

**BRITISH GEOLOGICAL SURVEY**

**Sable Island  
Observatory  
Monthly  
Magnetic  
Bulletin**

**September 2013**

**13/09/SB**



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

## SABLE ISLAND OBSERVATORY MAGNETIC DATA

### 1. Introduction

Sable Island geomagnetic observatory was established by the British Geological Survey (BGS). The installation was a joint venture between BGS, Halliburton (Sperry Drilling Services at the time), and Sable Offshore Energy in support of directional drilling programmes. The observatory became operational from 8th May 1999. Halliburton discontinued their involvement from 2011 and BGS continued the observatory operations with support from Environment Canada.

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:

Geomagnetism Team  
Earth Hazards and Systems  
British Geological Survey  
Murchison House, West Mains Road  
Edinburgh EH9 3LA  
Scotland, UK

Tel: +44 (0) 131 667 1000  
Fax: +44 (0) 131 650 0265  
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

The Island is a sandbank formed by the meeting of currents from the St. Lawrence Delta and the Gulf Stream and is located approximately 290km southeast of Halifax, Nova Scotia. The observatory co-ordinates are:-

*Geographic:* 43°55'55"N 299°59'28"E  
*Geomagnetic:* 53°26'10"N 015°09'22"E  
*Height above mean sea level:* 5m (approx)

The geomagnetic co-ordinates are approximations, calculated using the 11th generation International Geomagnetic Reference Field (IGRF) at epoch 2013.5.

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 in April 2004 and became fully operational from May 2004. 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 0.1Hz.

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 and 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. One set 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

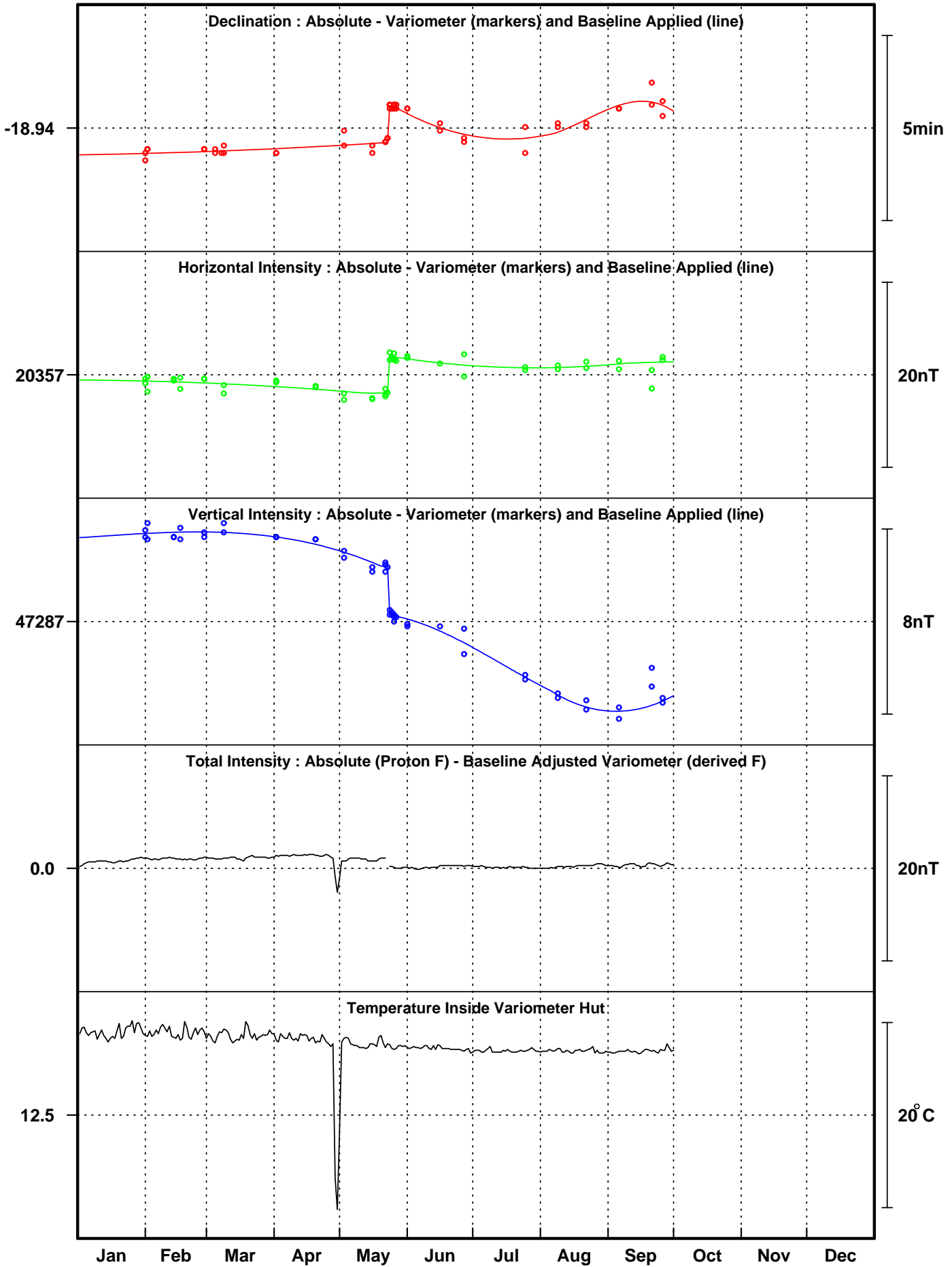
The data presented in this bulletin are provided for personal, academic, educational, non-commercial research or other non-commercial use and are not for sale or distribution to third parties without written permission from BGS.

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 Sable Island magnetic observatory, operated by the British Geological Survey in cooperation with Environment Canada (EC).'

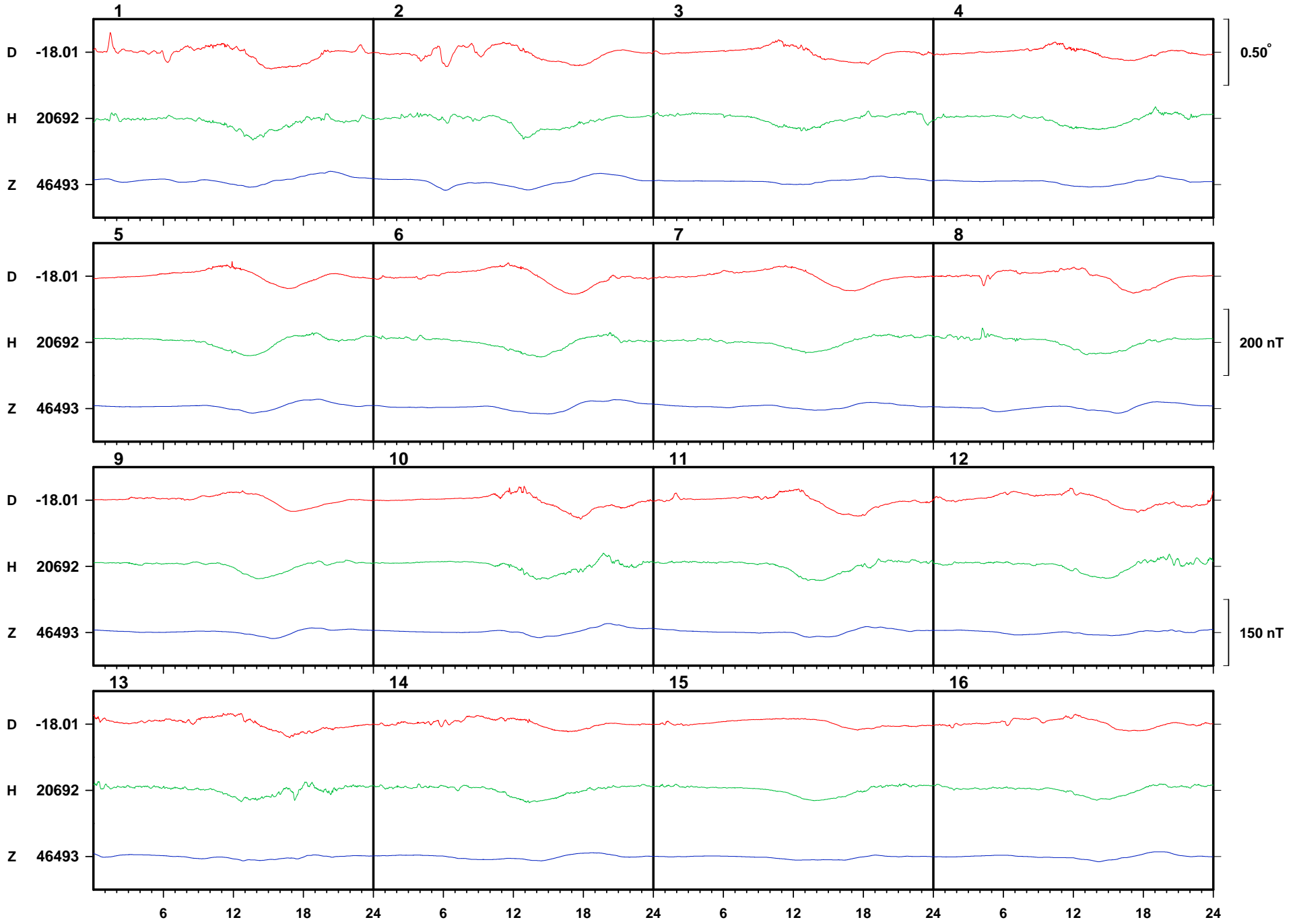
Commercial users can contact the geomagnetism team for information on the range of applications and services offered. Full contact details are available at [www.geomag.bgs.ac.uk/contactus/staff](http://www.geomag.bgs.ac.uk/contactus/staff)

