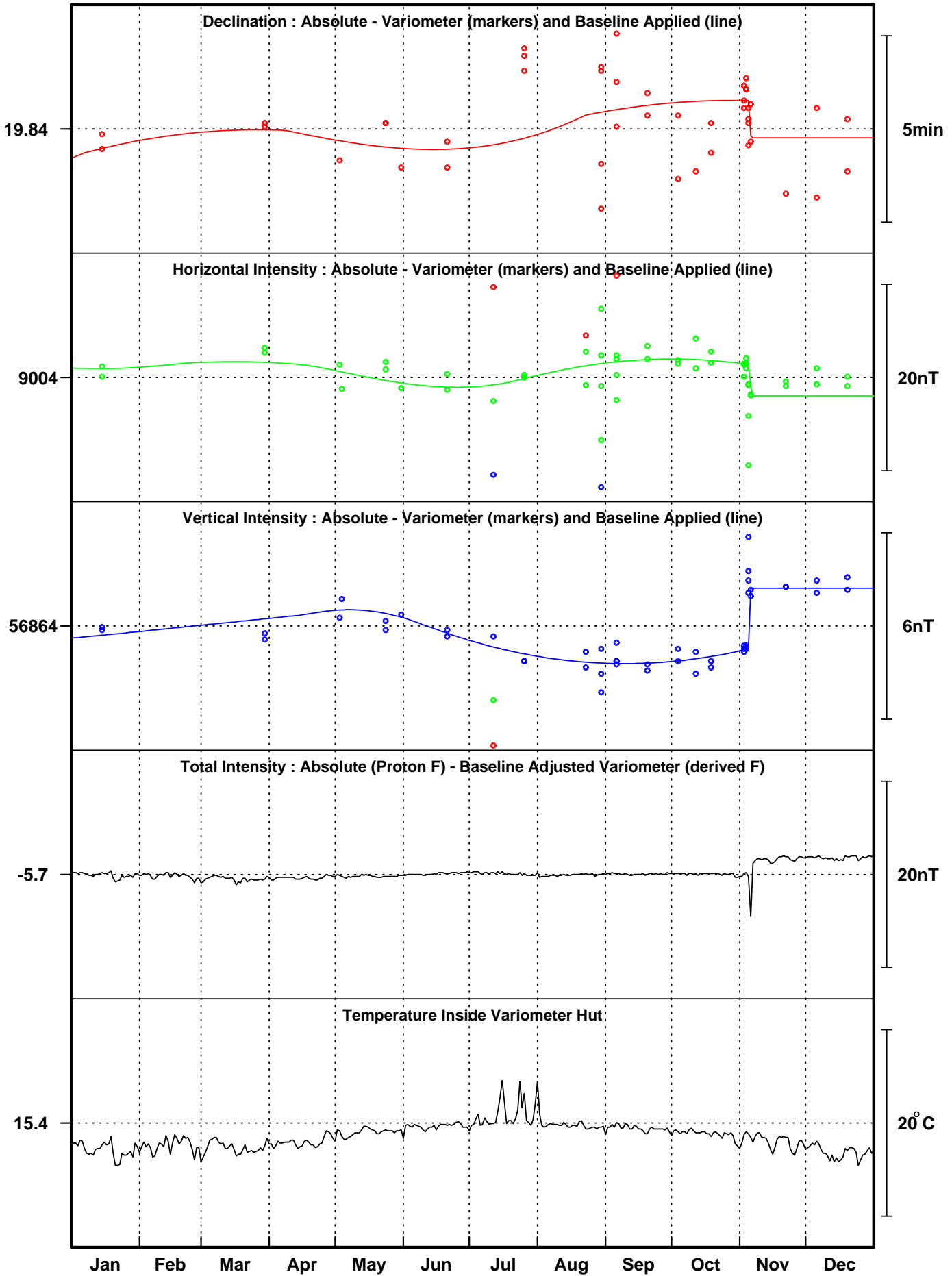
The data presented in this bulletin are provided for personal, academic, educational, non-commercial research or other non-commercial use and are not for sale or distribution to third parties without written permission from BGS.

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](http://www.geomag.bgs.ac.uk/contactus/staff)



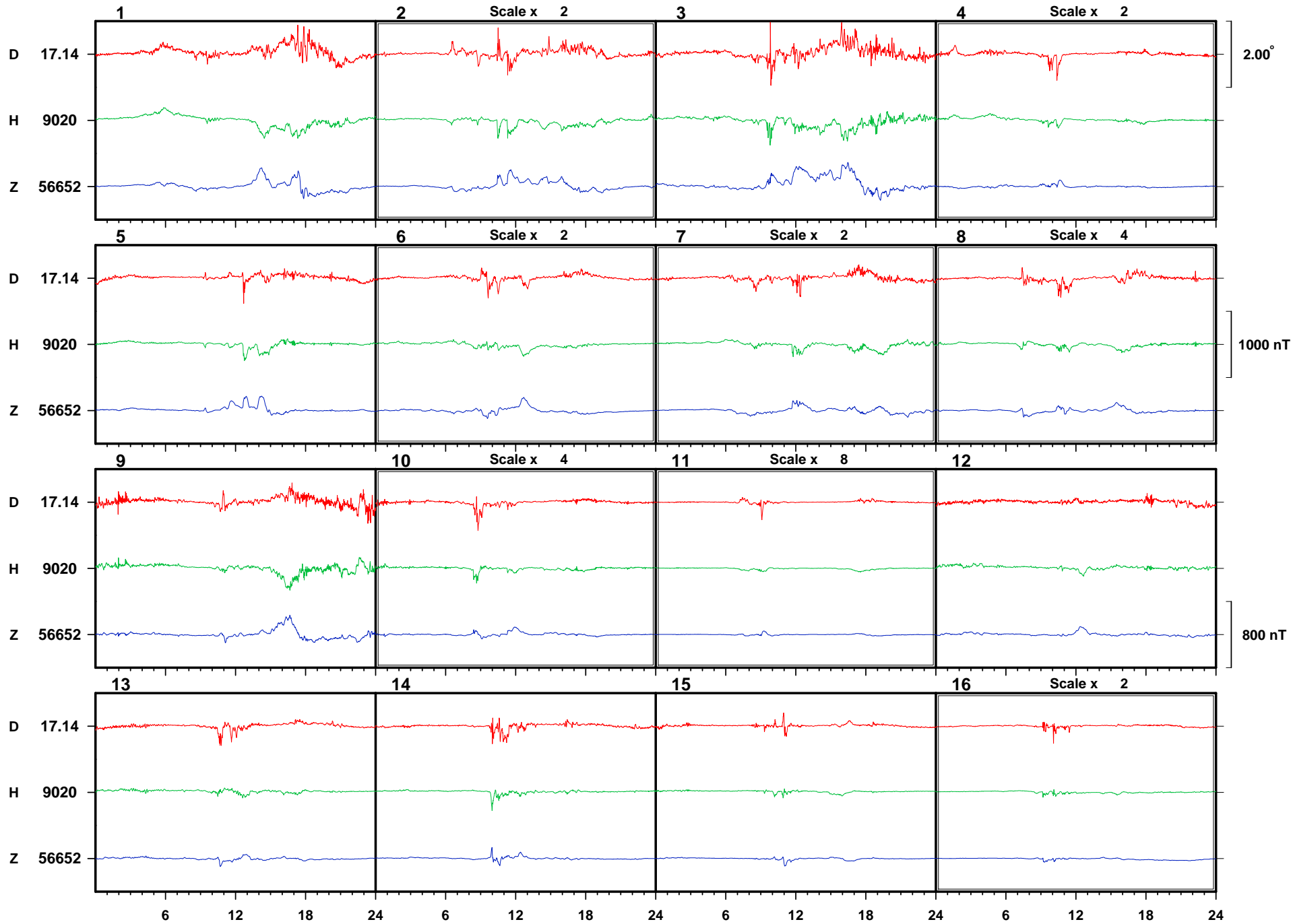
# Jim Carrigan Obs 2018

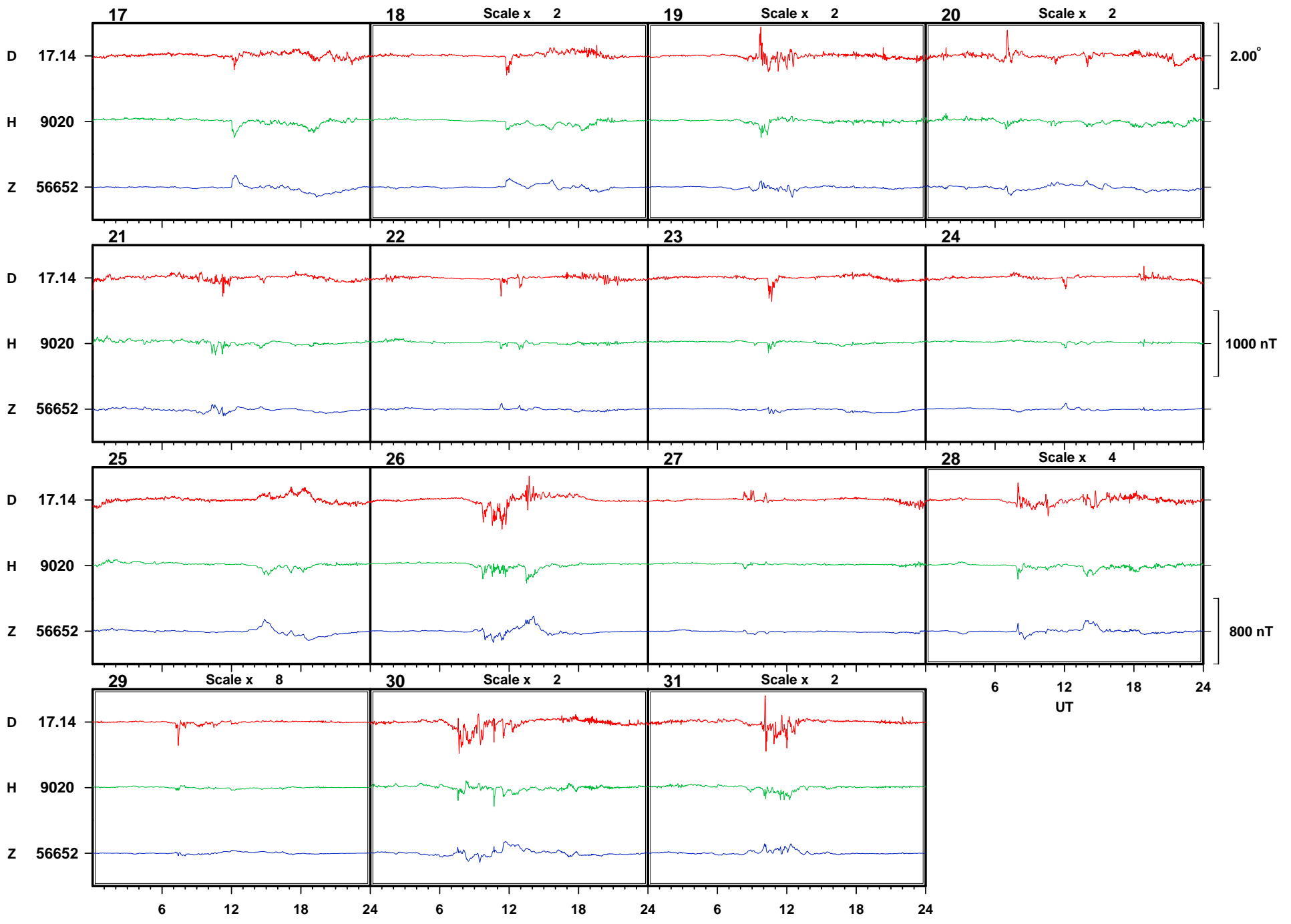


Jim Carrigan

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2018





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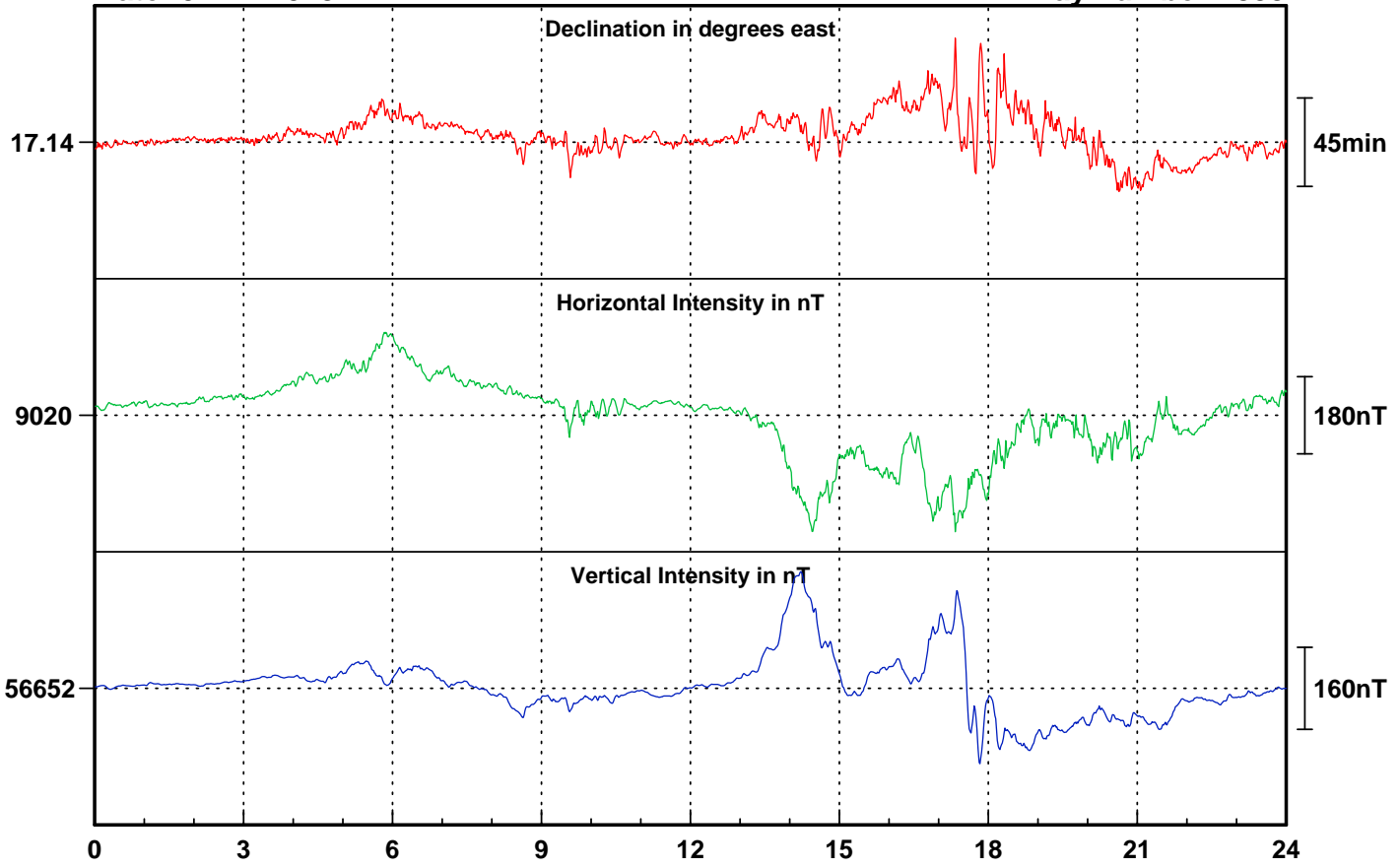
December

2018

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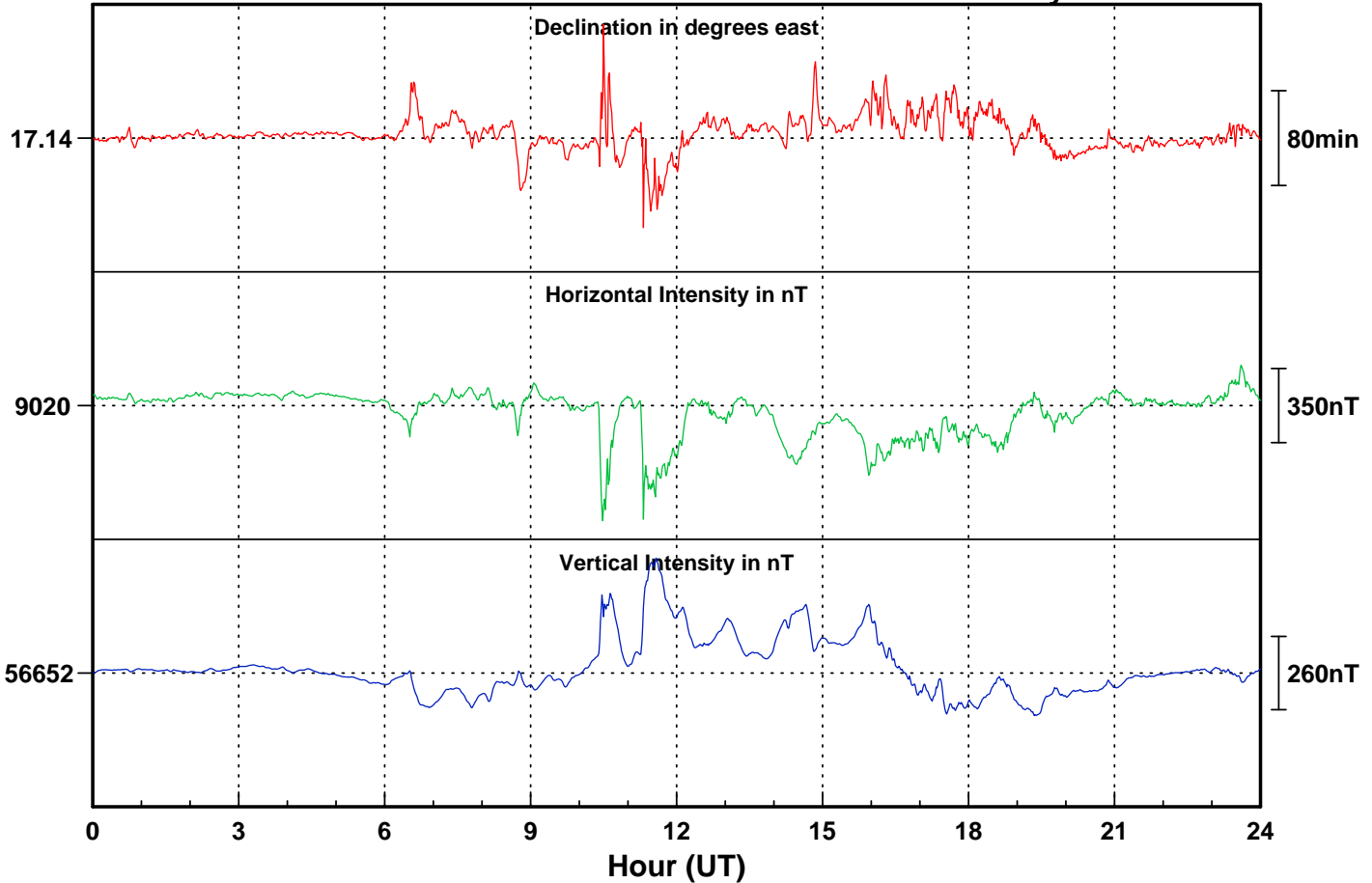
Jim Carrigan