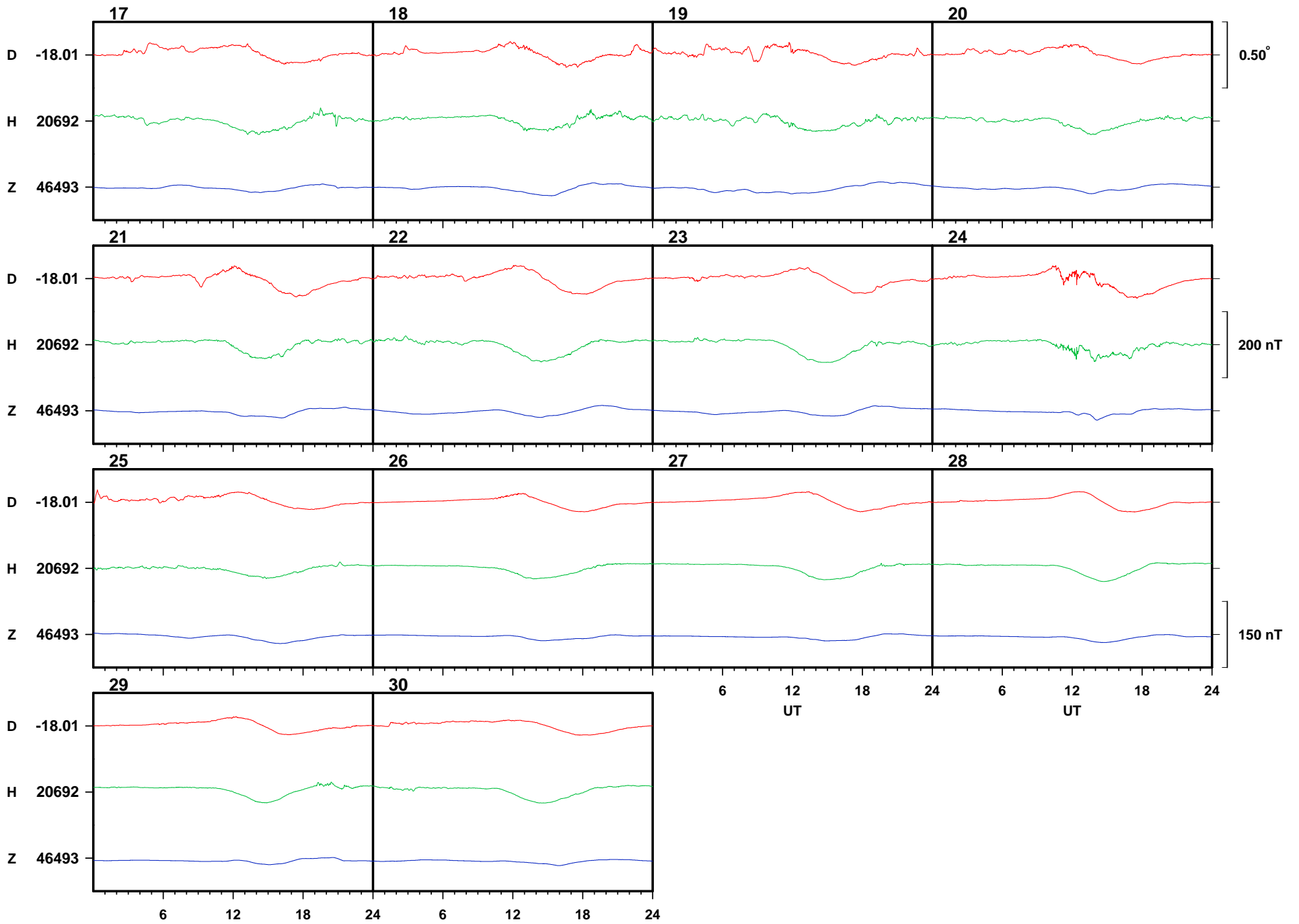


# Sable Island 2013



Sable Island September 2013





Sable Island

September

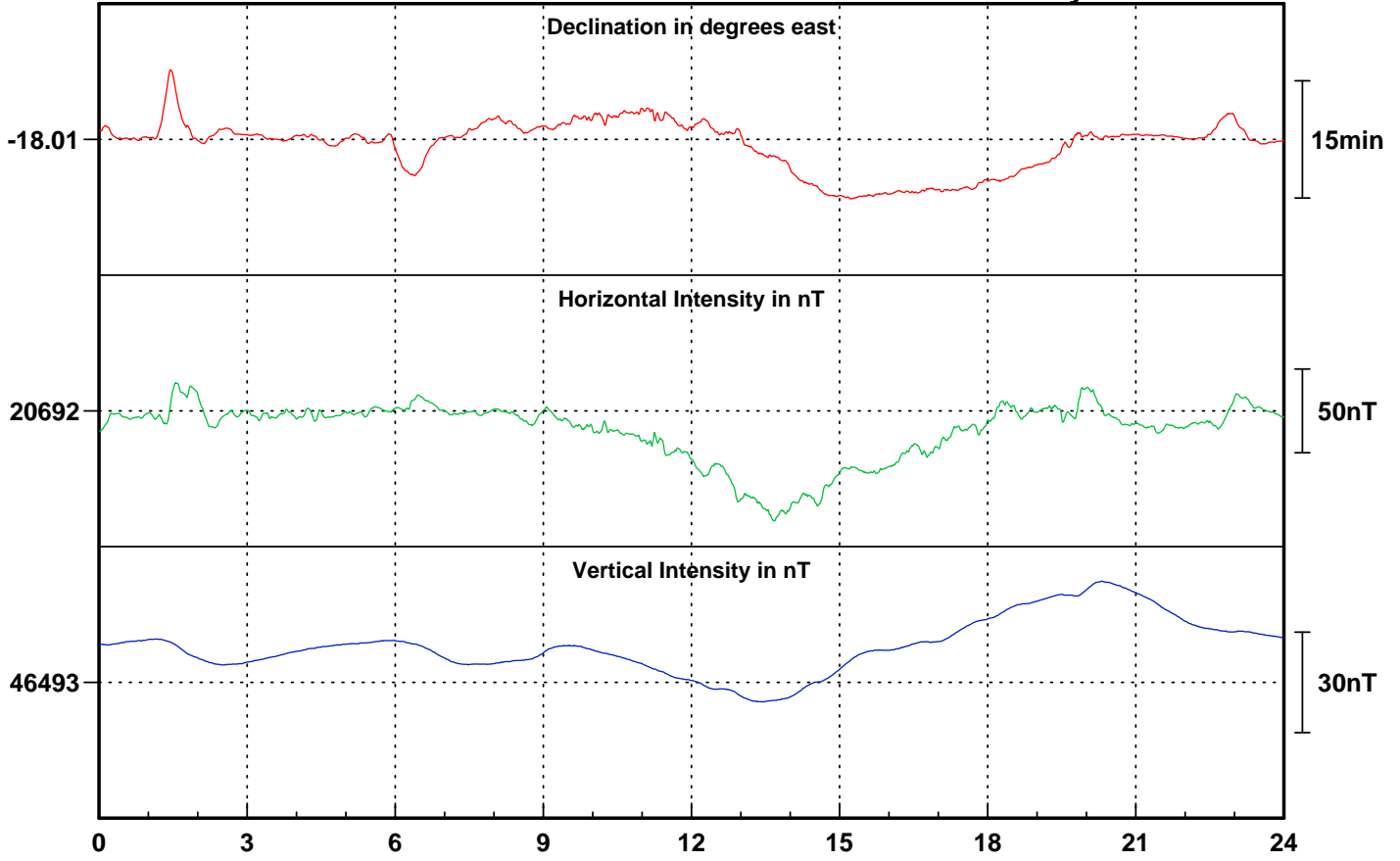
2013



Date: 01-09-2013

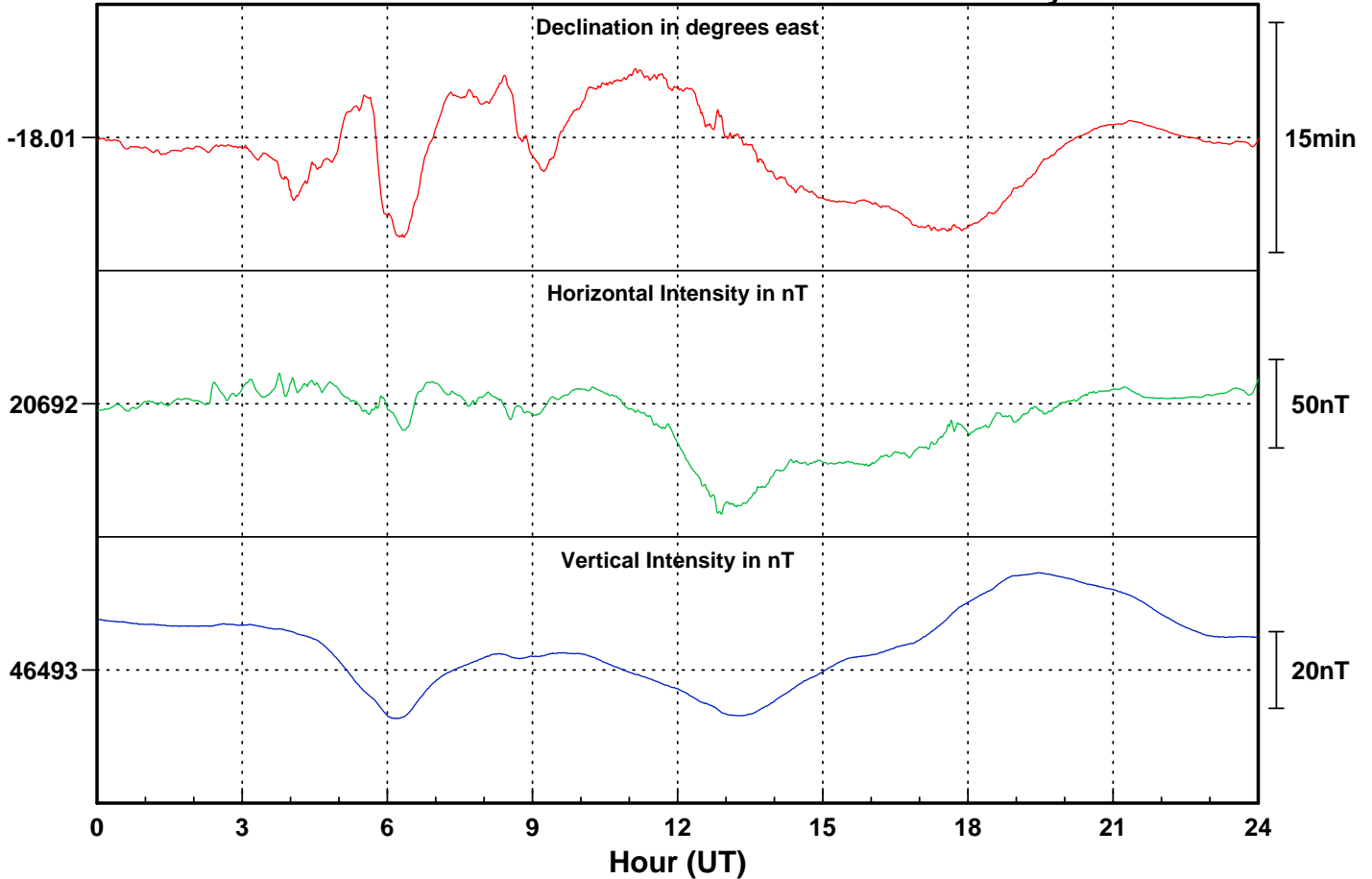
# Sable Island

Day number: 244



Date: 02-09-2013

Day number: 245

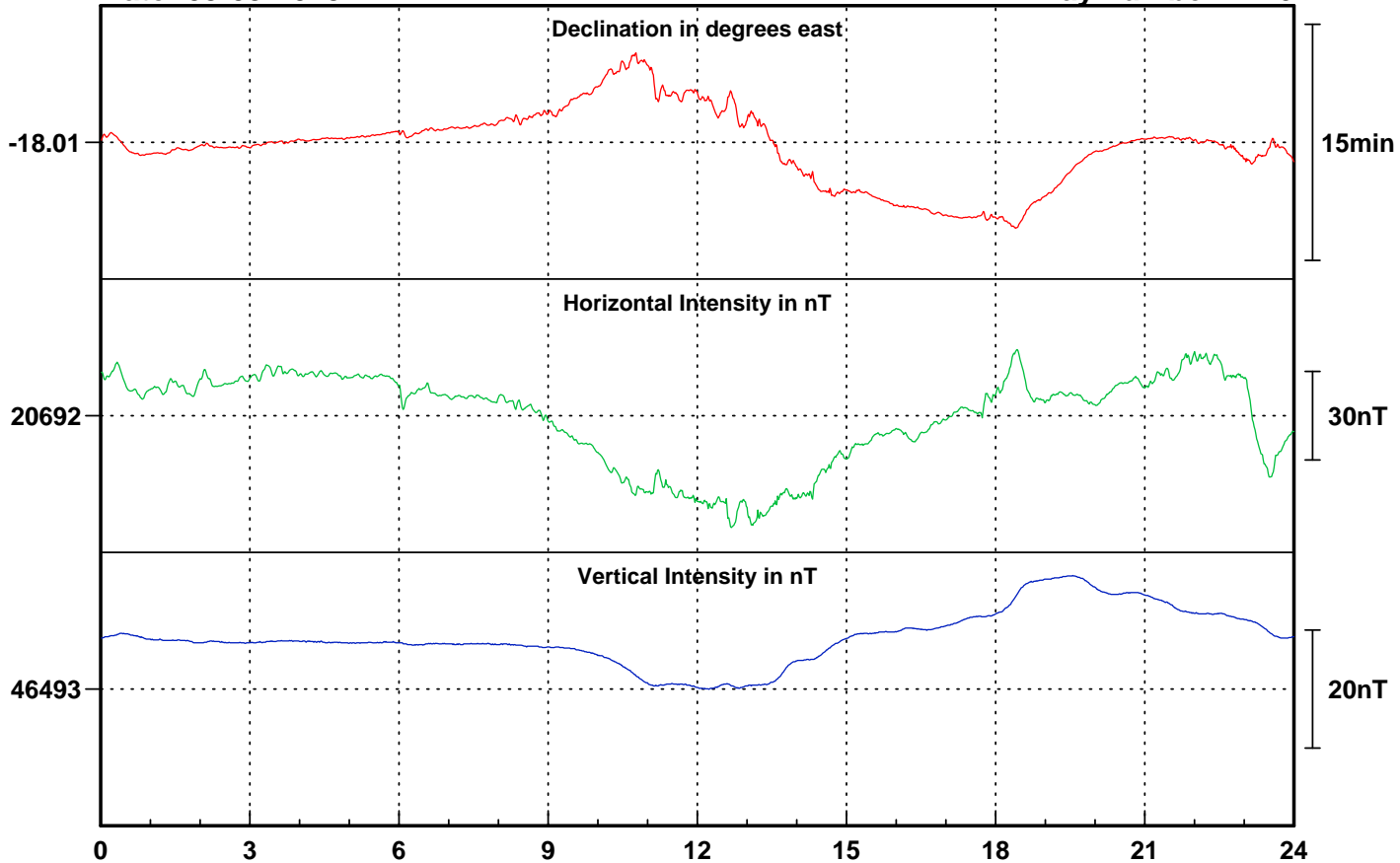




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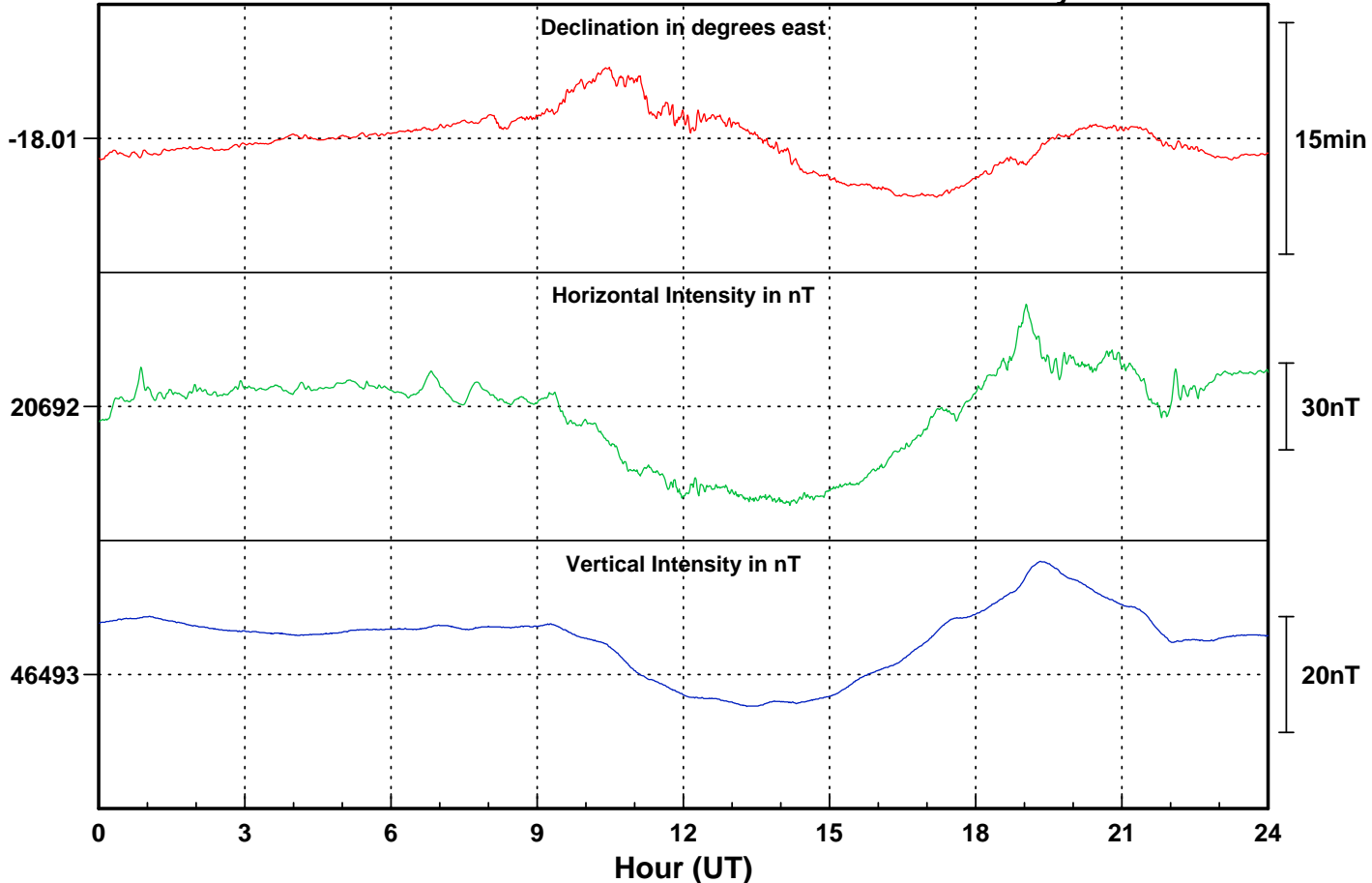
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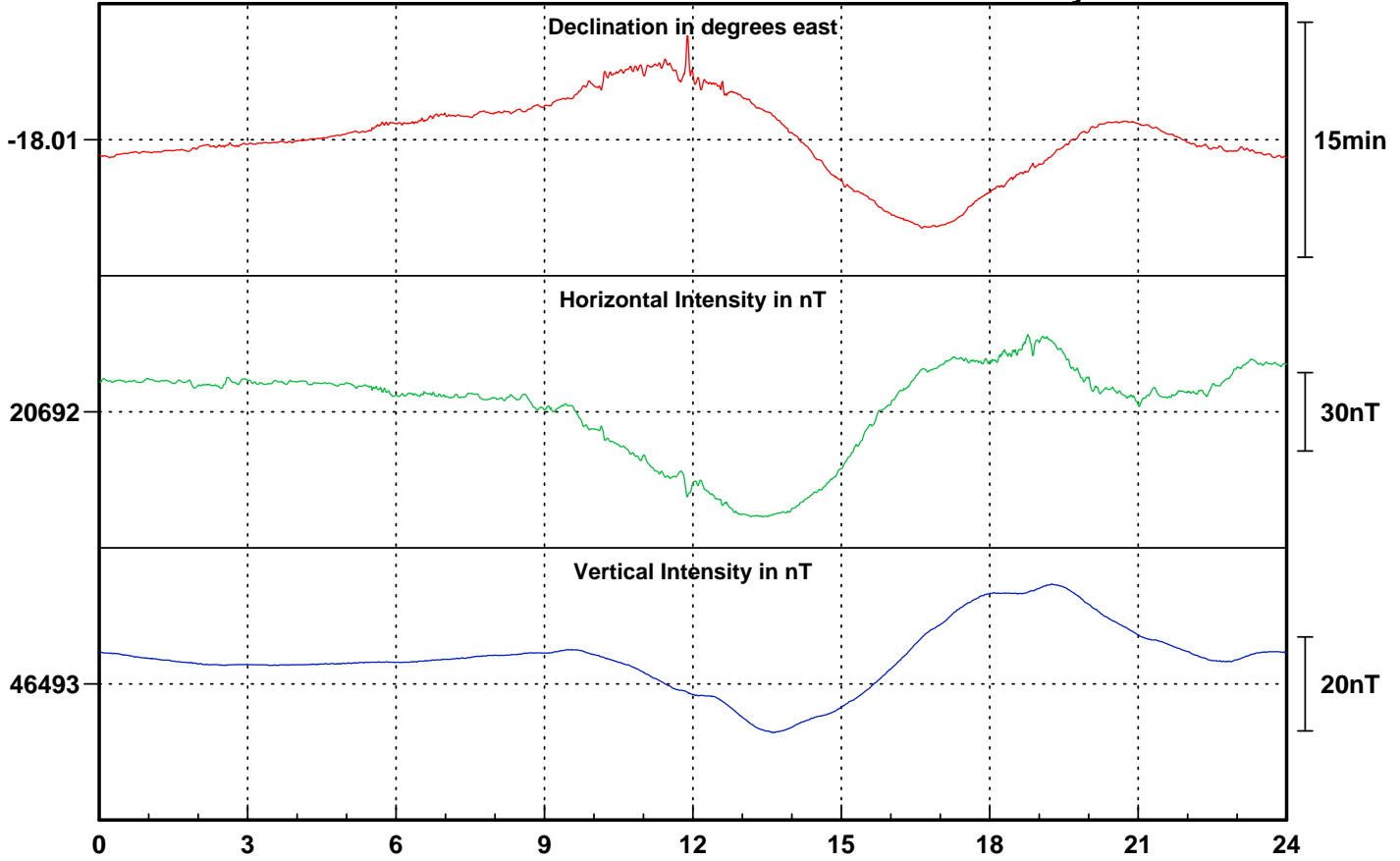
Day number: 247