Day number: 335



Date: 02-12-2018

Day number: 336

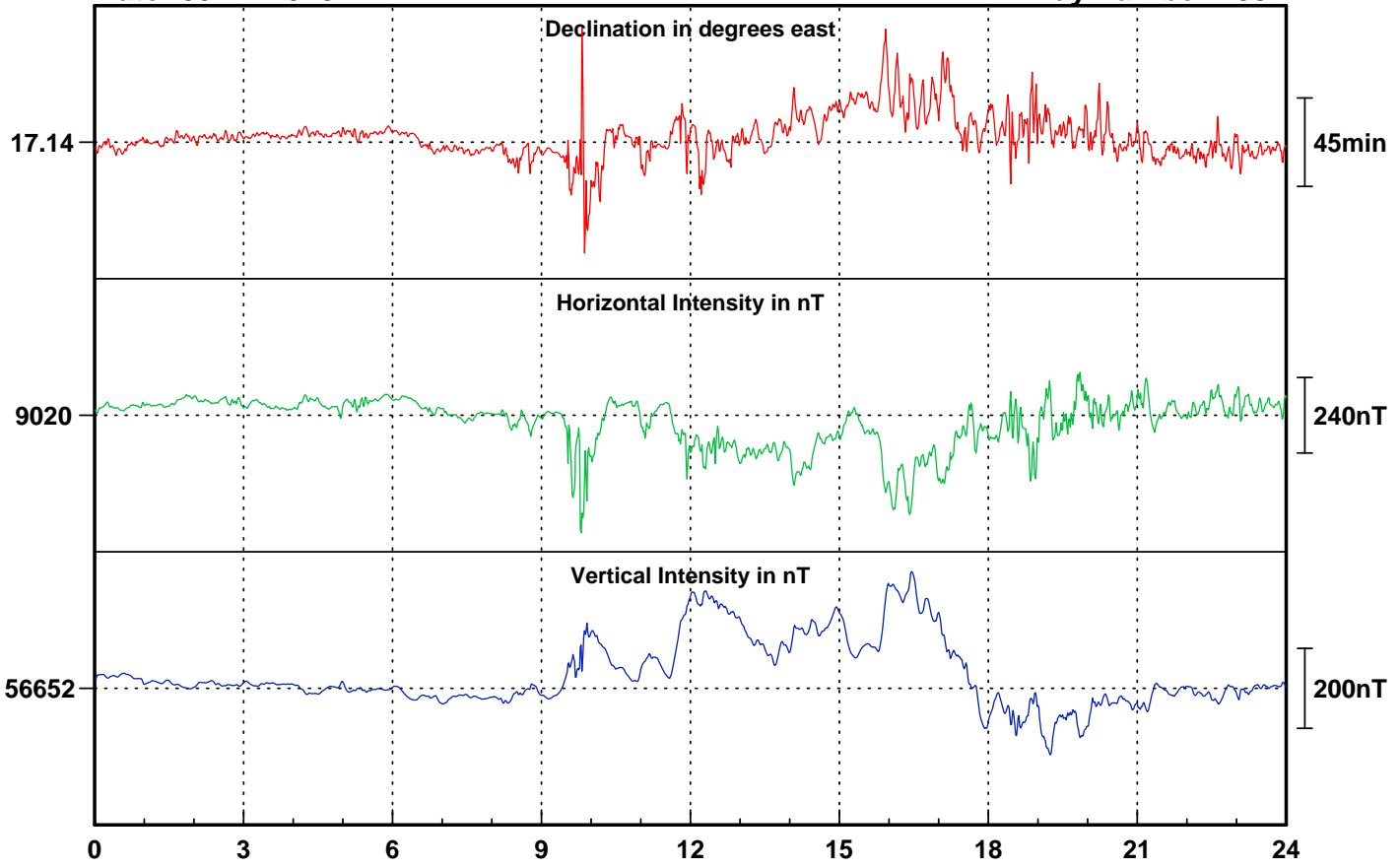




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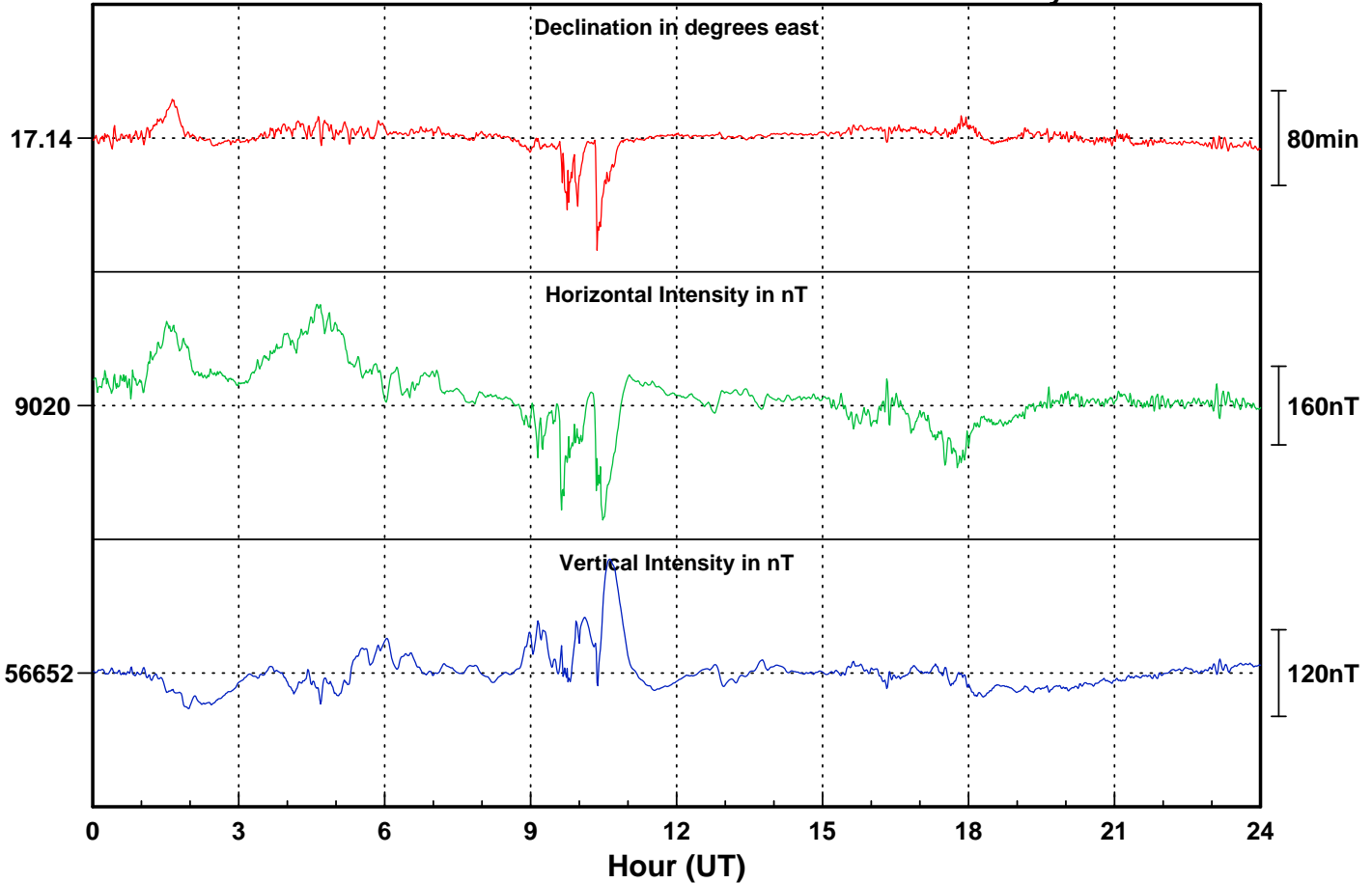
Jim Carrigan

Day number: 337



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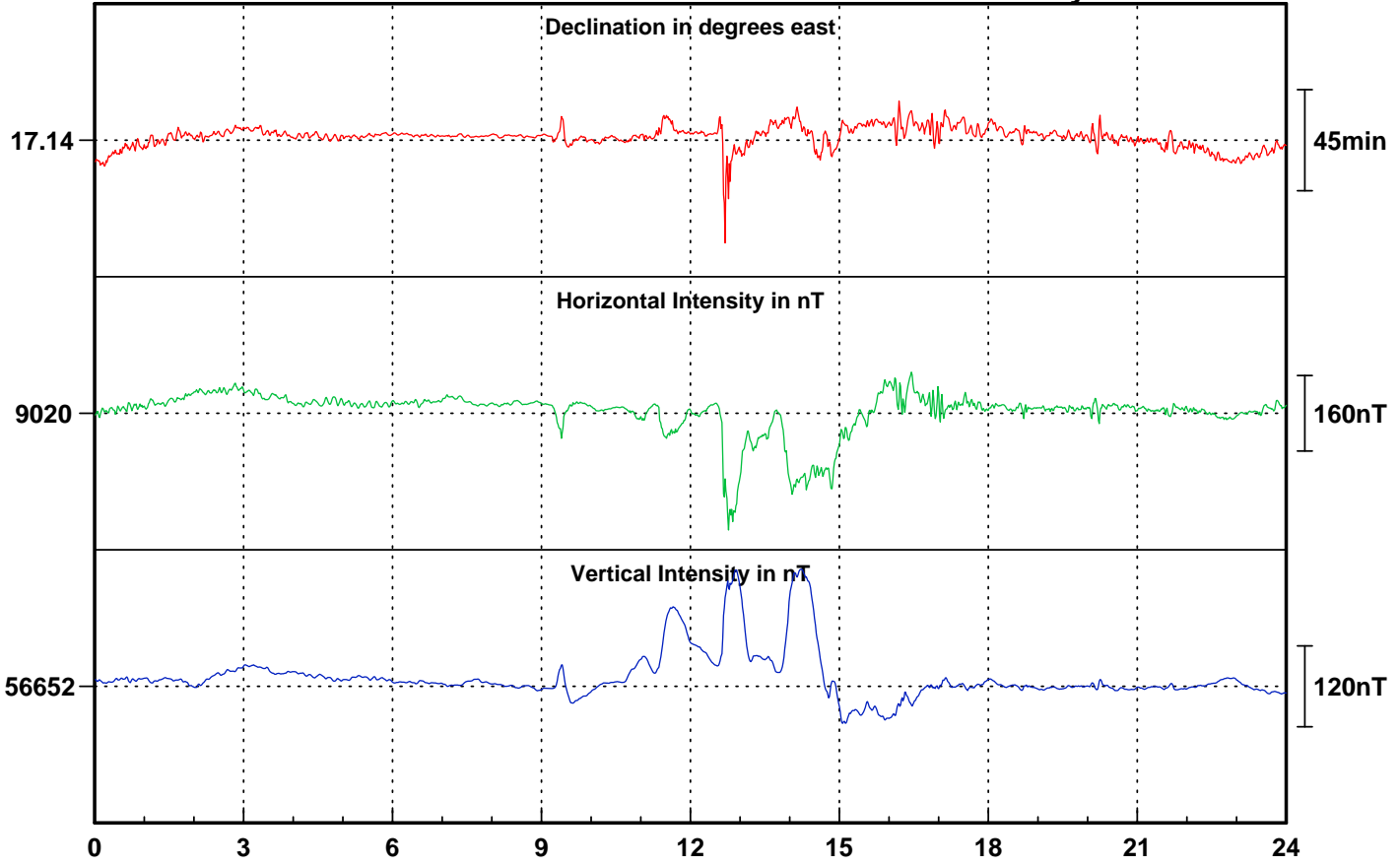
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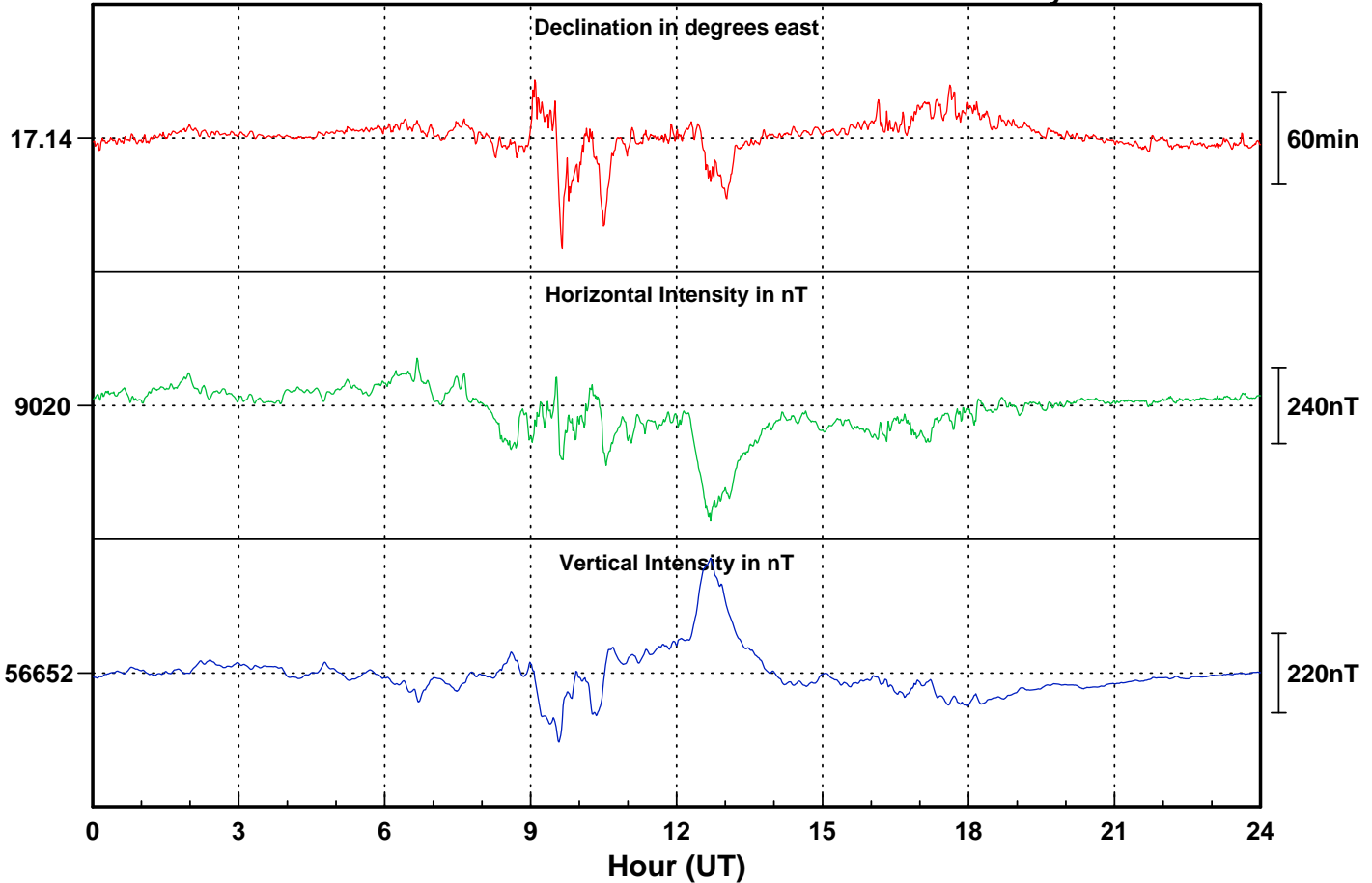
Jim Carrigan

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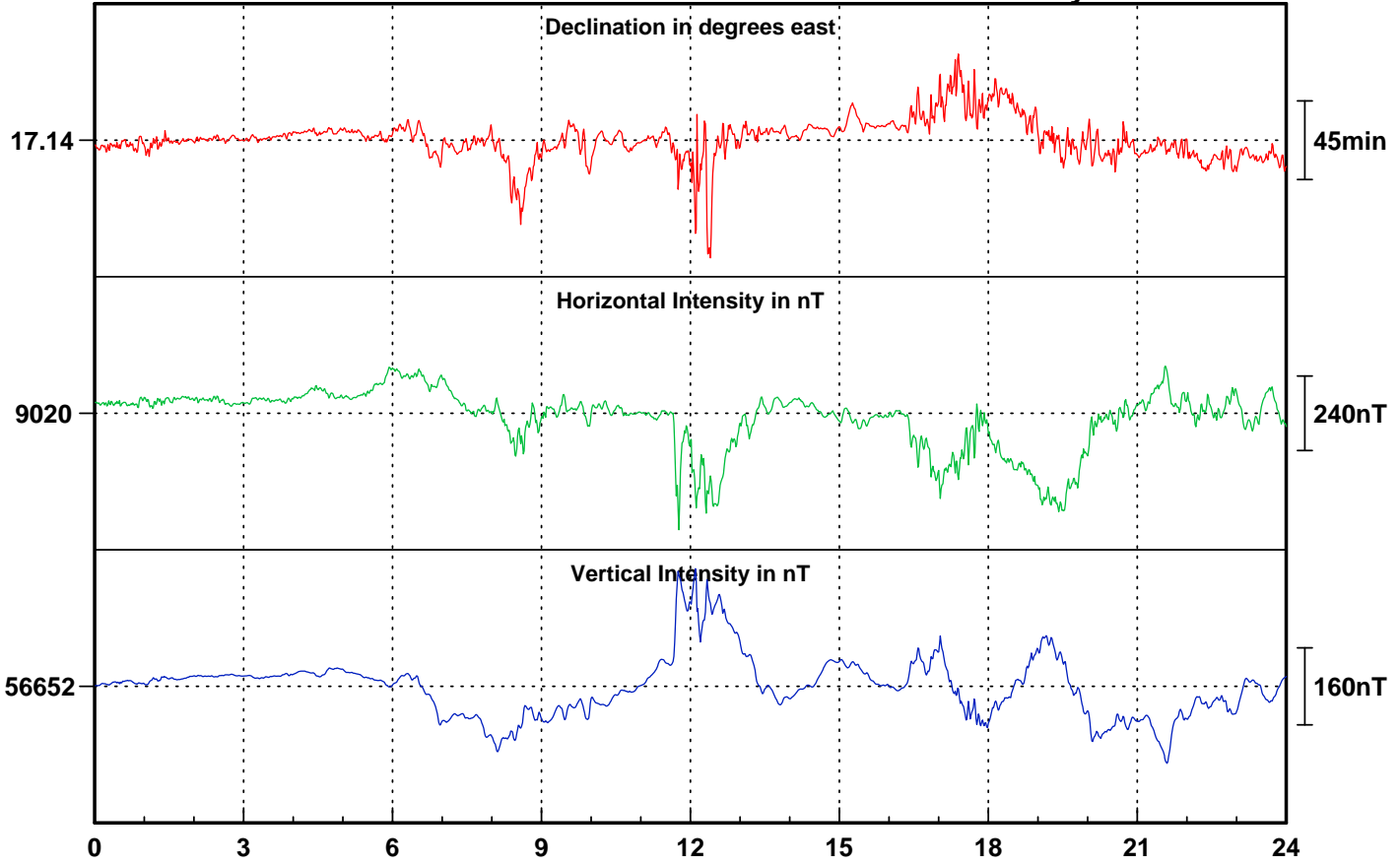
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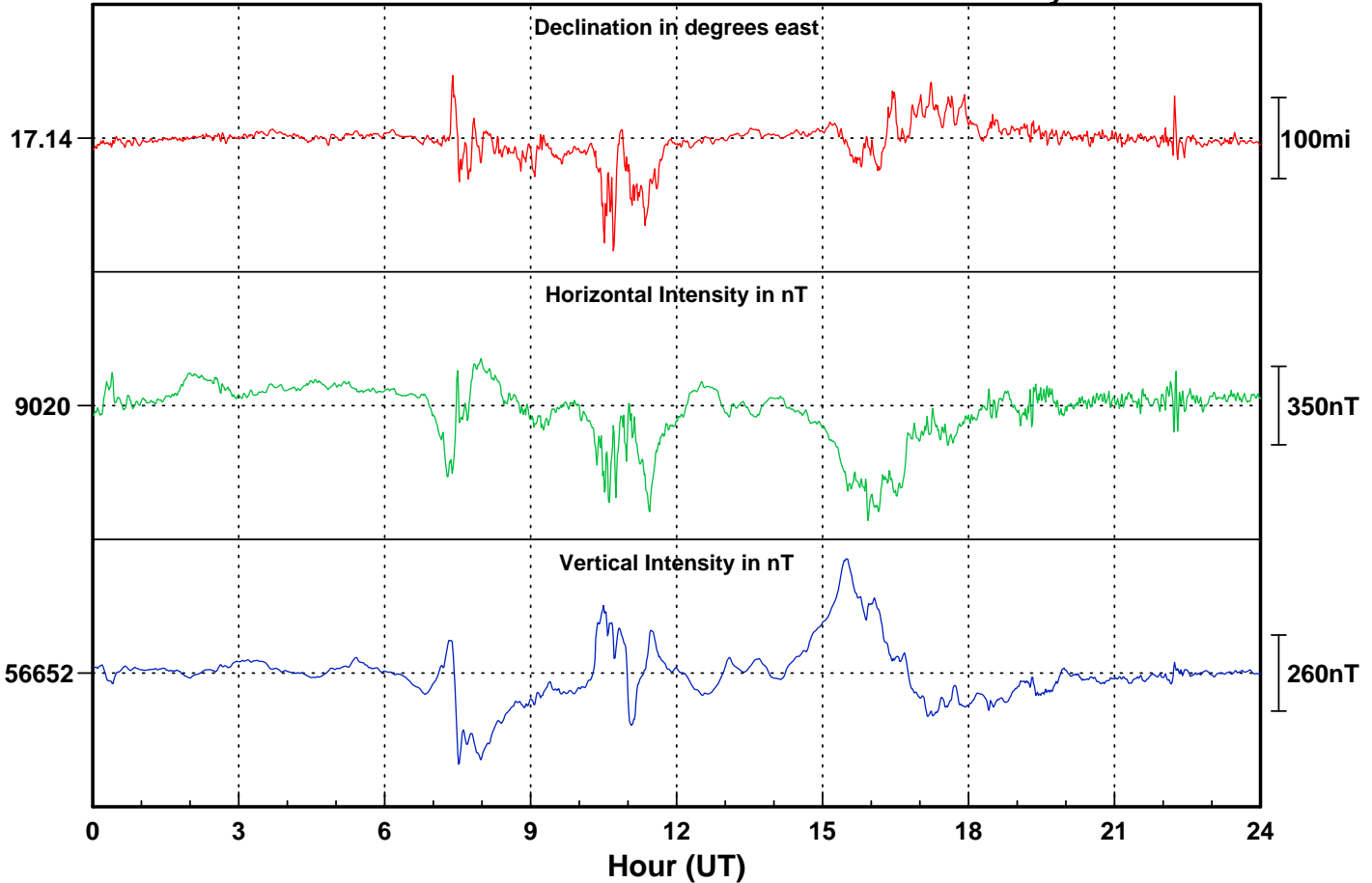
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Day number: 341



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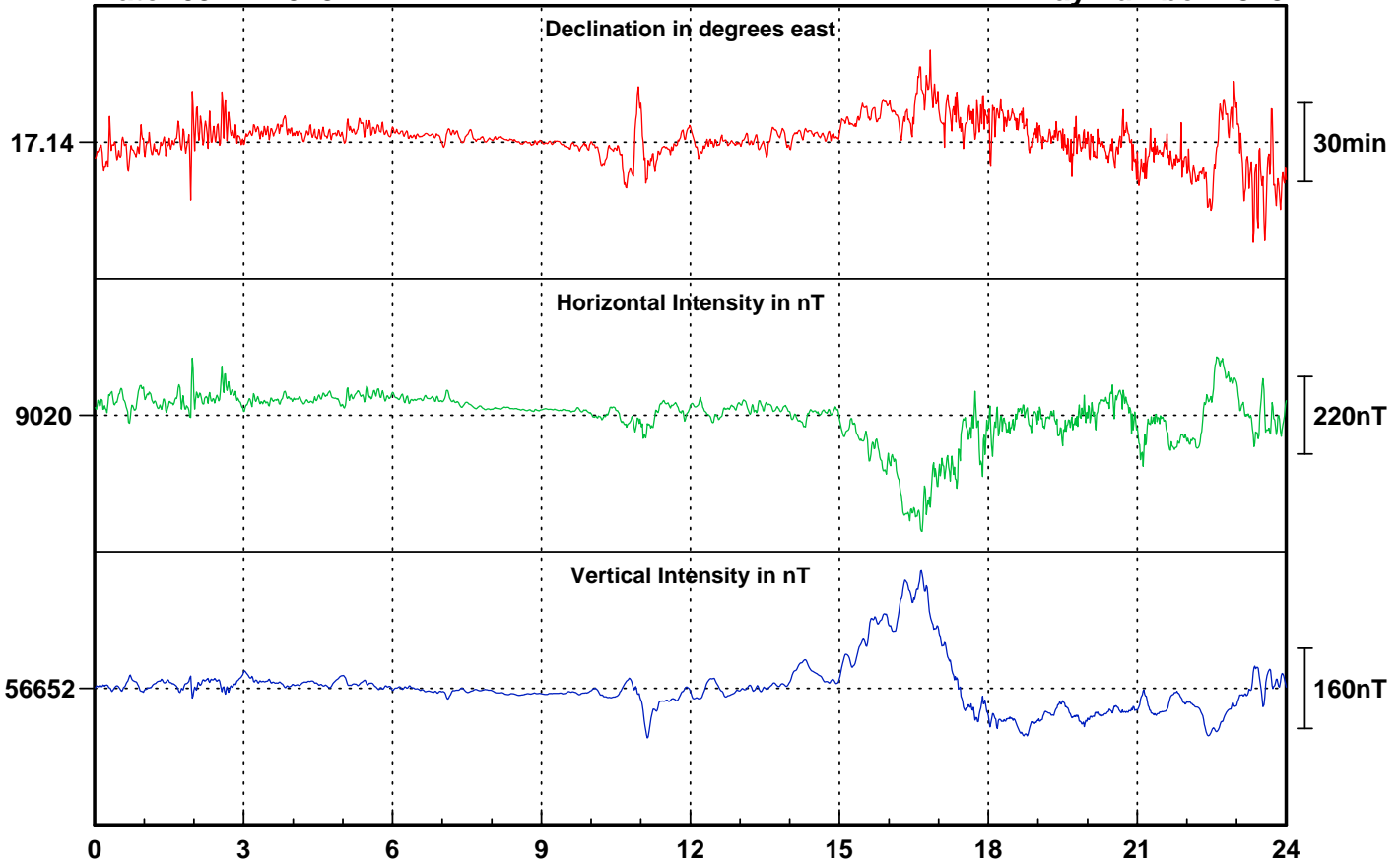
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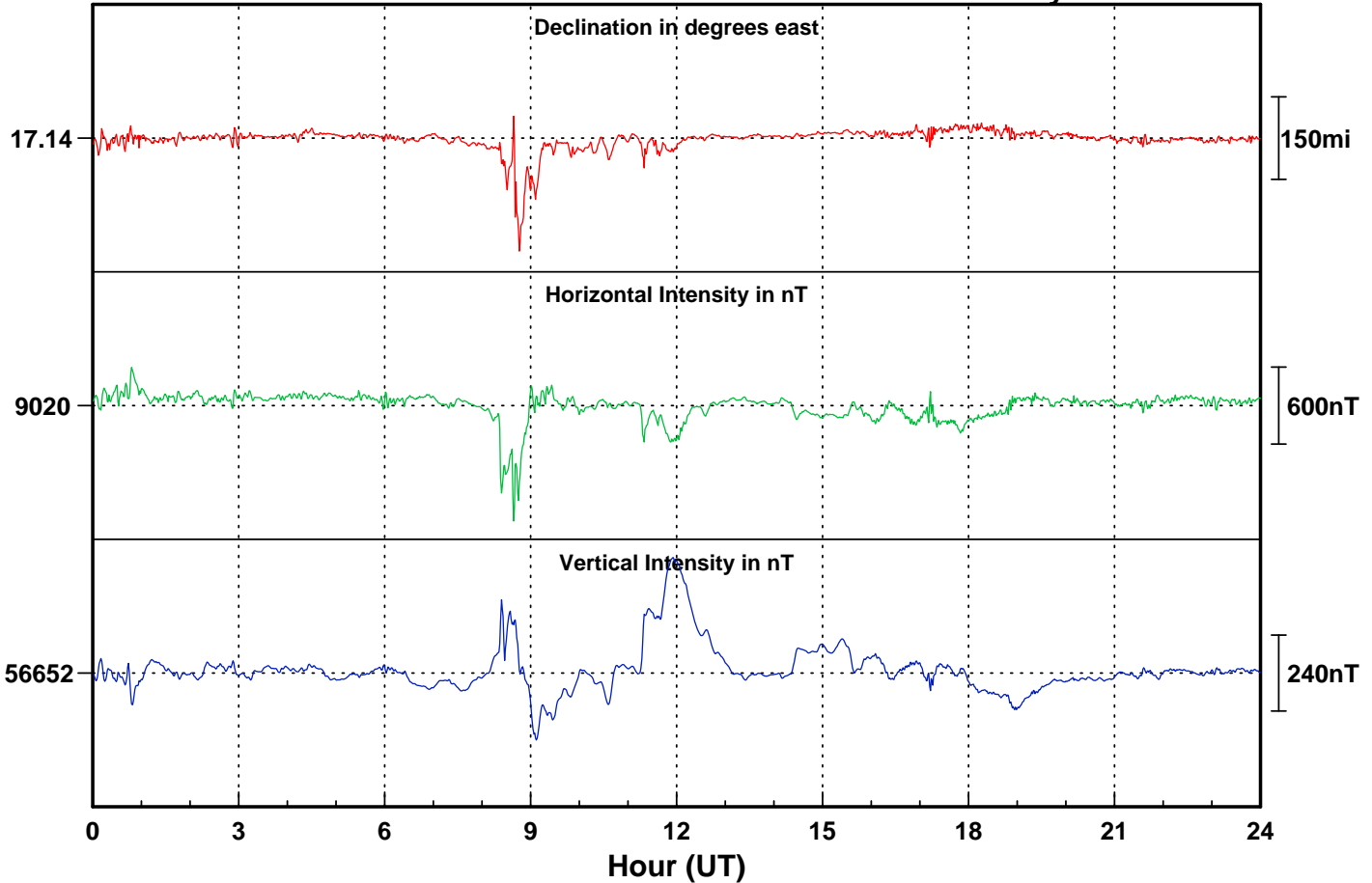
Jim Carrigan

Day number: 343



Date: 10-12-2018

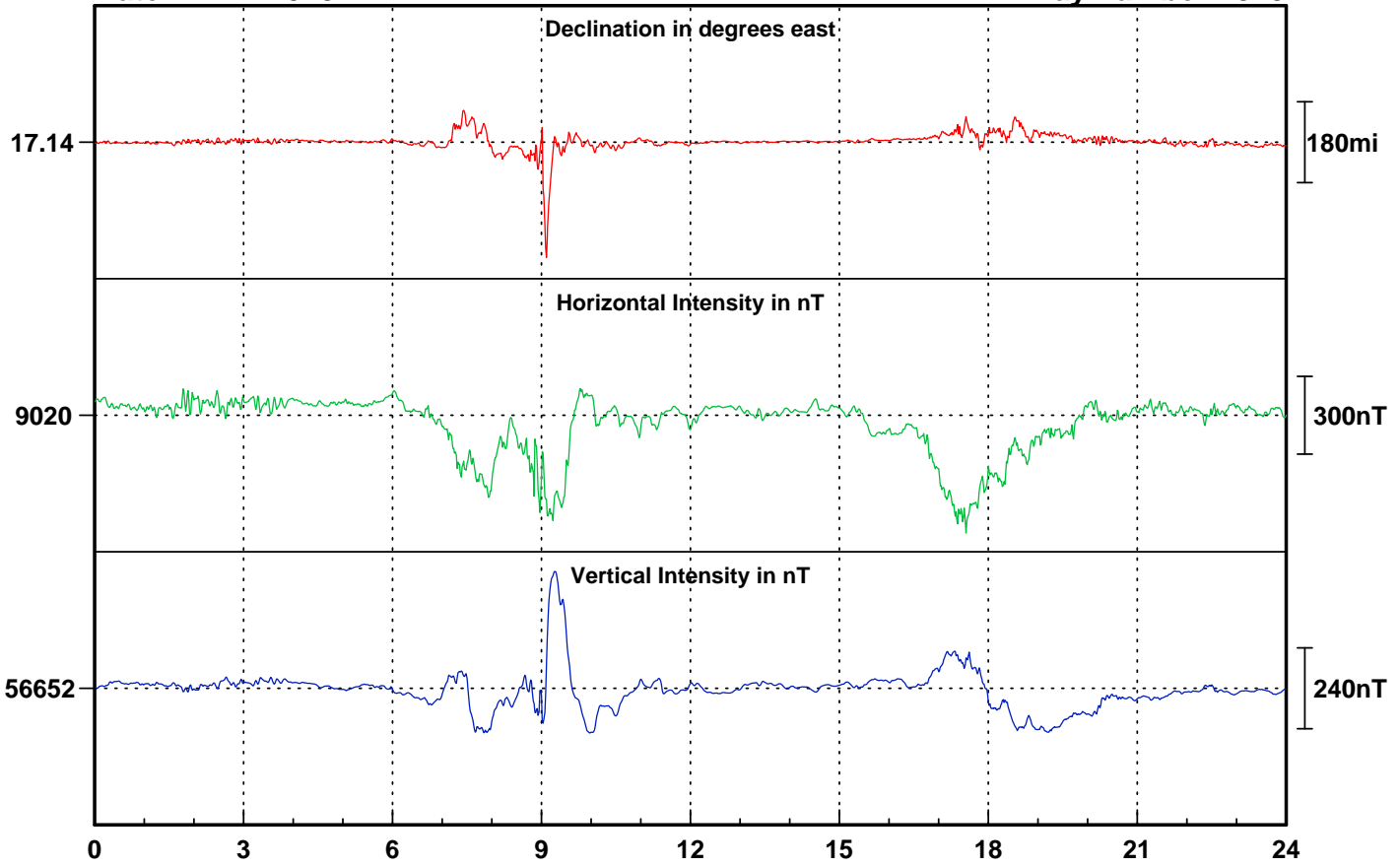
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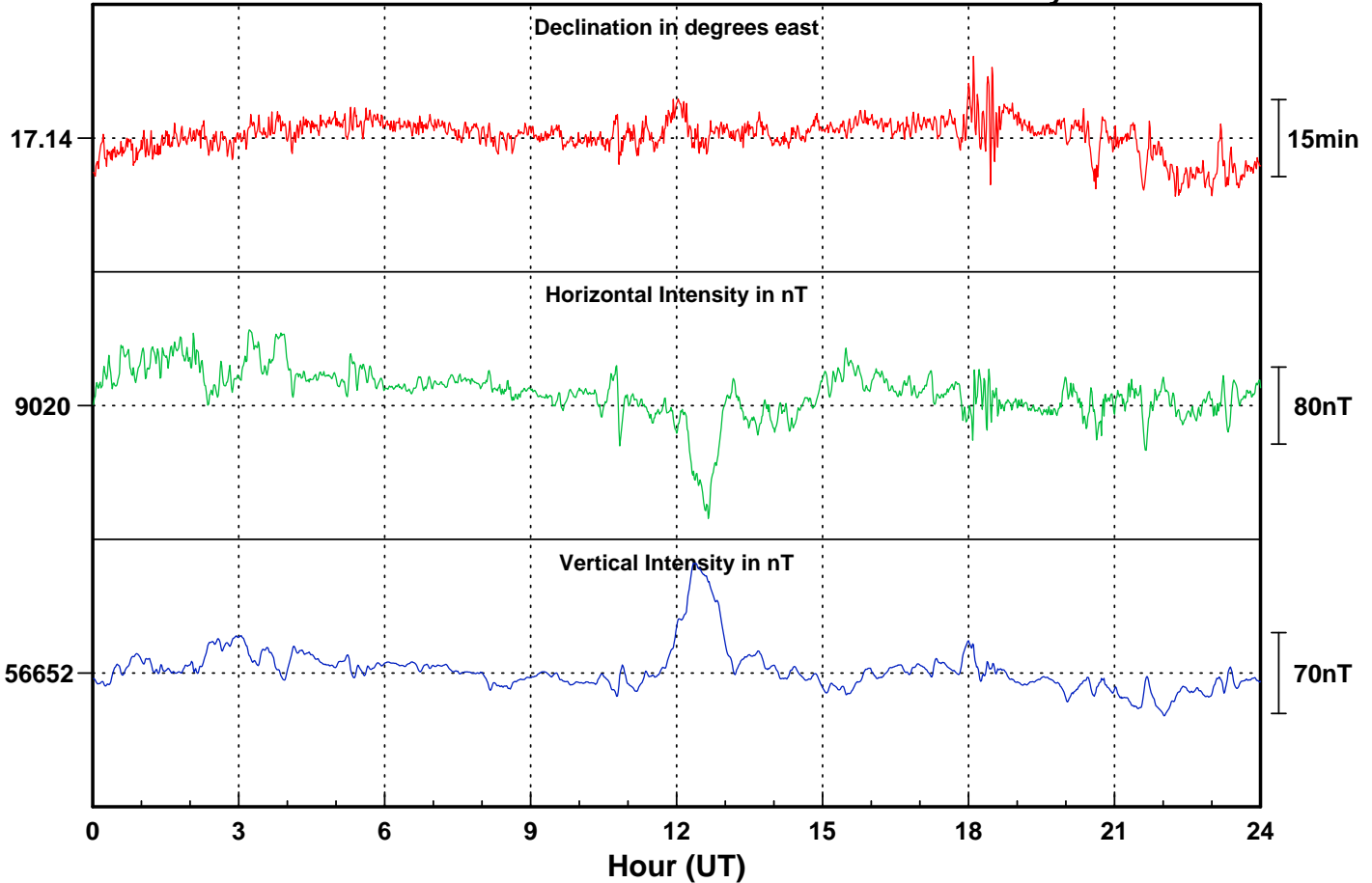
Jim Carrigan