Date: 05-09-2013

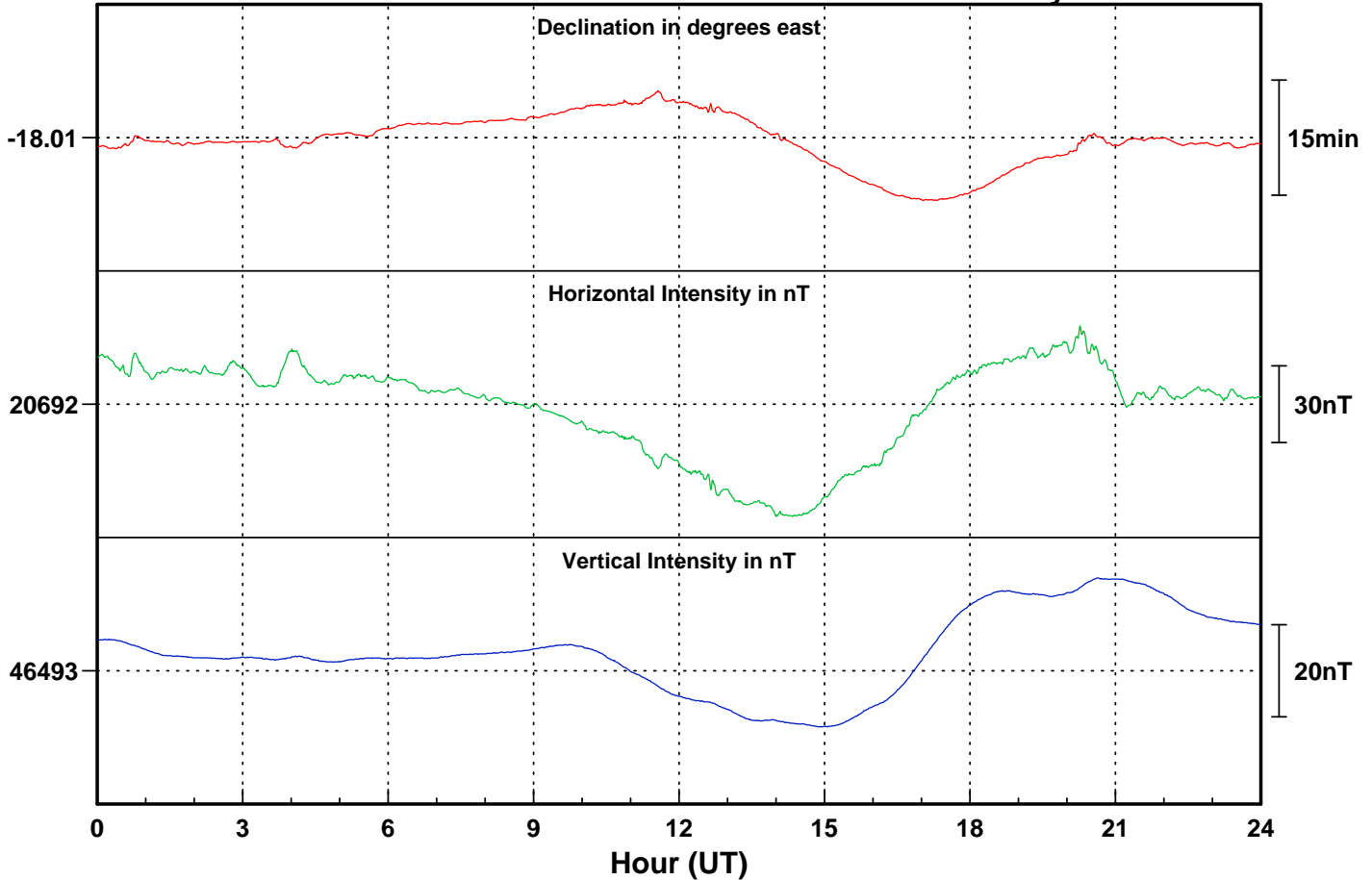
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Day number: 248



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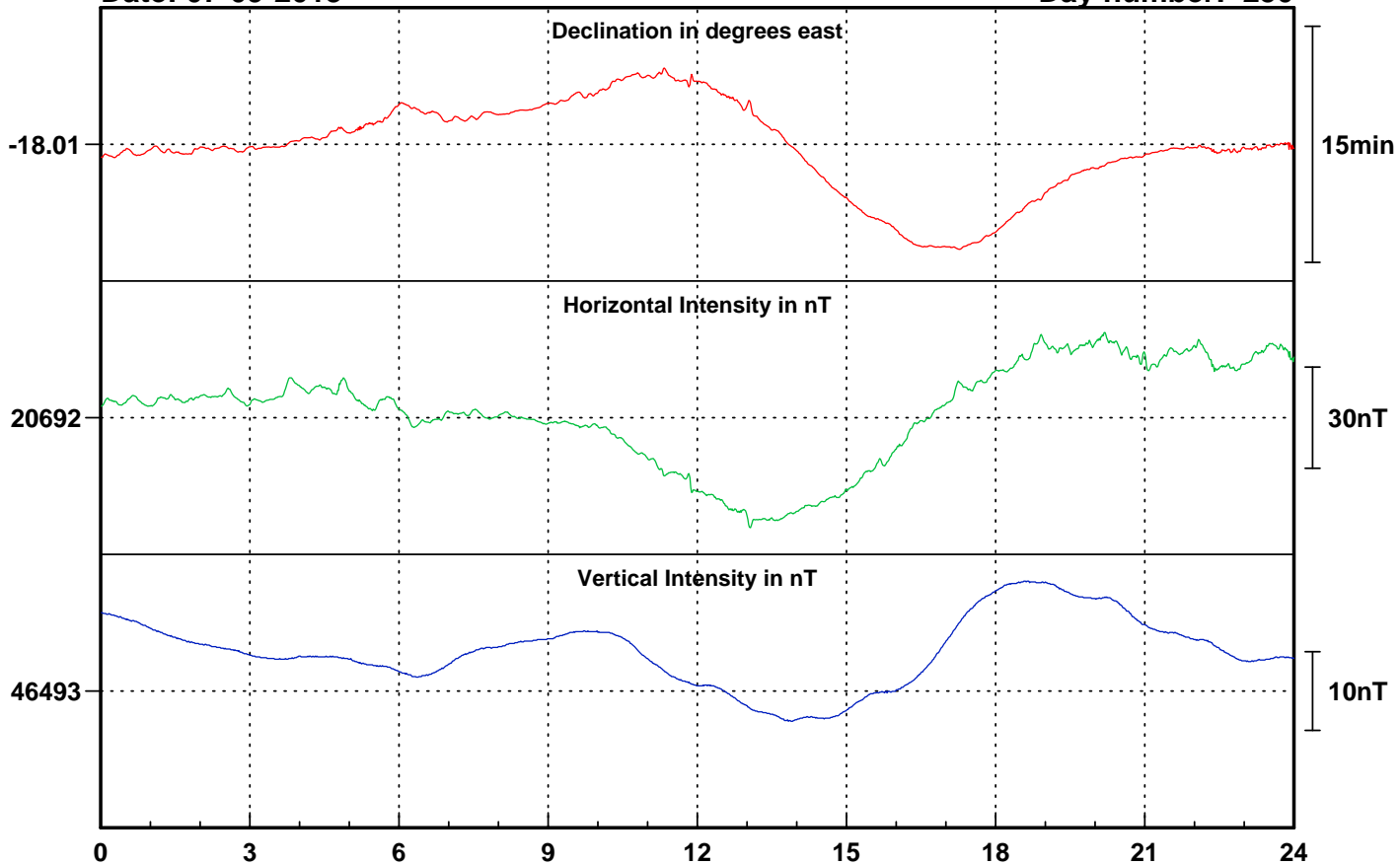
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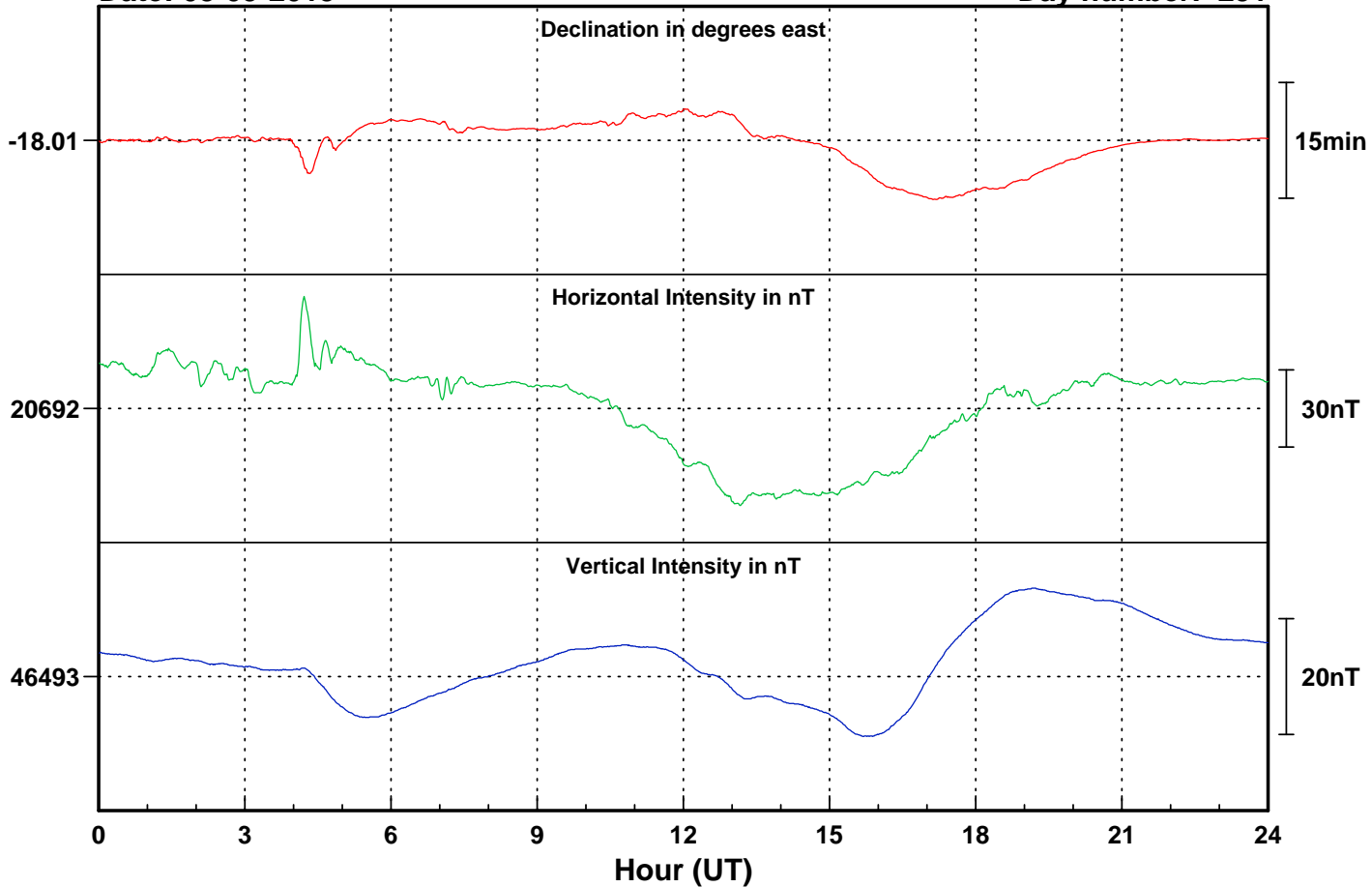
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Day number: 250



Date: 08-09-2013

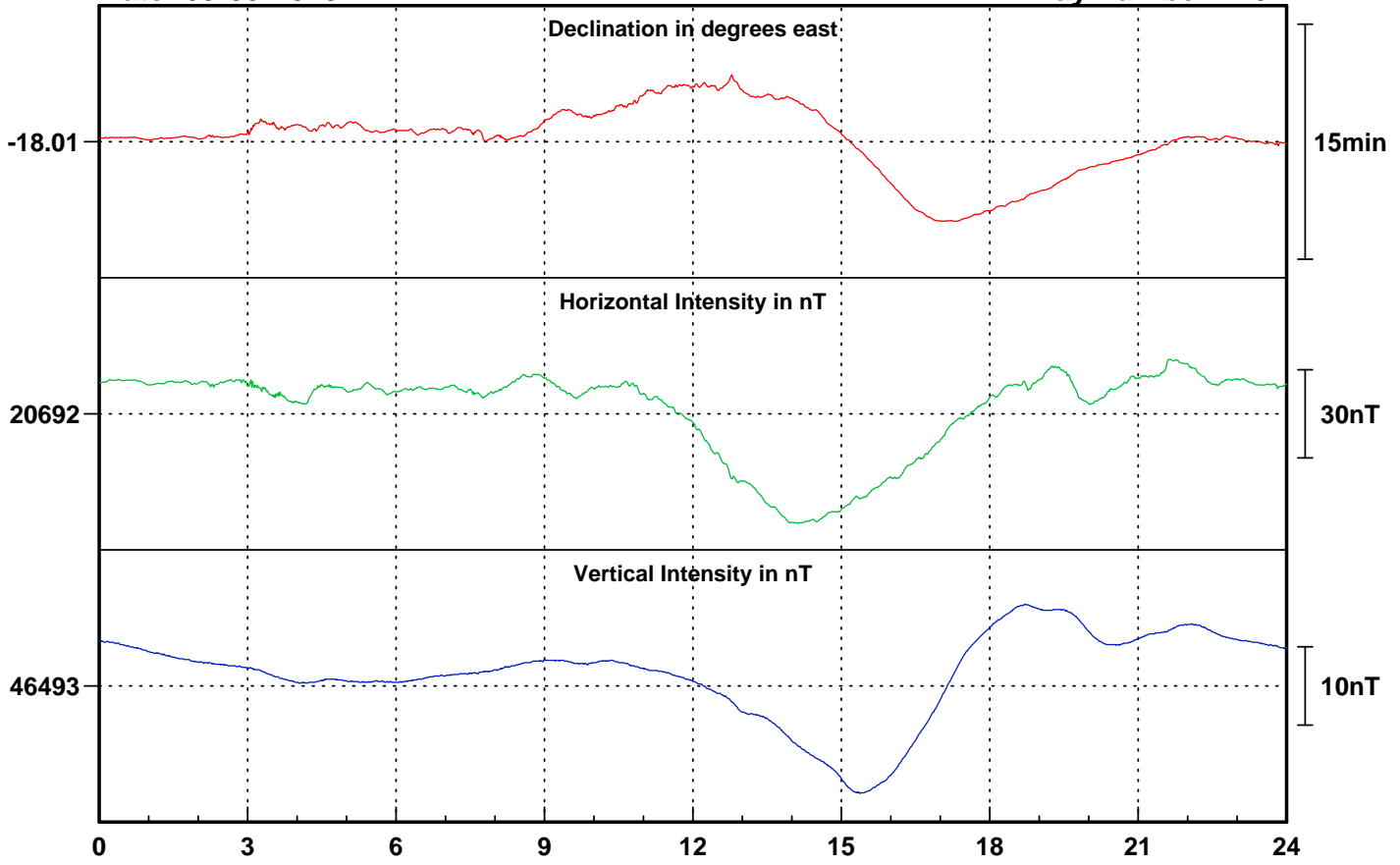
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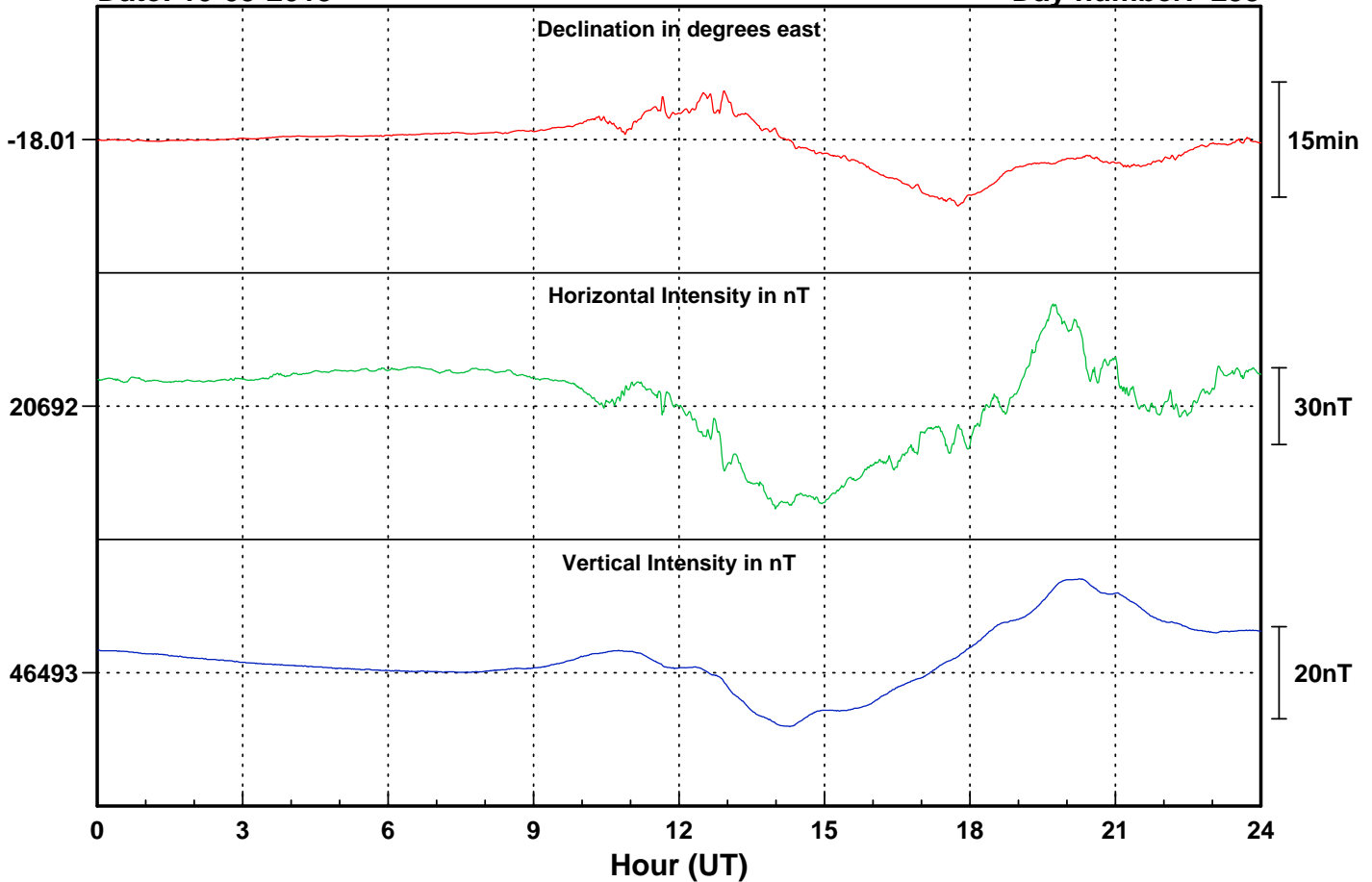
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Day number: 252