Day number: 345



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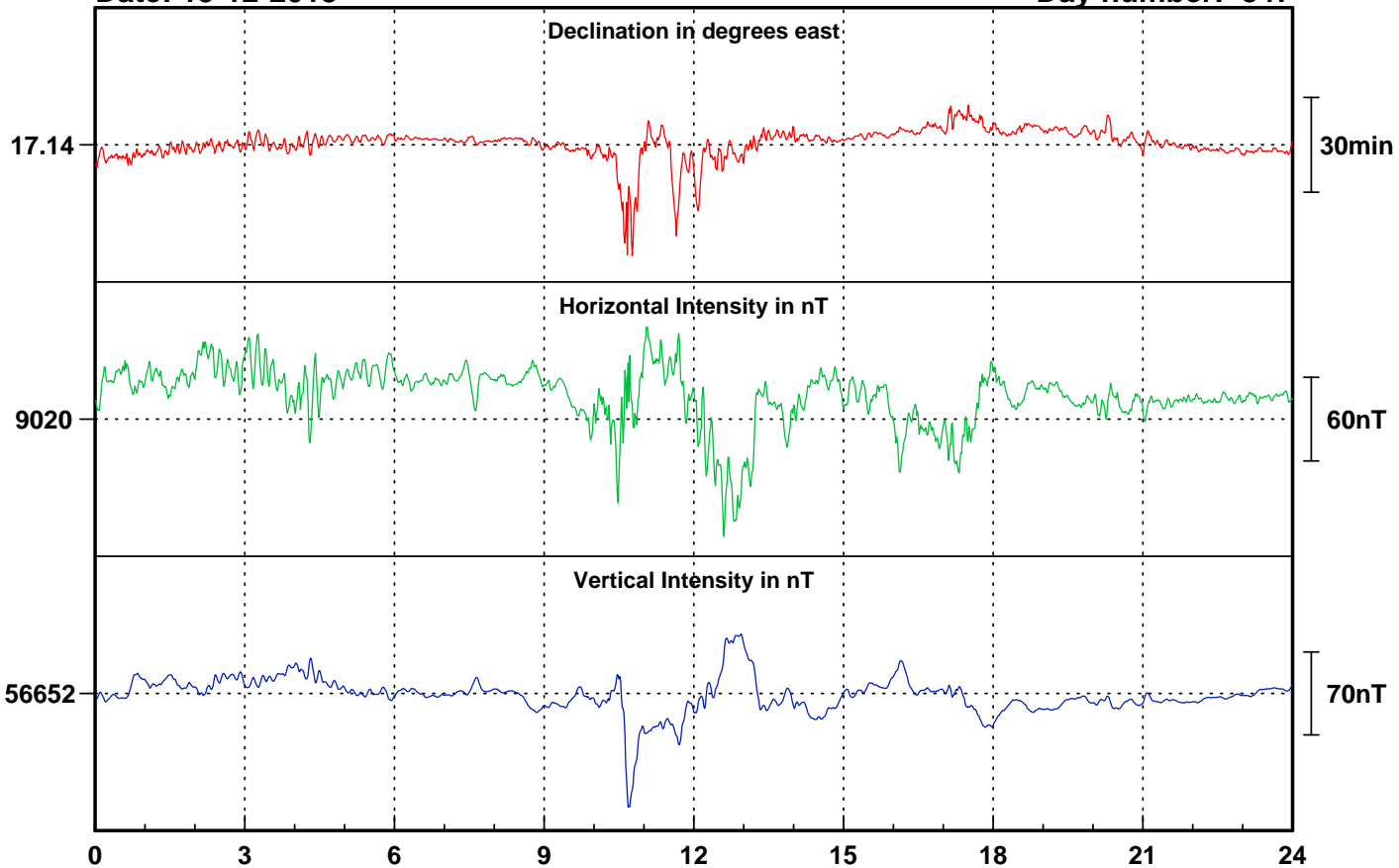
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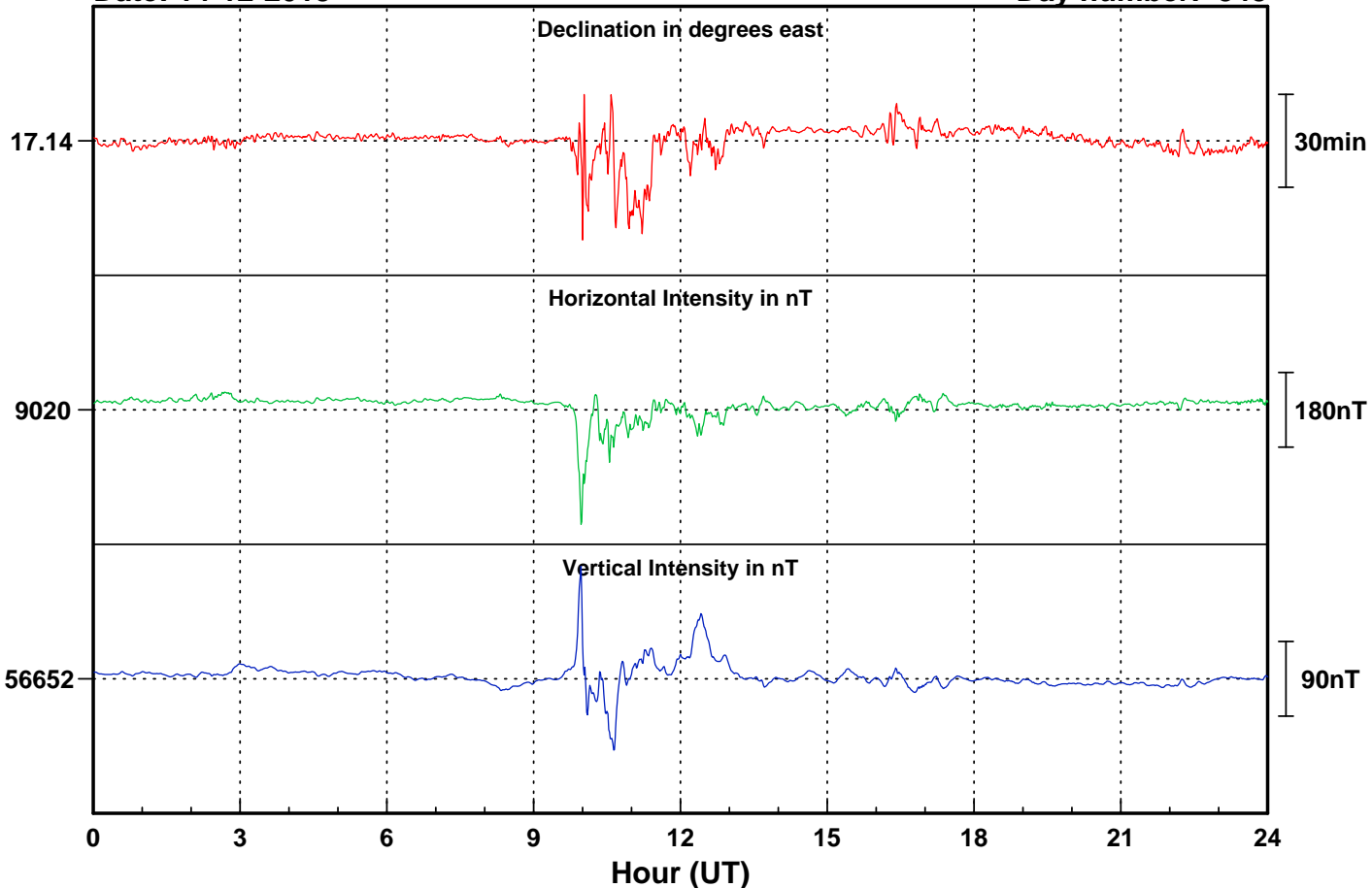
Jim Carrigan

Day number: 347



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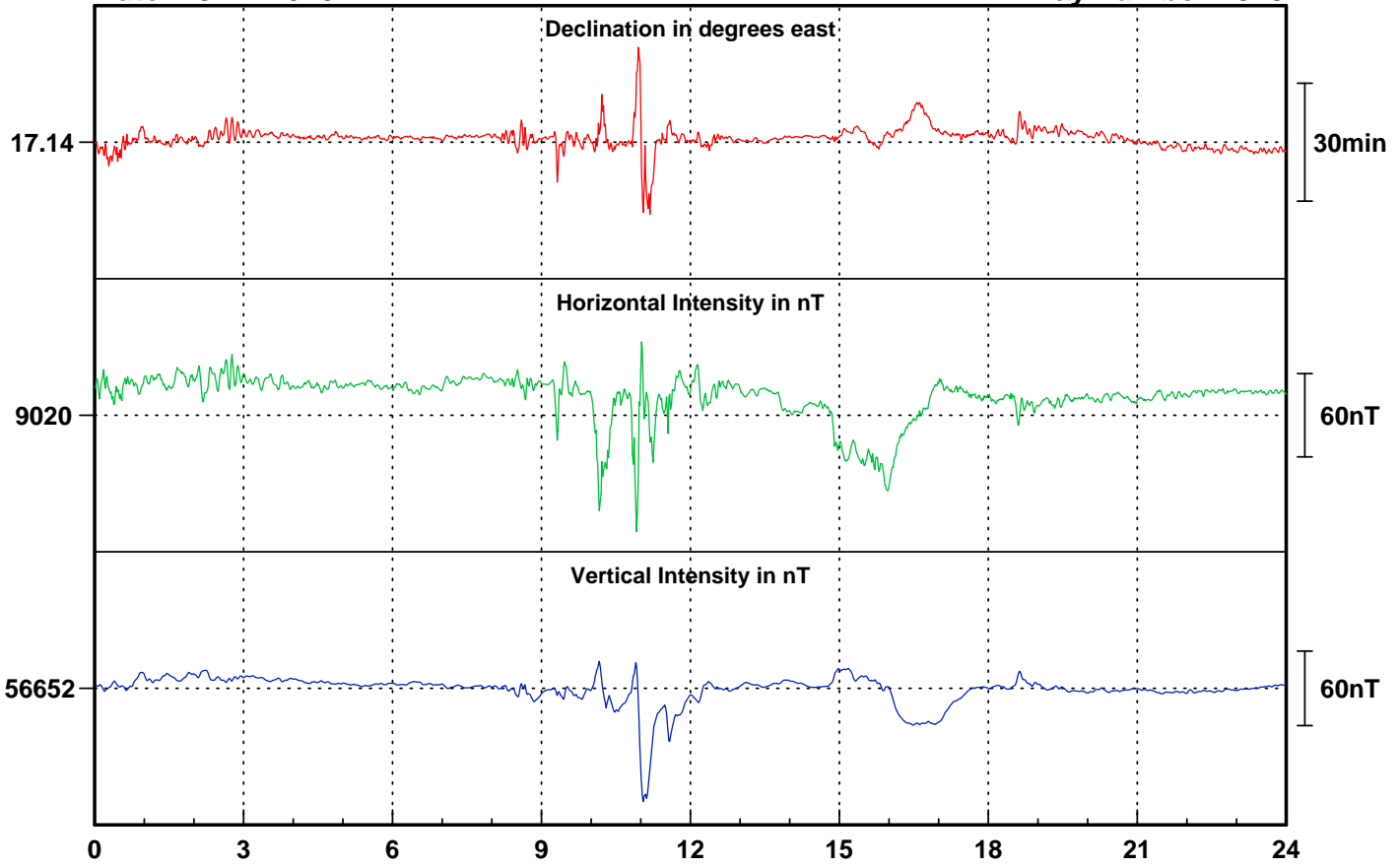
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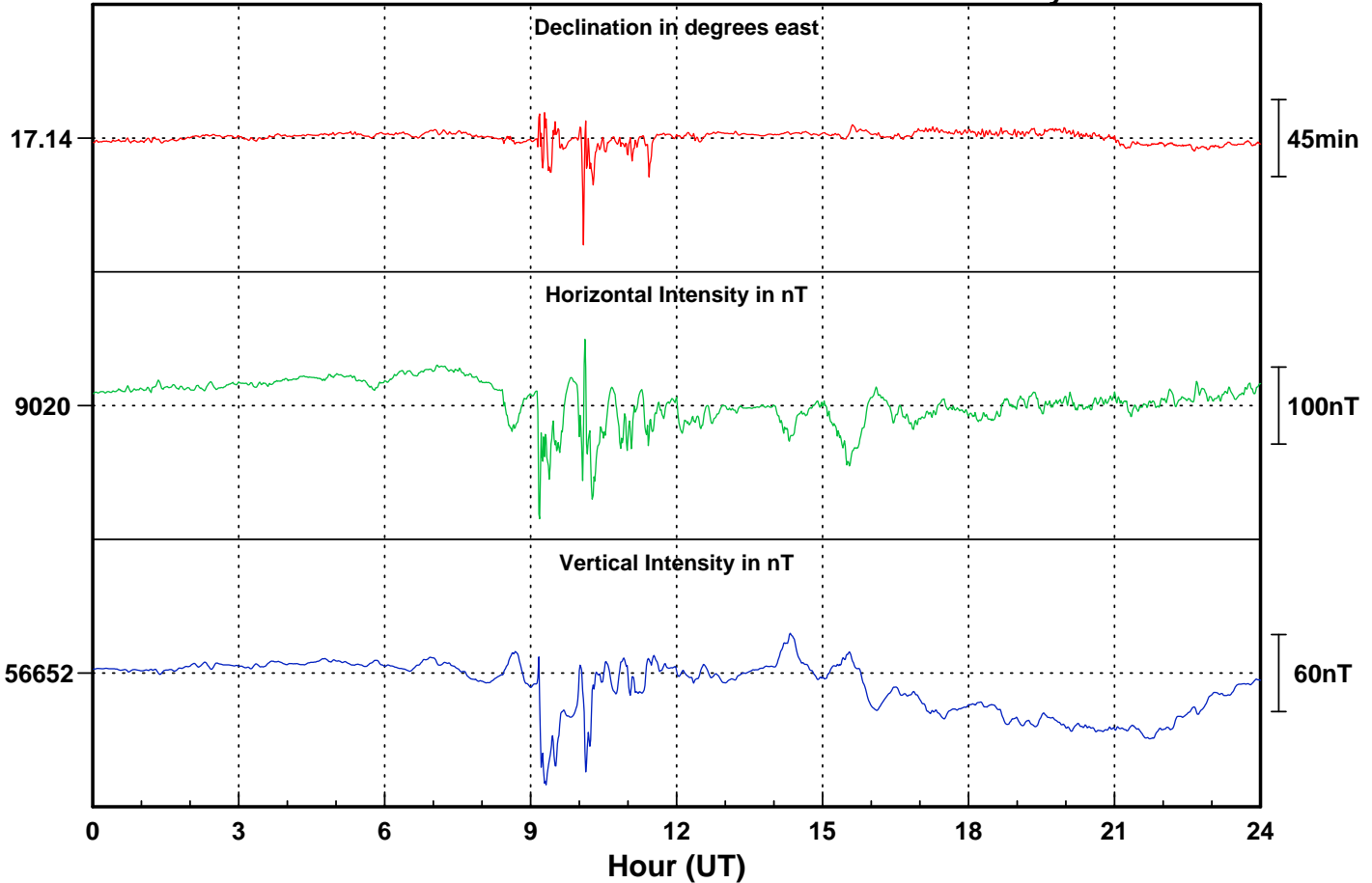
Jim Carrigan