Date: 10-09-2013

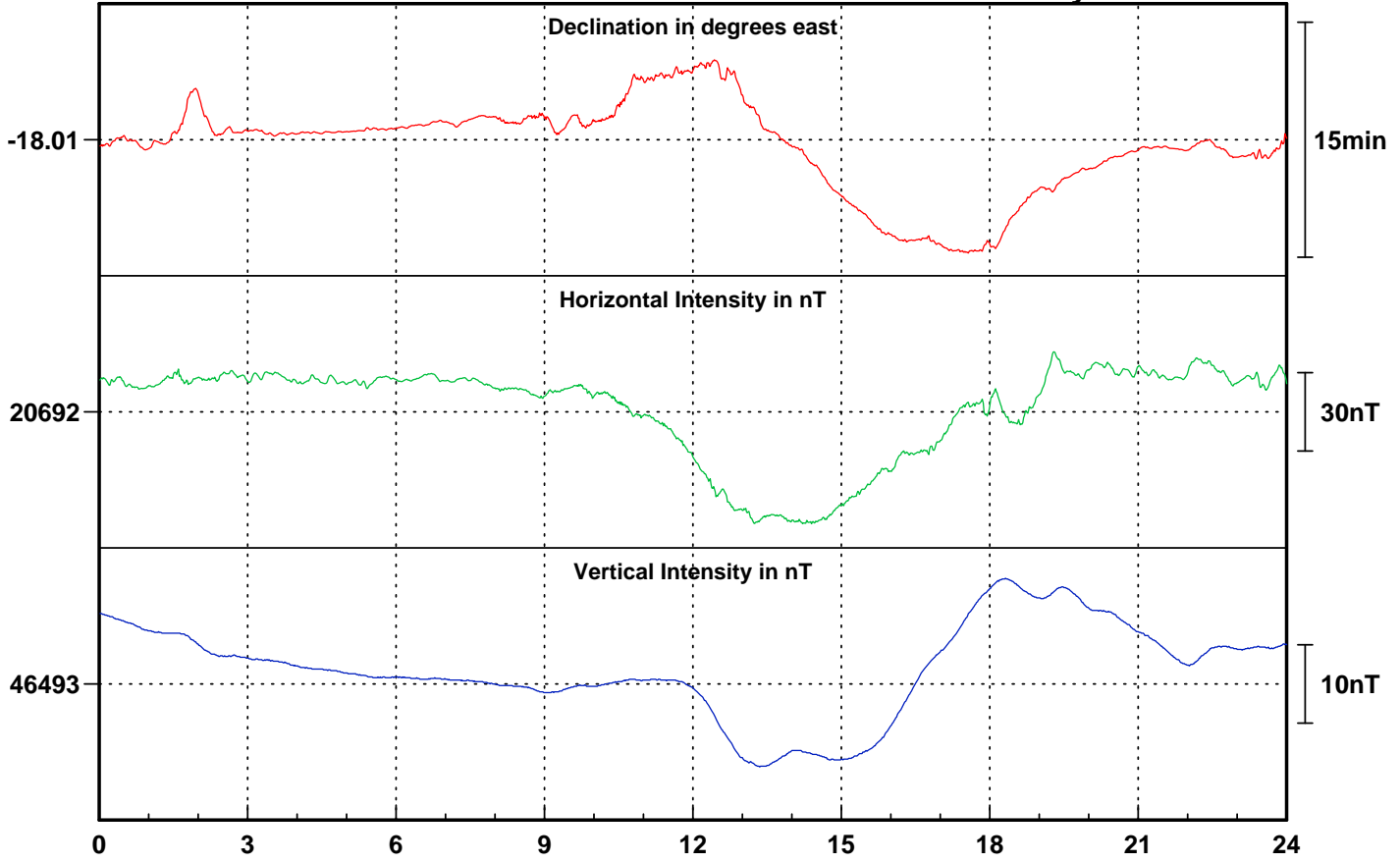
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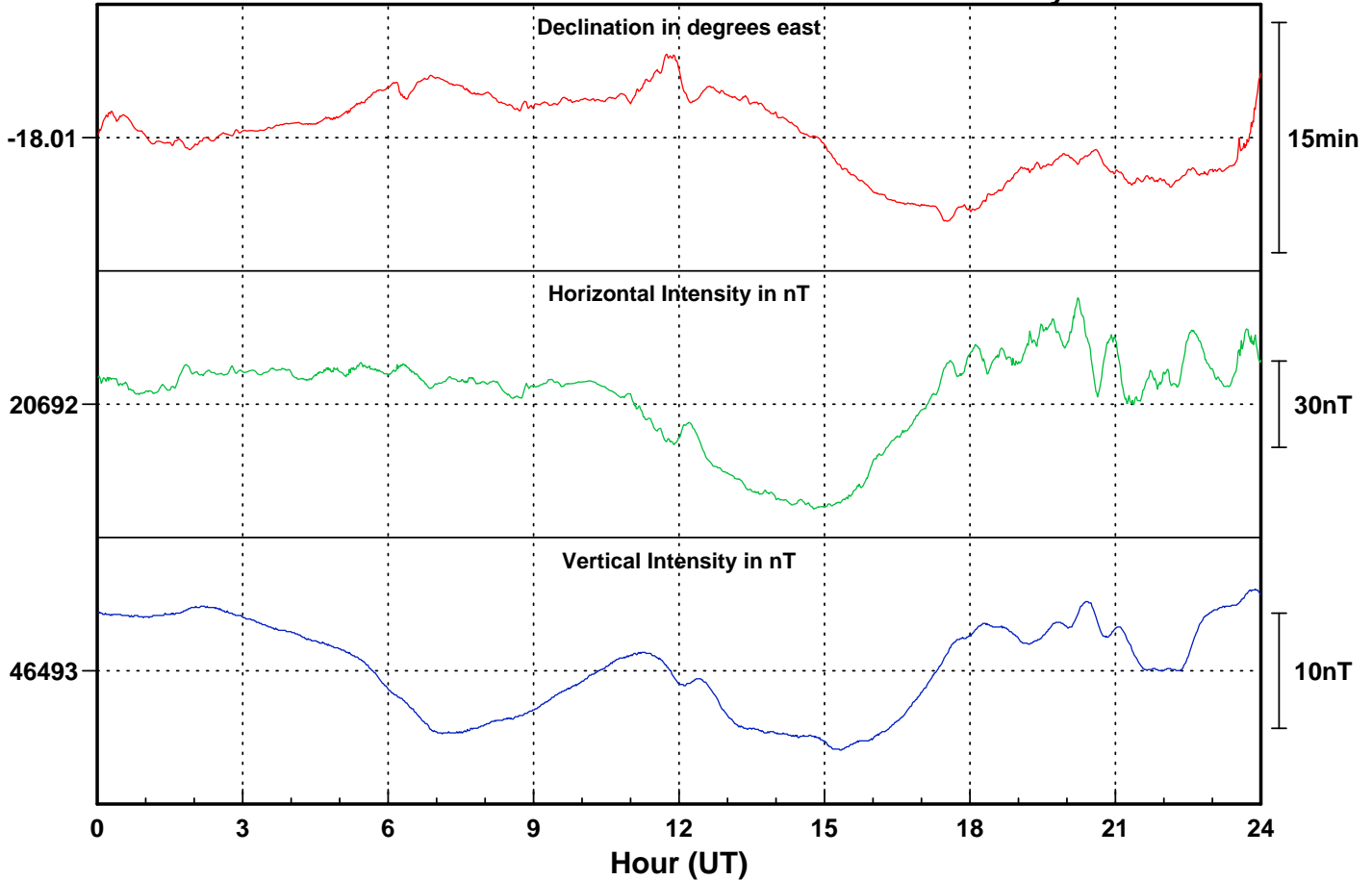
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Day number: 254



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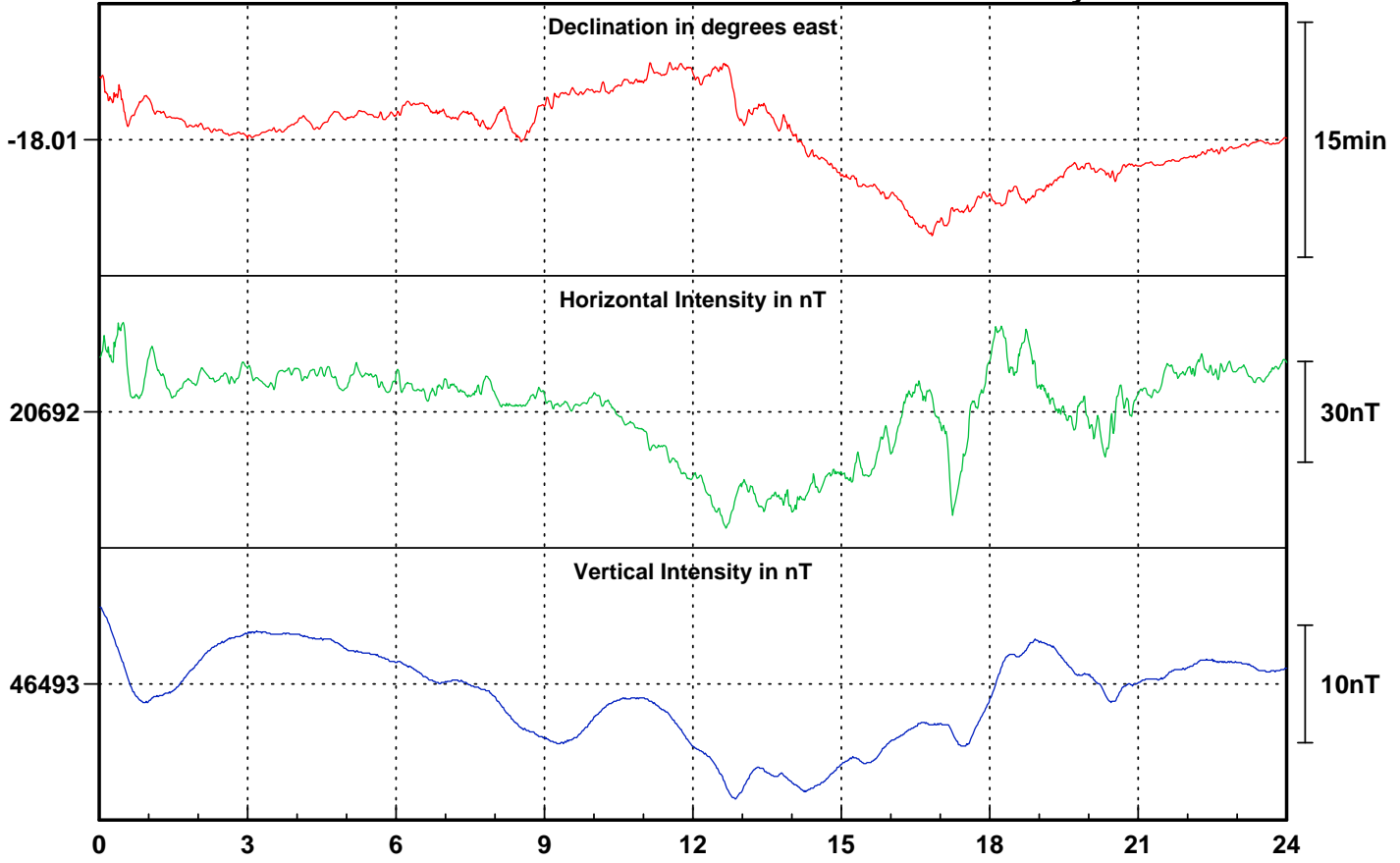
Day number: 255