Day number: 349



Date: 16-12-2018

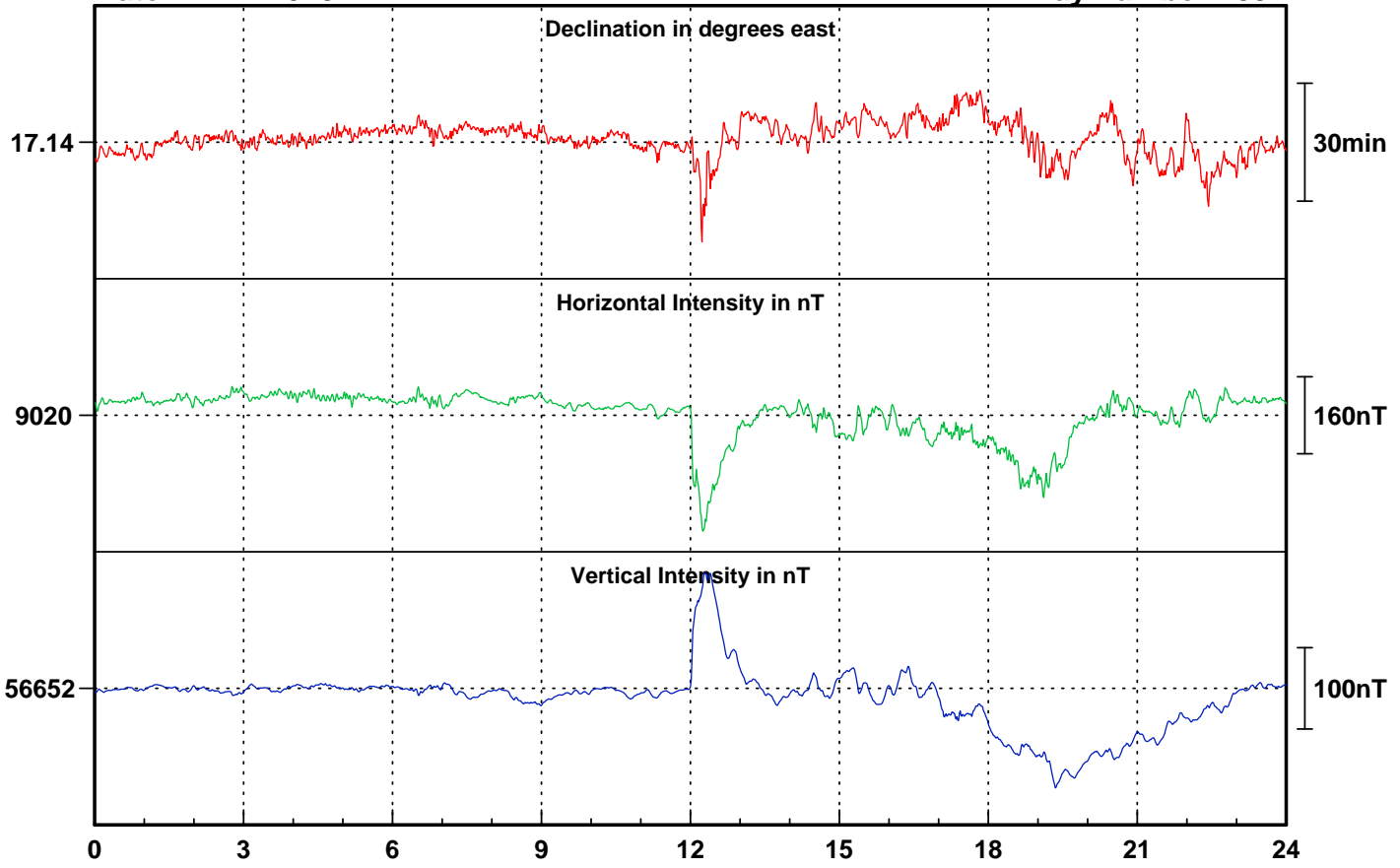
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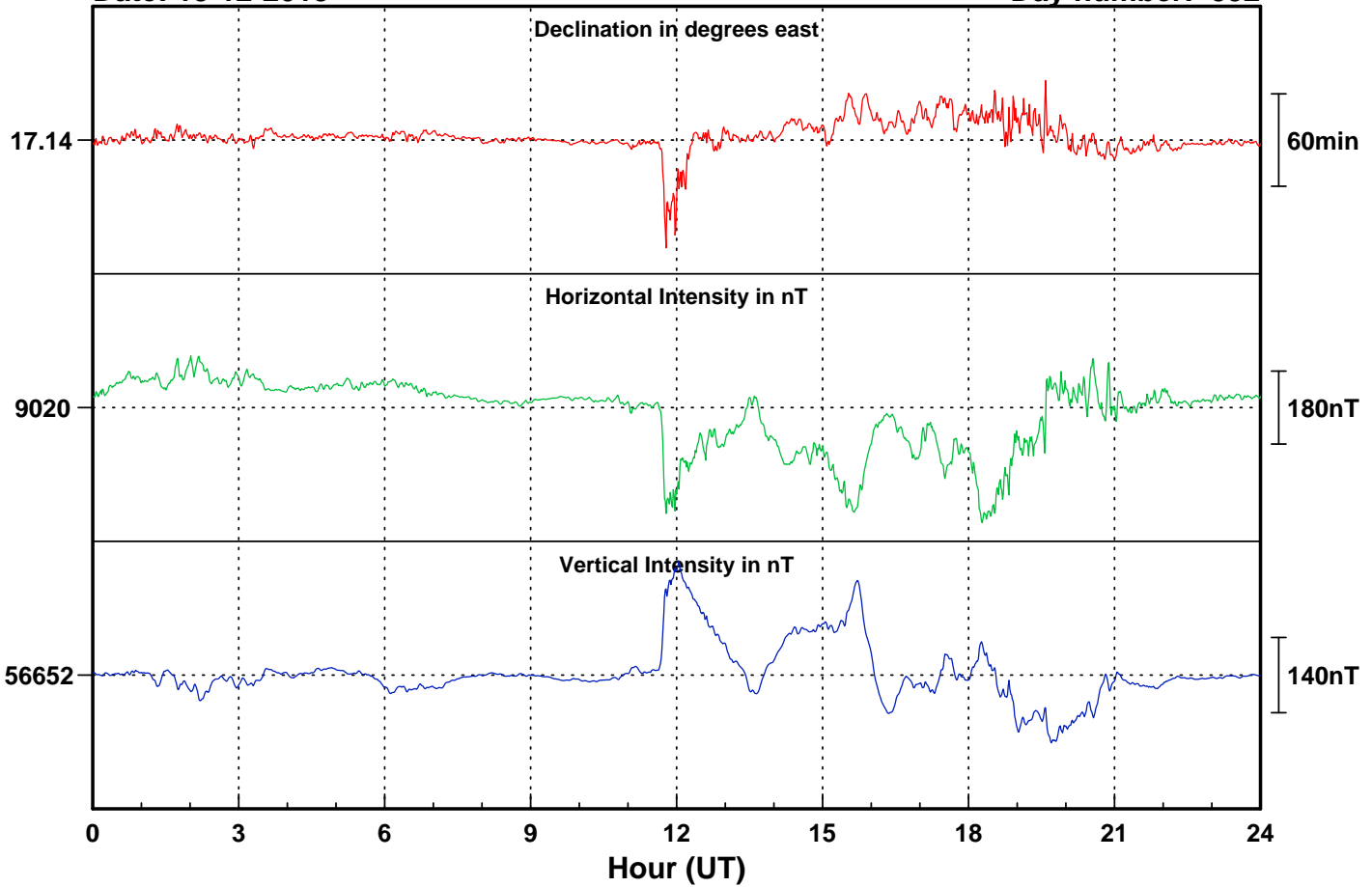
Jim Carrigan

Day number: 351



Date: 18-12-2018

Day number: 352

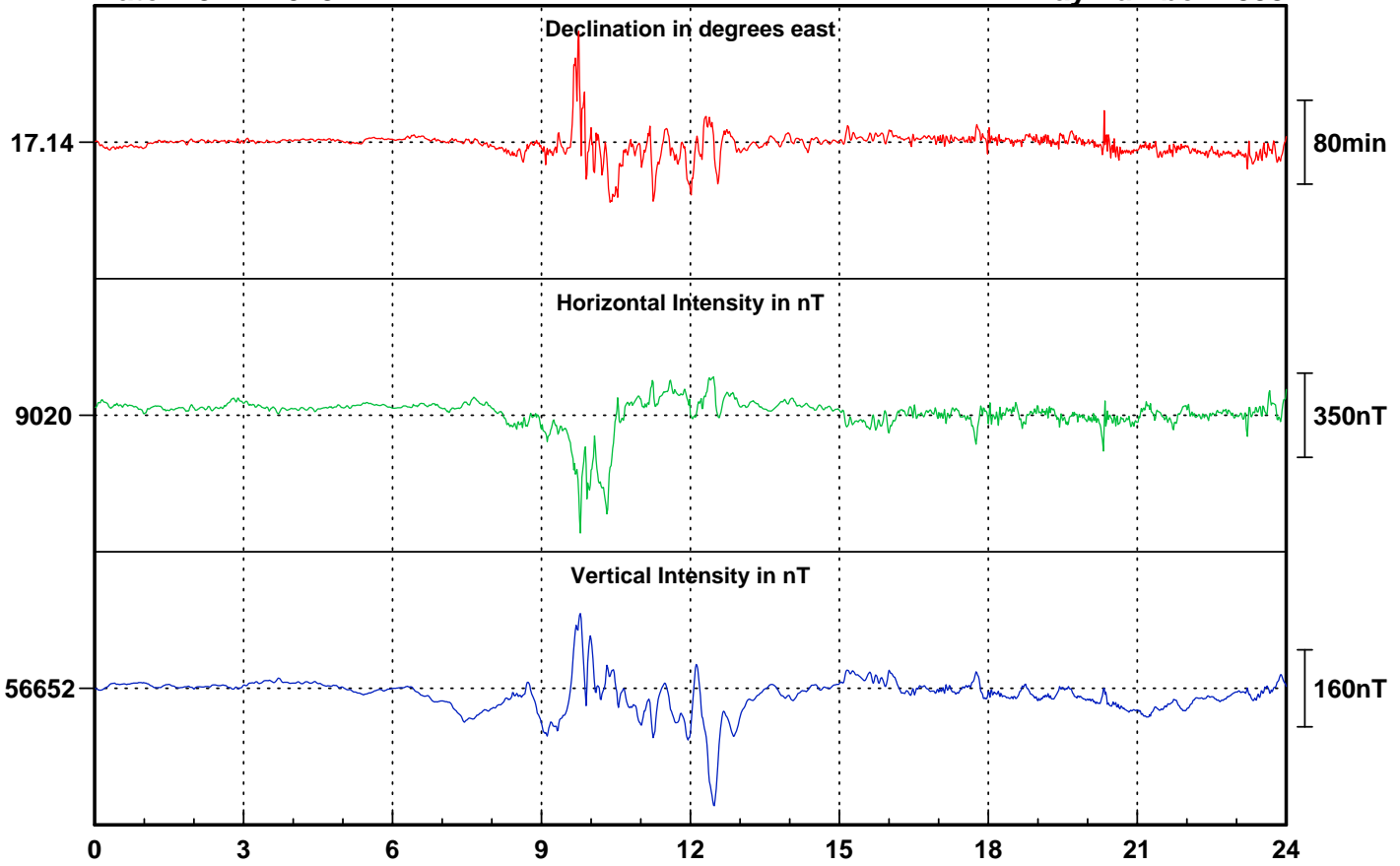




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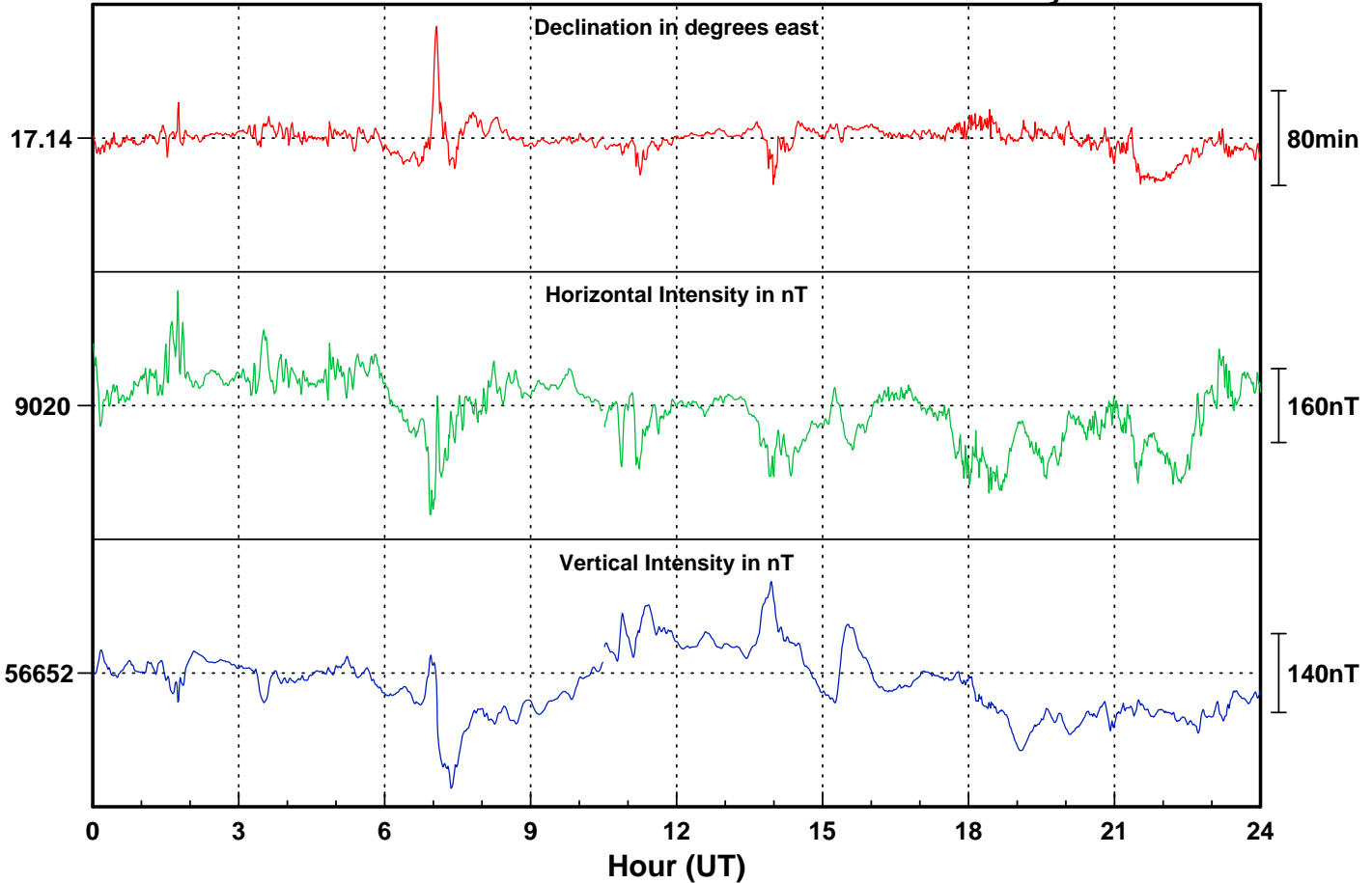
Jim Carrigan

Day number: 353



Date: 20-12-2018

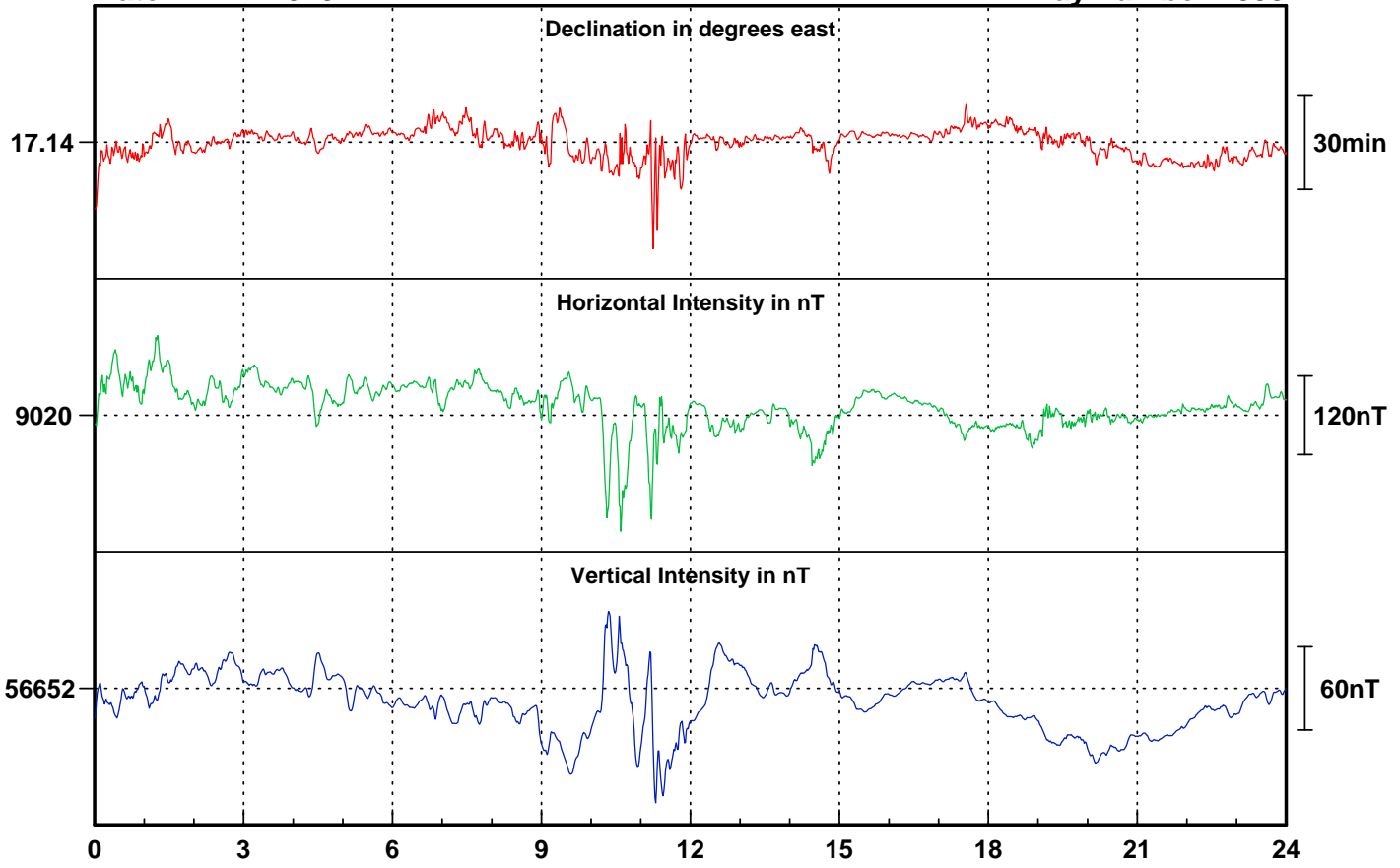
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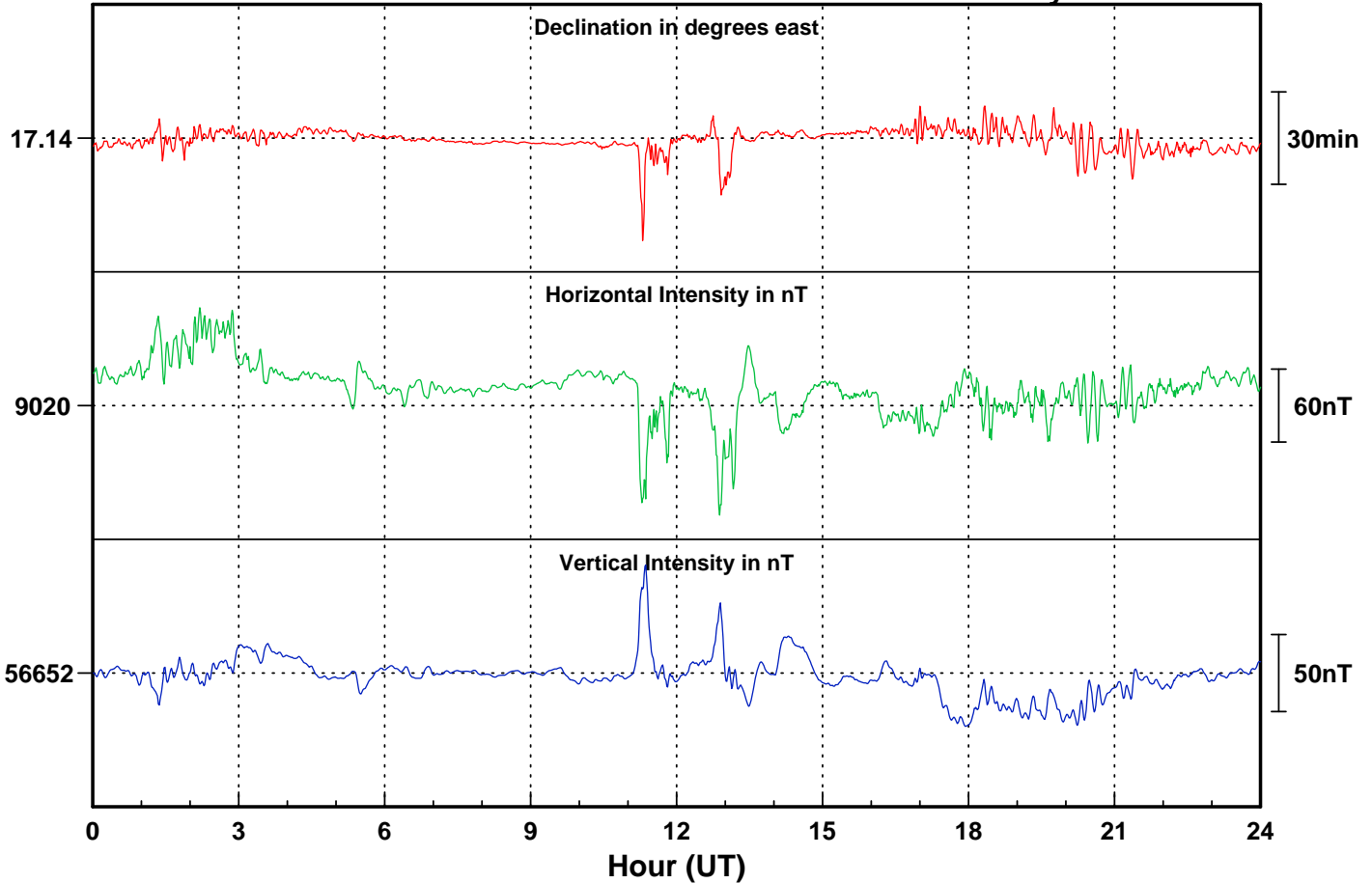
Jim Carrigan

Day number: 355



Date: 22-12-2018

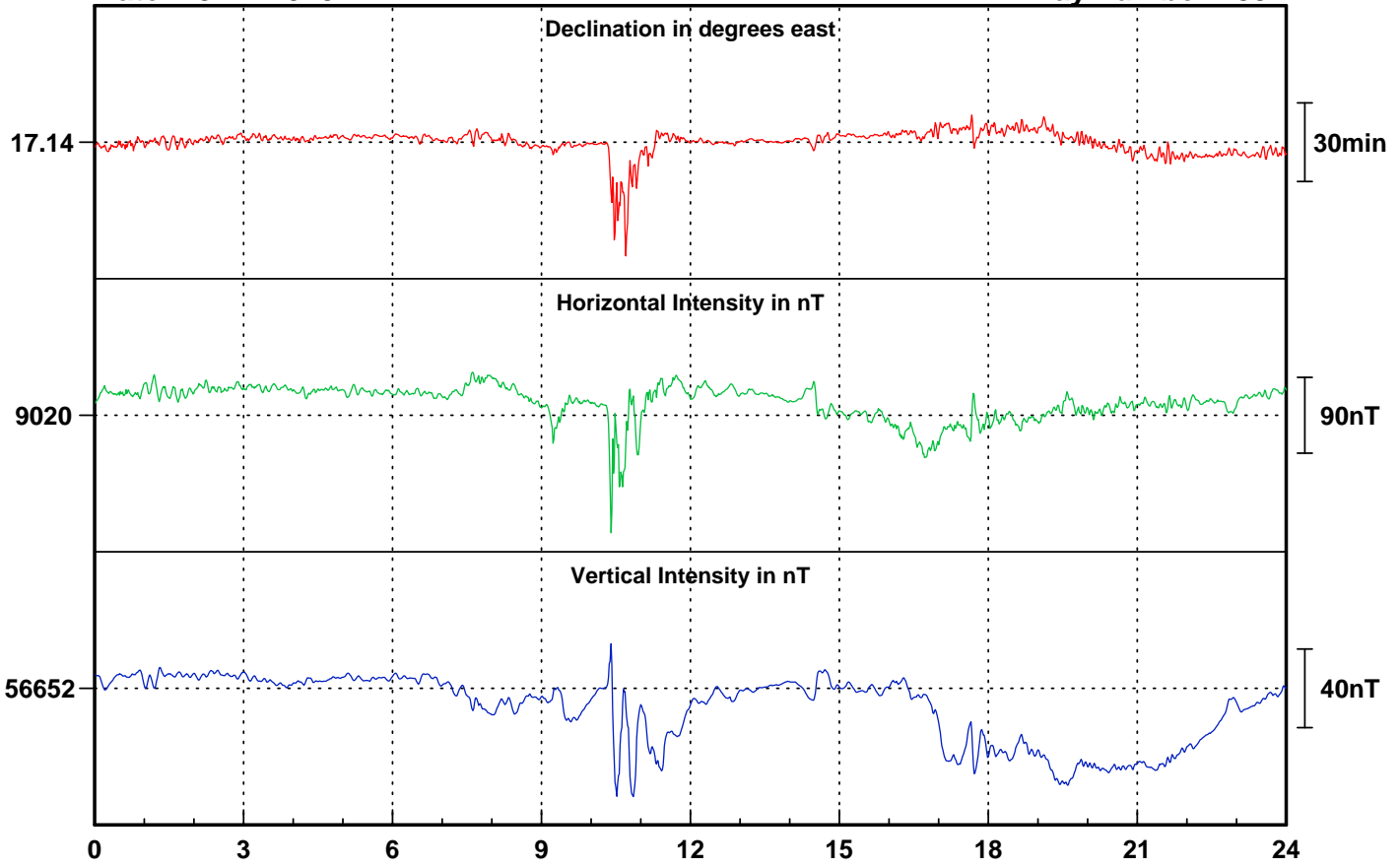
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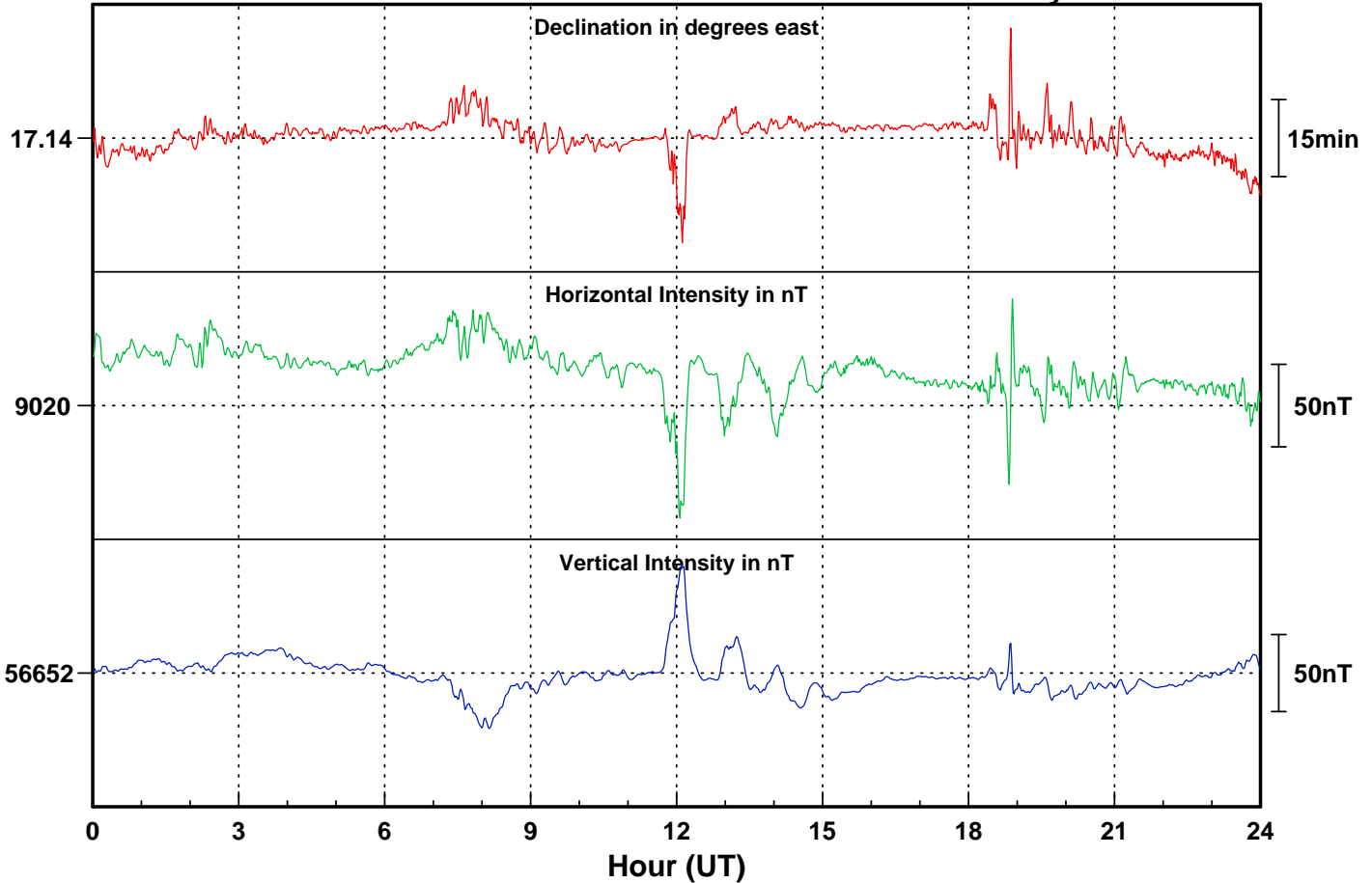
Jim Carrigan

Day number: 357



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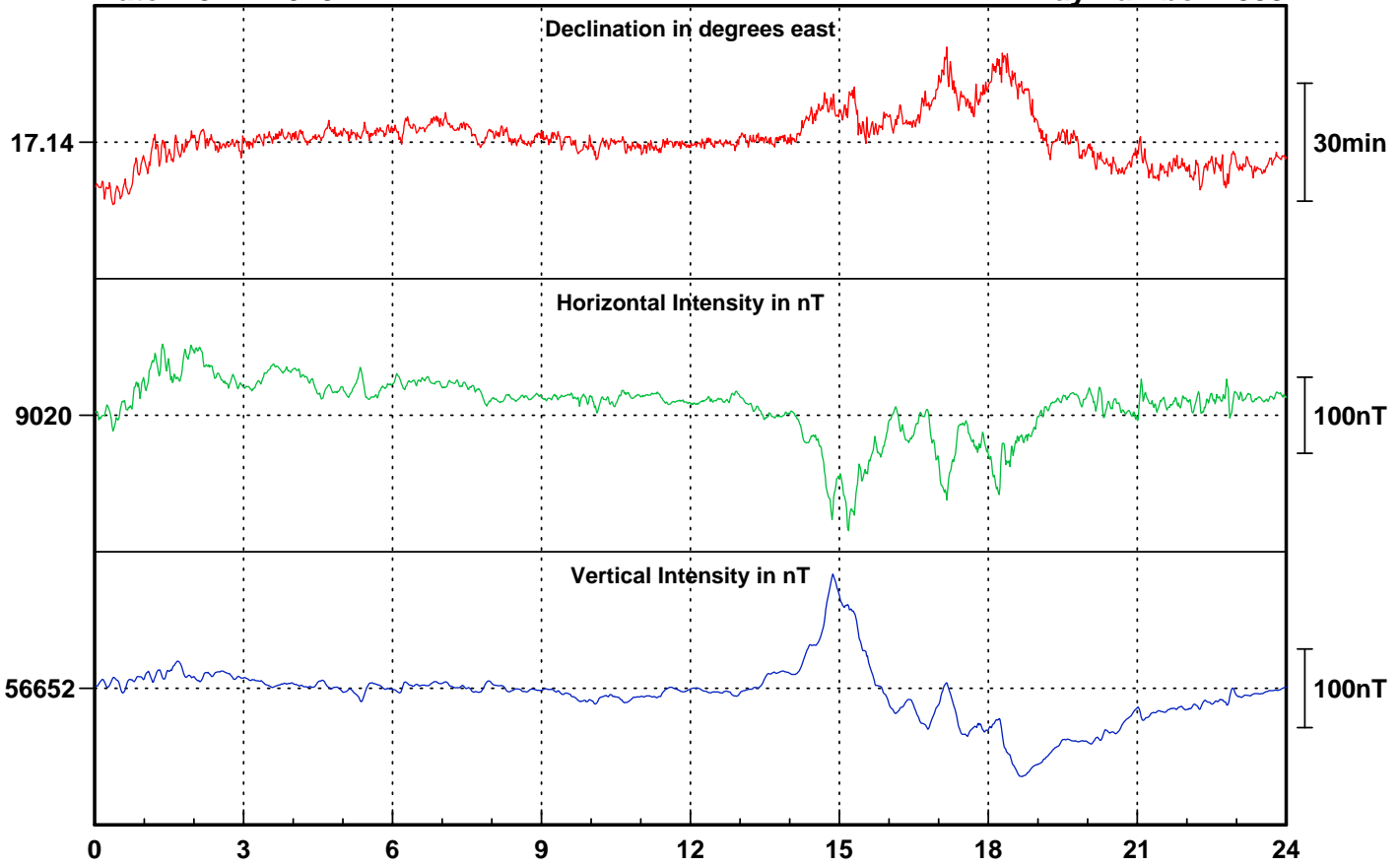
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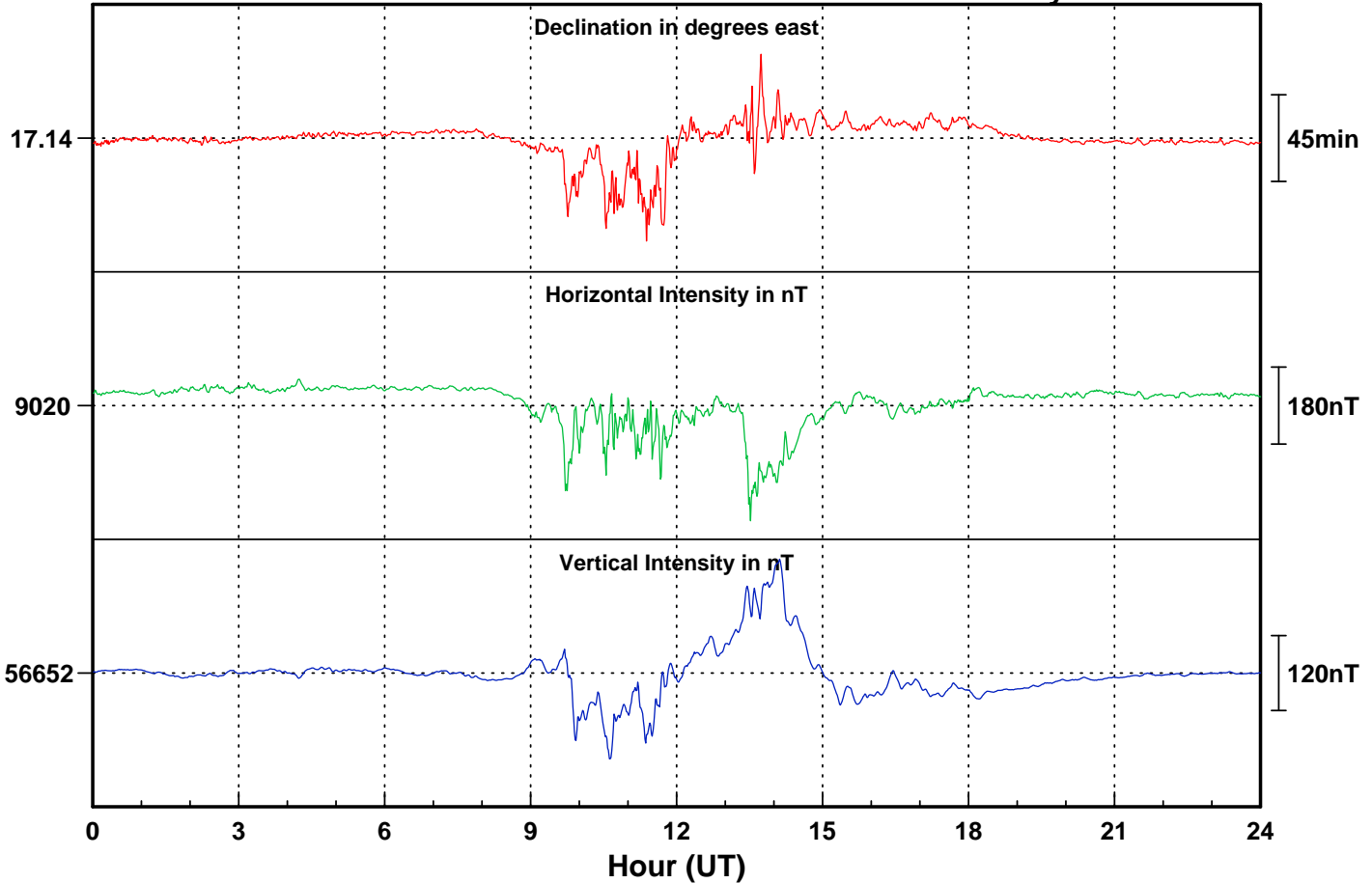
Jim Carrigan