Date: 13-09-2013

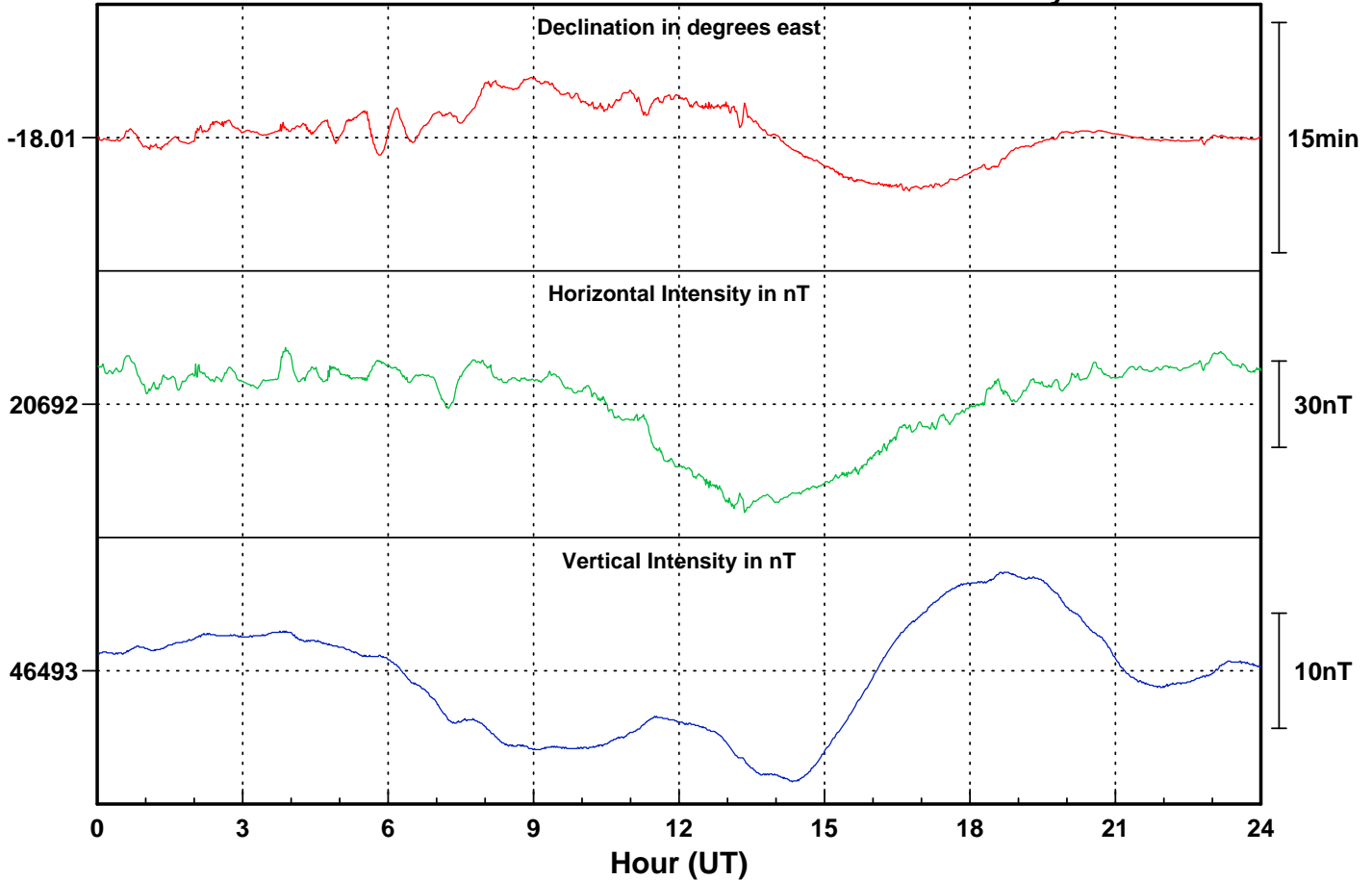
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Day number: 256



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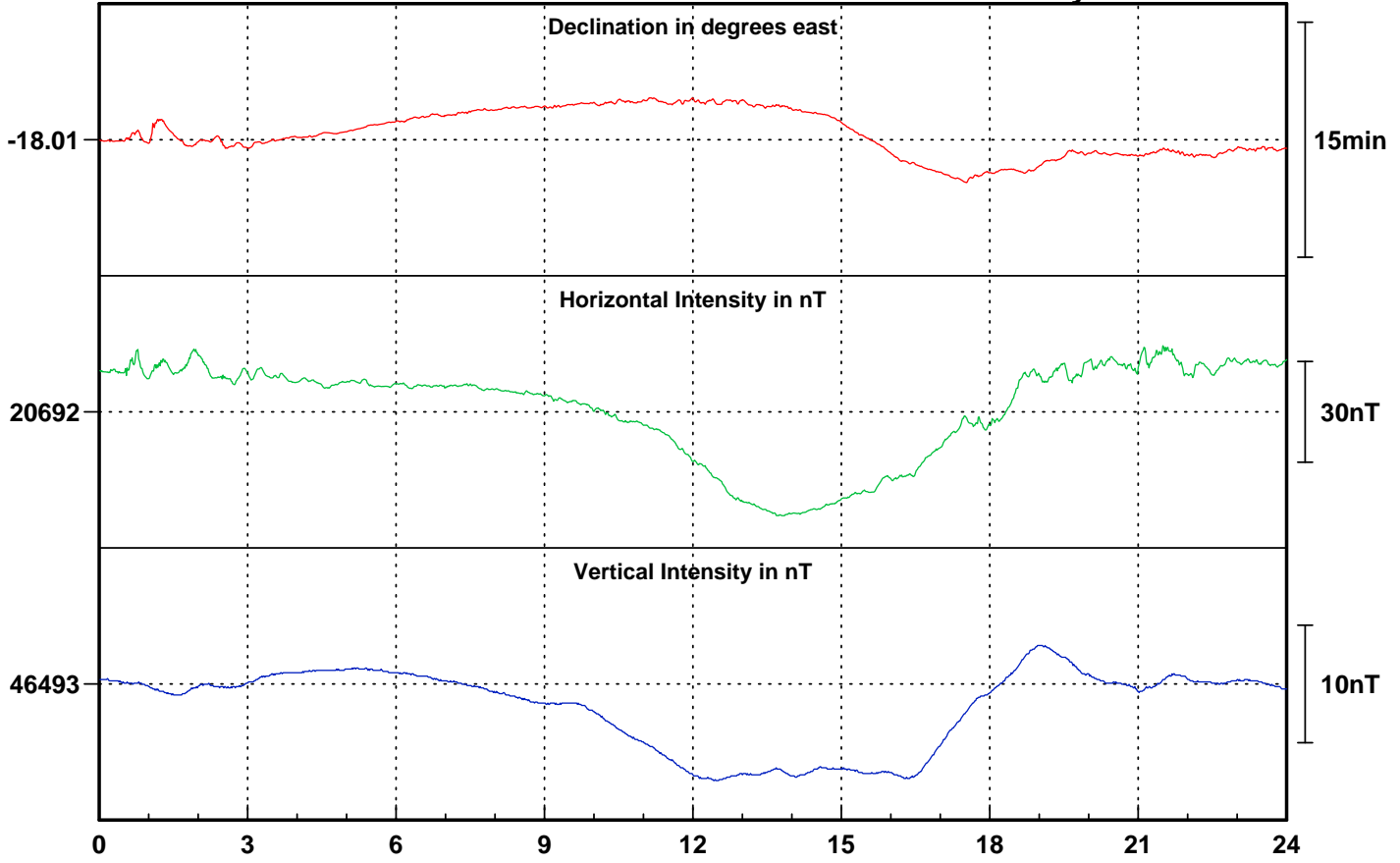
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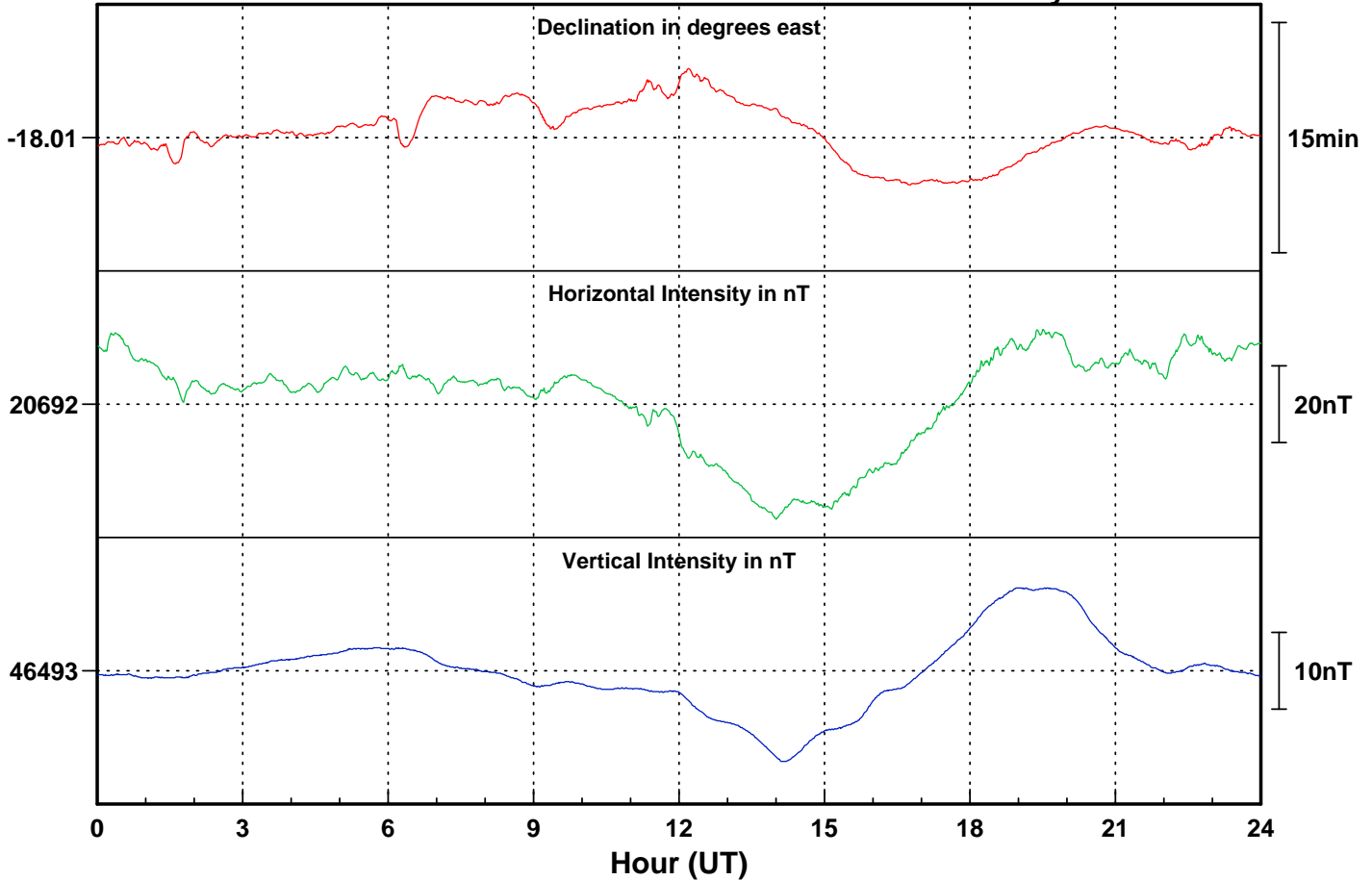
# Sable Island