Day number: 359



Date: 26-12-2018

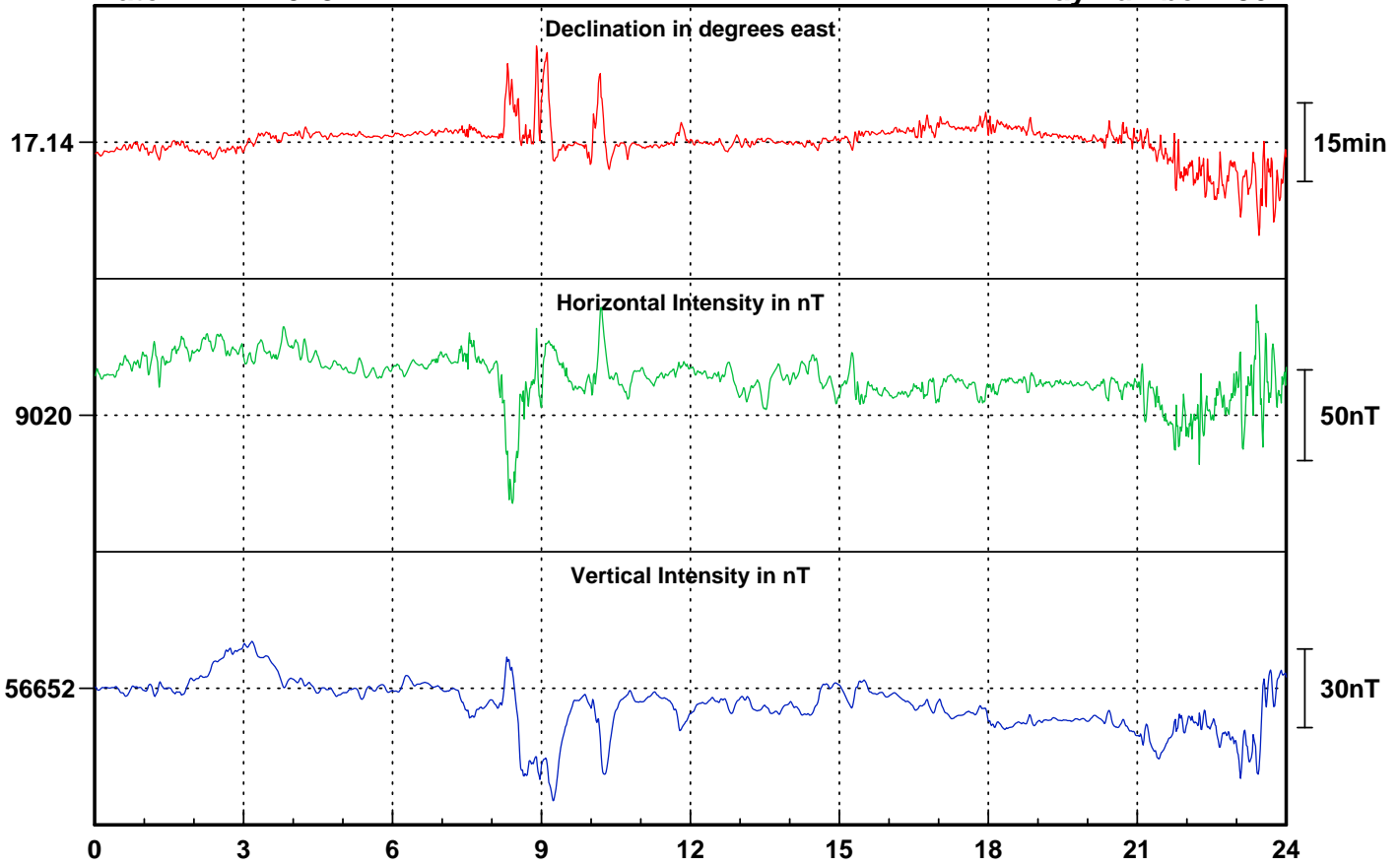
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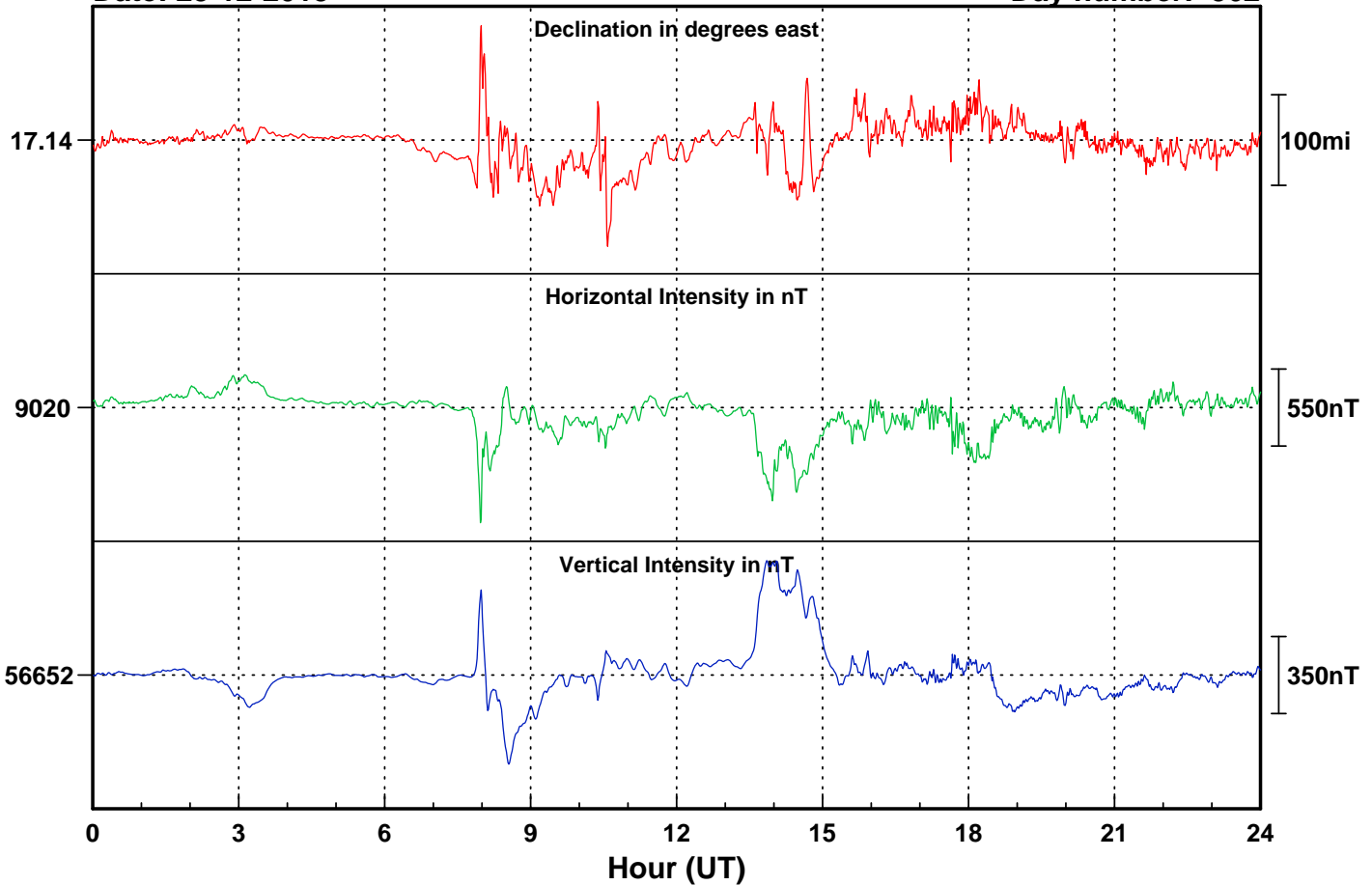
Jim Carrigan

Day number: 361



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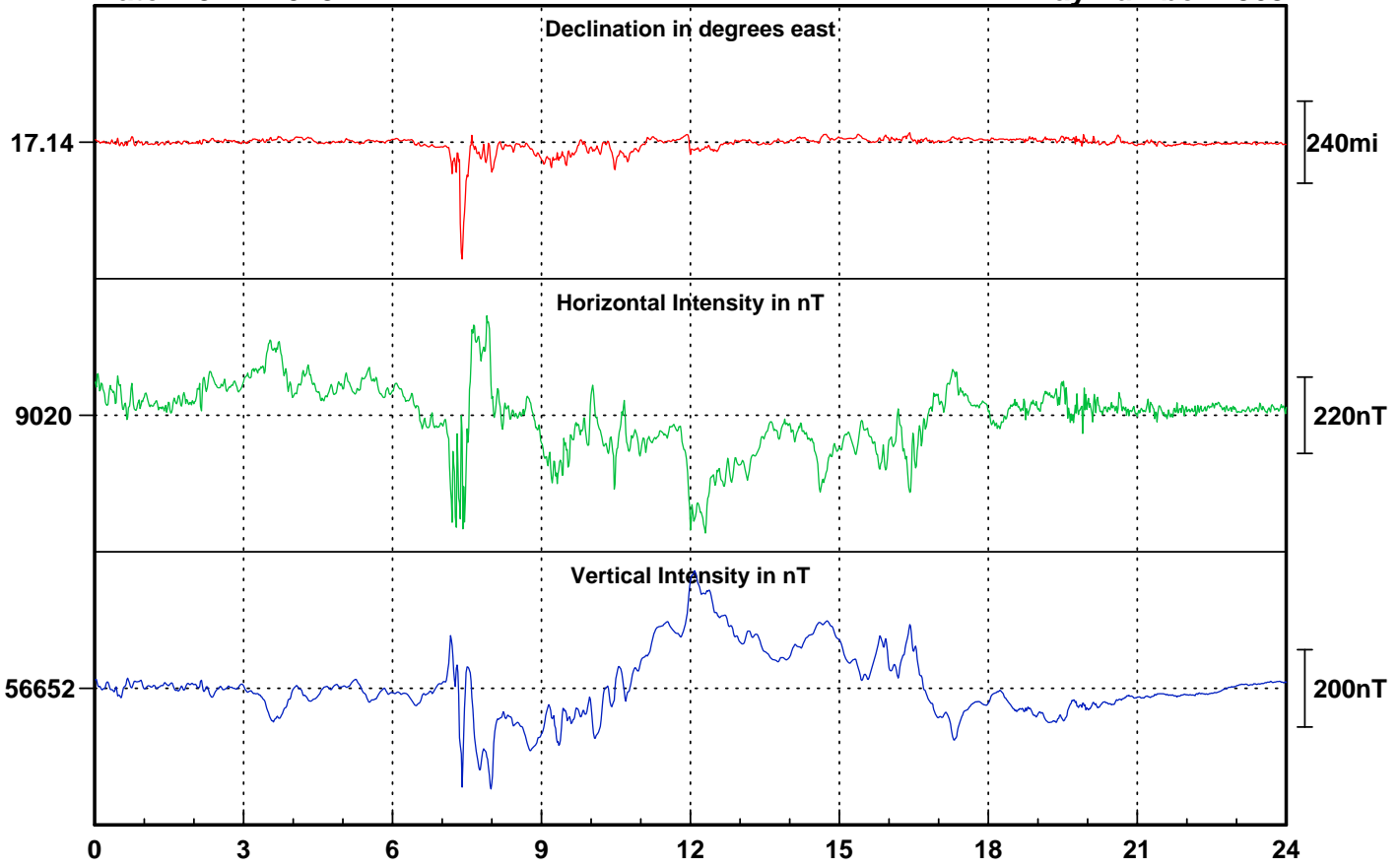
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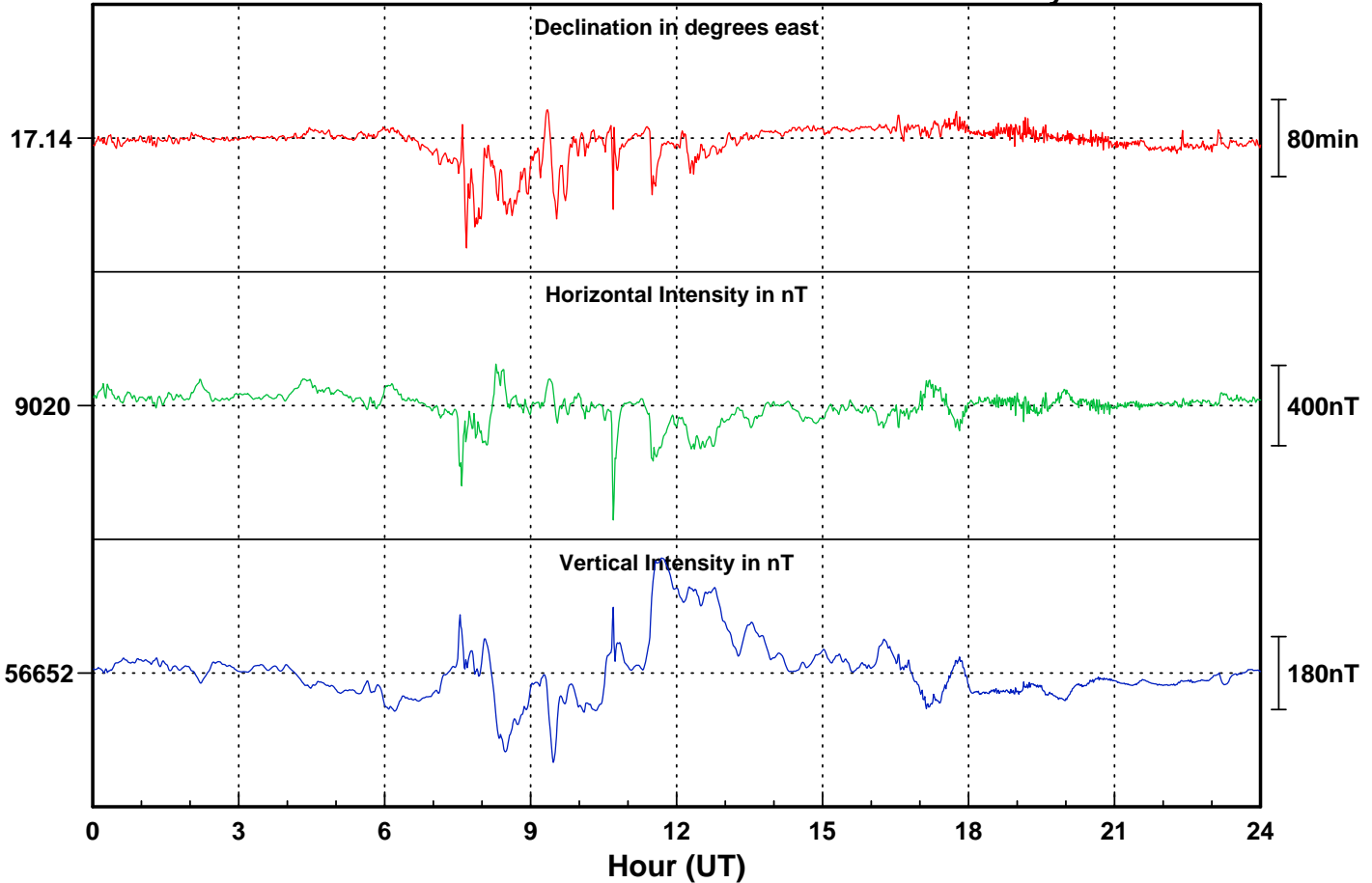
Jim Carrigan

Day number: 363



Date: 30-12-2018

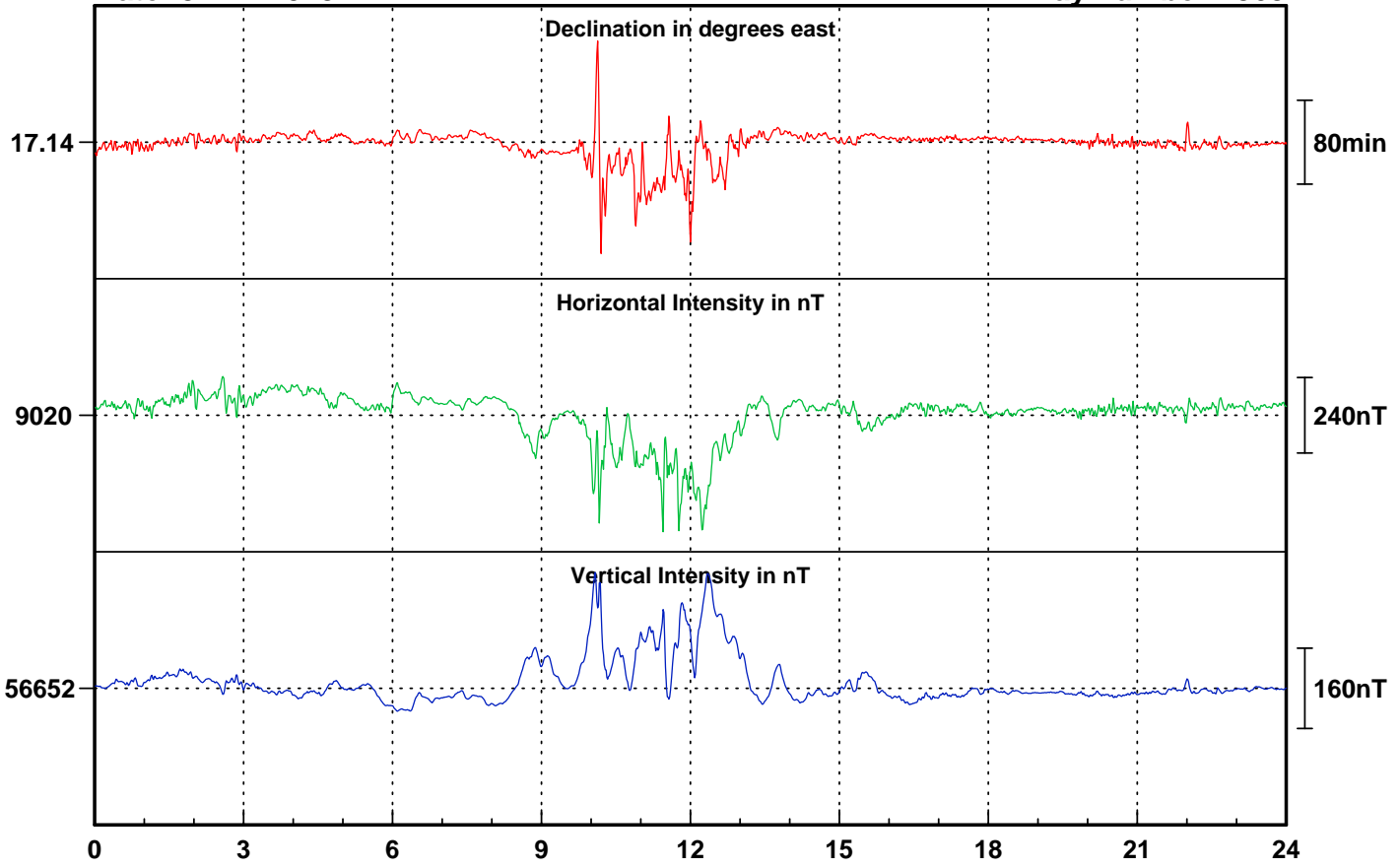
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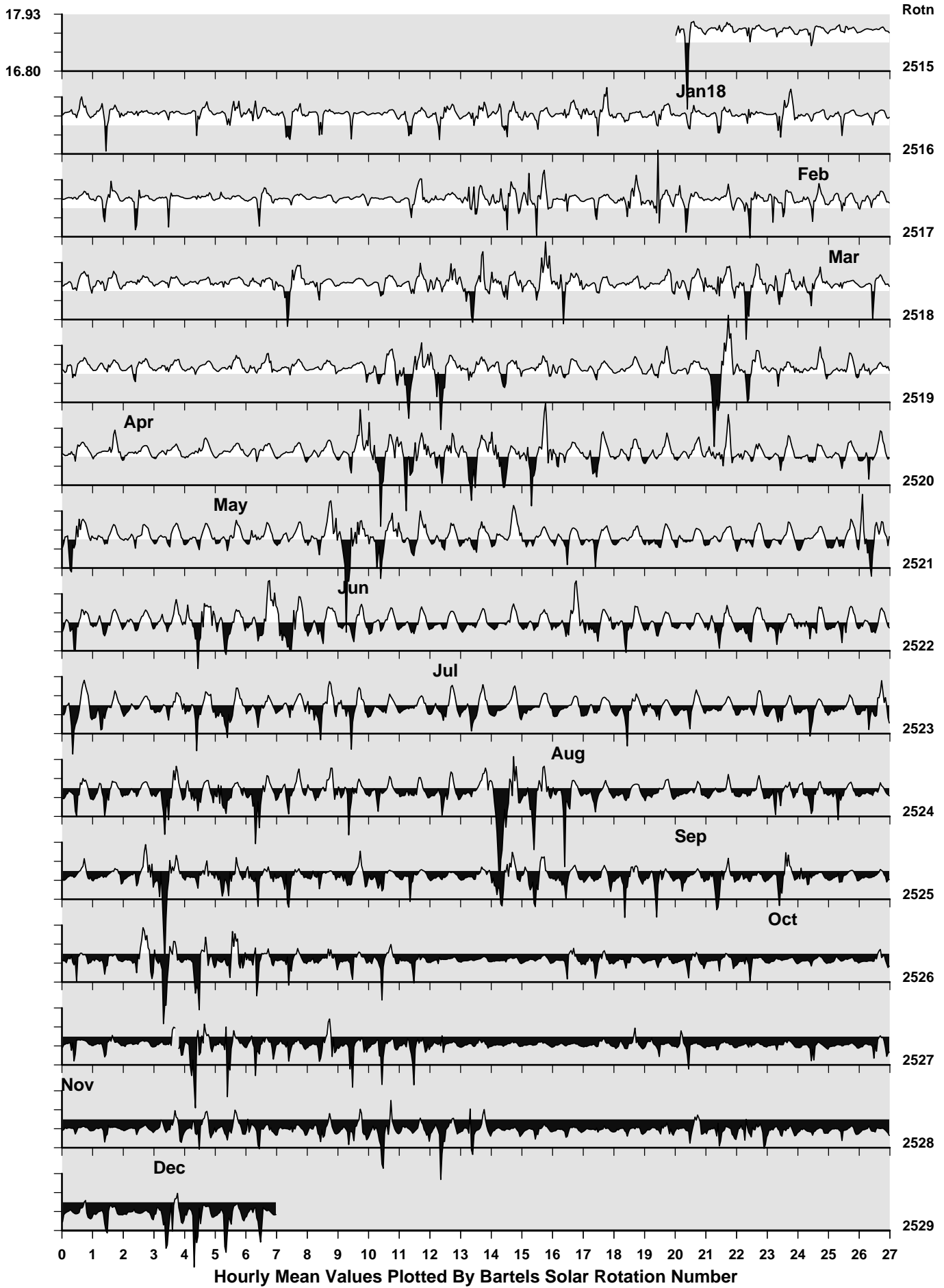
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Jim Carrigan

Day number: 365

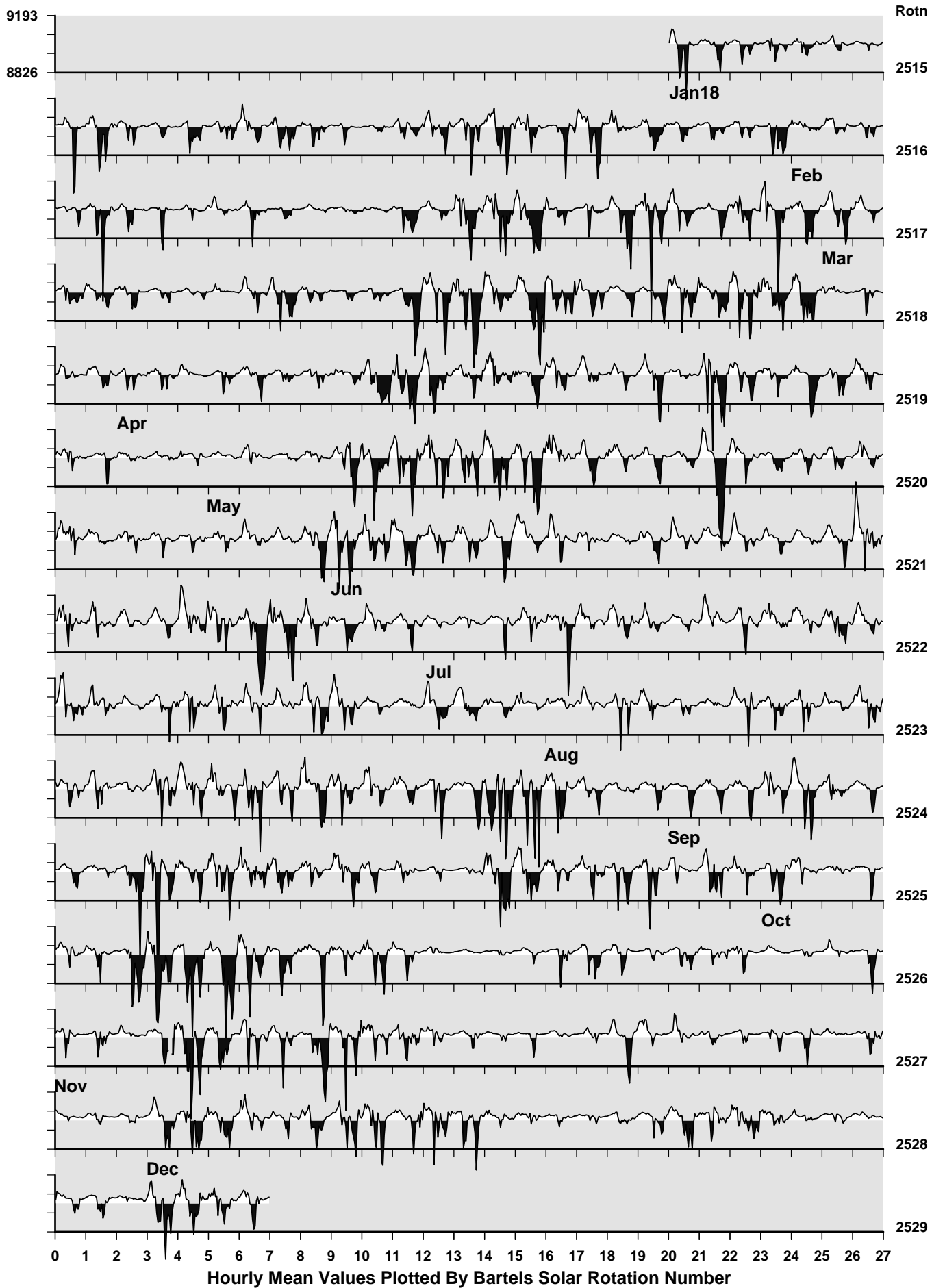


# Jim Carrigan Observatory: Declination (degrees)



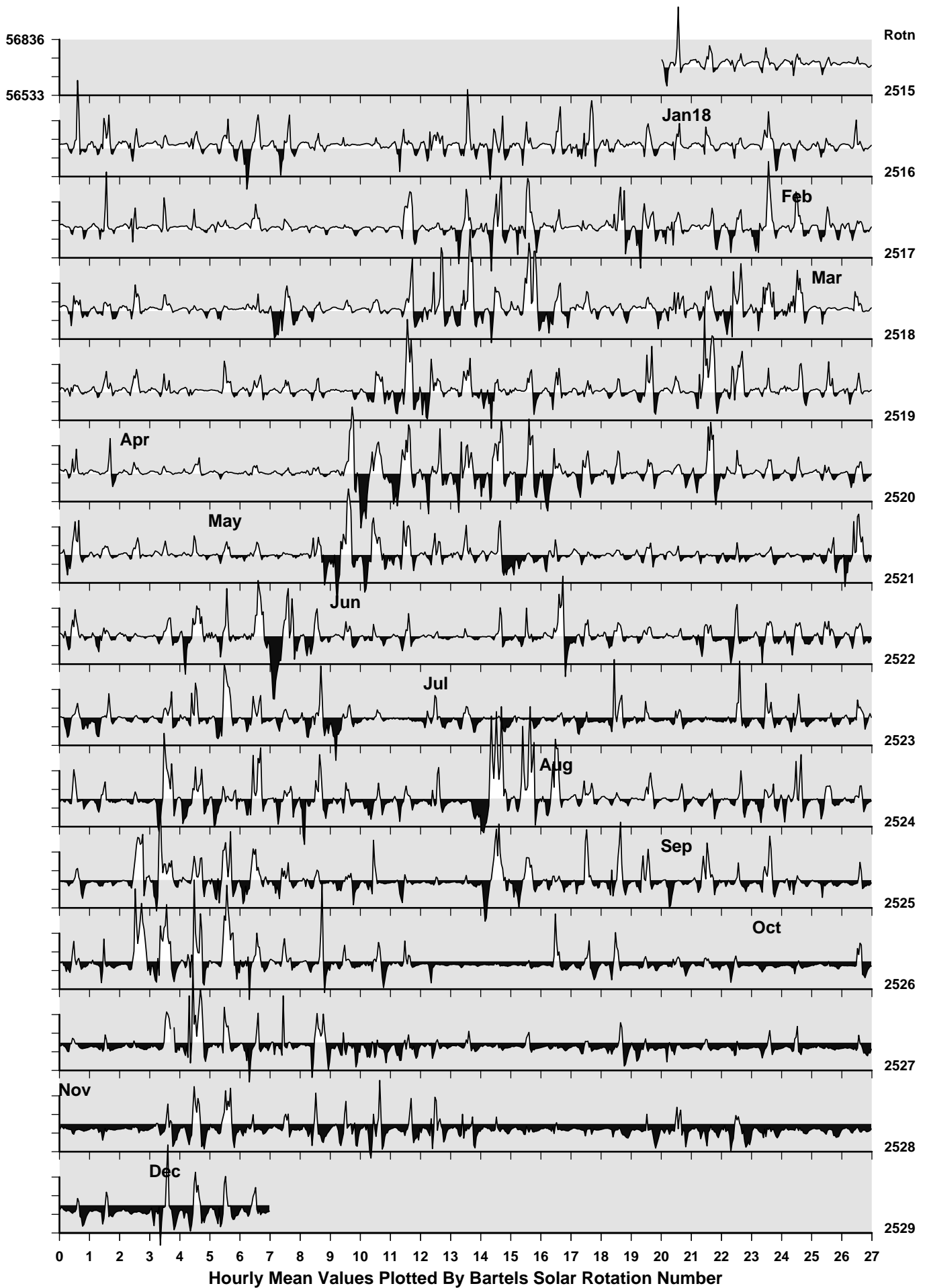


# Jim Carrigan Observatory: Horizontal Intensity (nT)



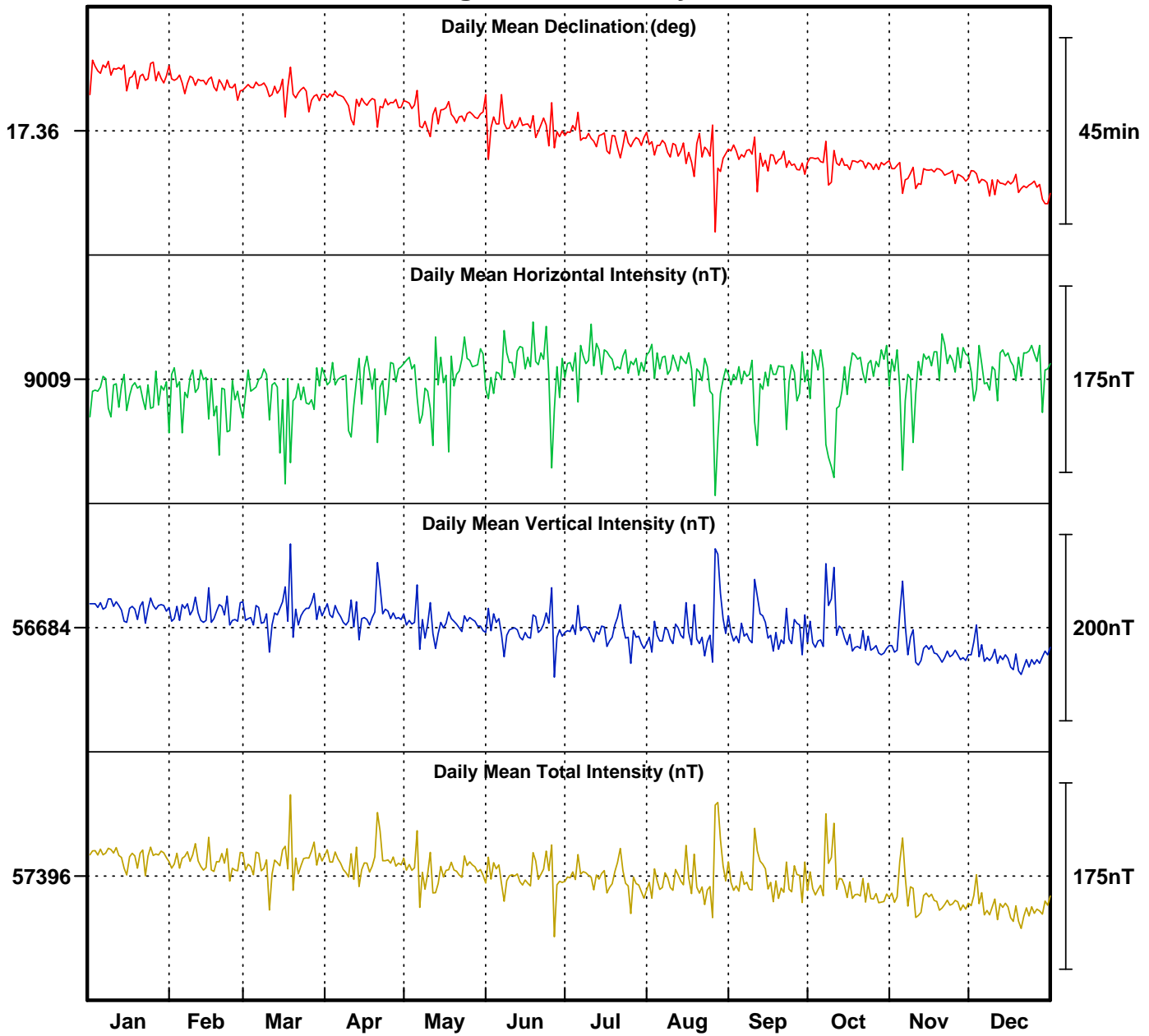
Hourly Mean Values Plotted By Bartels Solar Rotation Number

# Jim Carrigan Observatory: Vertical Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

# Jim Carrigan Observatory 2018



### Monthly Mean Values for Jim Carrigan Observatory 2018

Month	<i>D</i>	<i>H</i>	<i>I</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>
January	17° 35.7′	8995 nT	80° 59.2′	8574 nT	2719 nT	56706 nT	57415 nT
February	17° 33.2′	8993 nT	80° 59.3′	8574 nT	2712 nT	56701 nT	57410 nT
March	17° 31.4′	8994 nT	80° 59.2′	8577 nT	2708 nT	56701 nT	57409 nT
April	17° 28.5′	9005 nT	80° 58.6′	8589 nT	2704 nT	56700 nT	57410 nT
May	17° 25.9′	9011 nT	80° 58.1′	8597 nT	2699 nT	56688 nT	57400 nT
June	17° 22.8′	9019 nT	80° 57.5′	8607 nT	2694 nT	56683 nT	57396 nT
July	17° 20.0′	9027 nT	80° 57.1′	8617 nT	2689 nT	56679 nT	57393 nT
August	17° 16.3′	9013 nT	80° 57.9′	8607 nT	2676 nT	56684 nT	57396 nT
September	17° 14.8′	9008 nT	80° 58.2′	8603 nT	2671 nT	56681 nT	57392 nT
October	17° 14.0′	9007 nT	80° 58.2′	8603 nT	2669 nT	56676 nT	57387 nT
November	17° 11.3′	9018 nT	80° 57.4′	8616 nT	2665 nT	56662 nT	57375 nT
December	17° 08.7′	9020 nT	80° 57.2′	8619 nT	2659 nT	56652 nT	57366 nT

#### Note

i. The values shown here are provisional.