Day number: 258



Date: 16-09-2013

Day number: 259

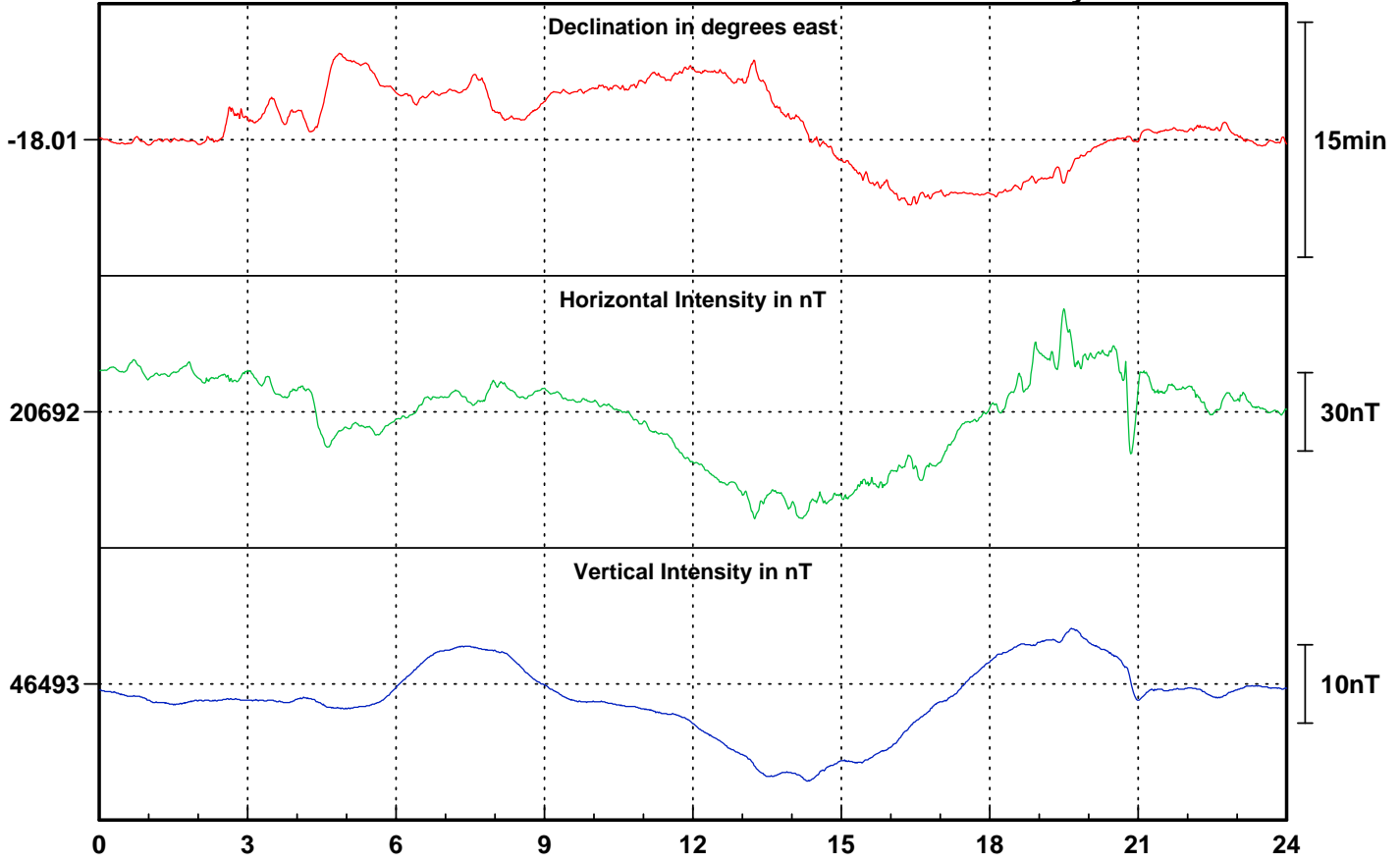




Date: 17-09-2013

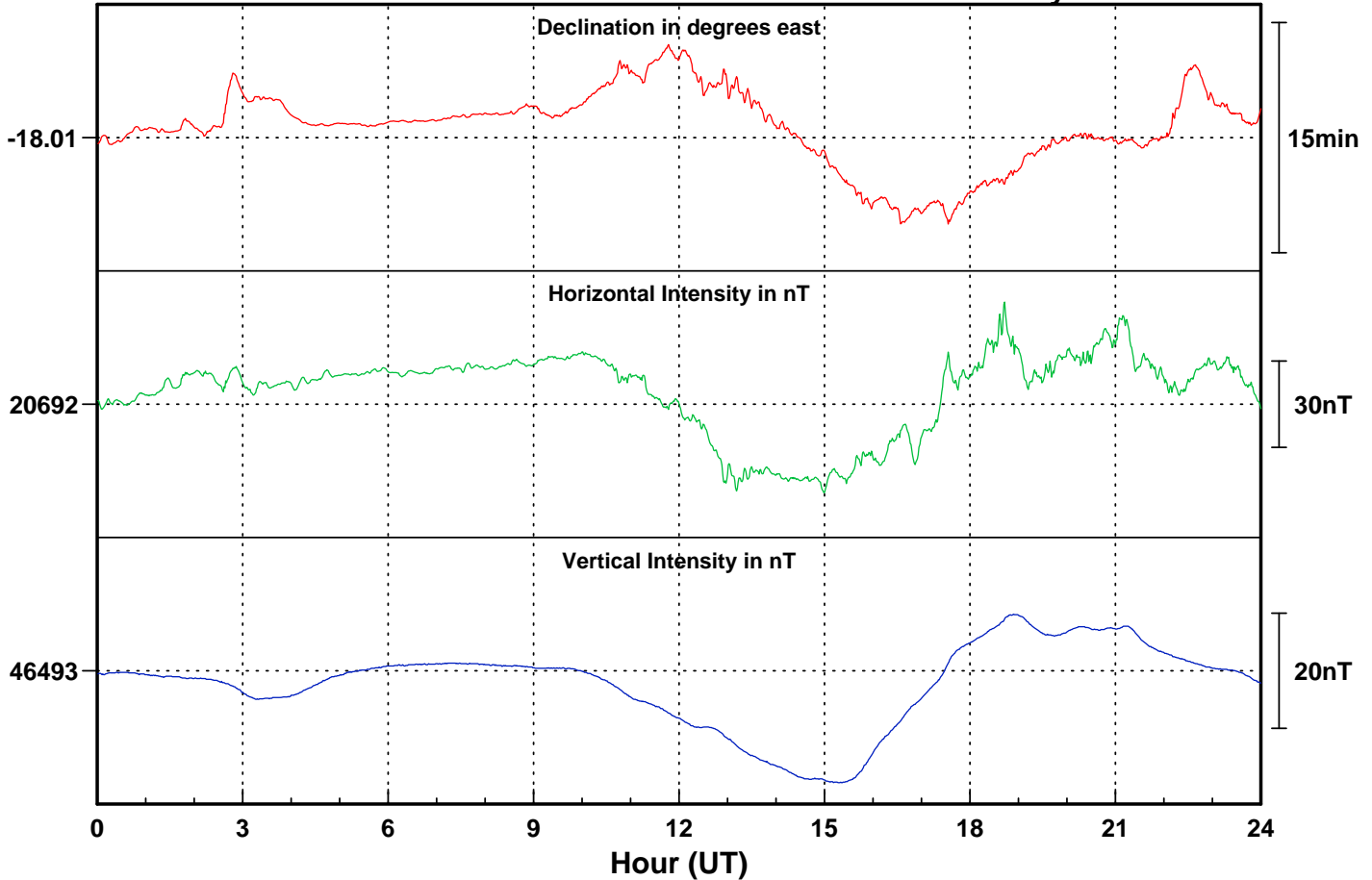
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Day number: 260



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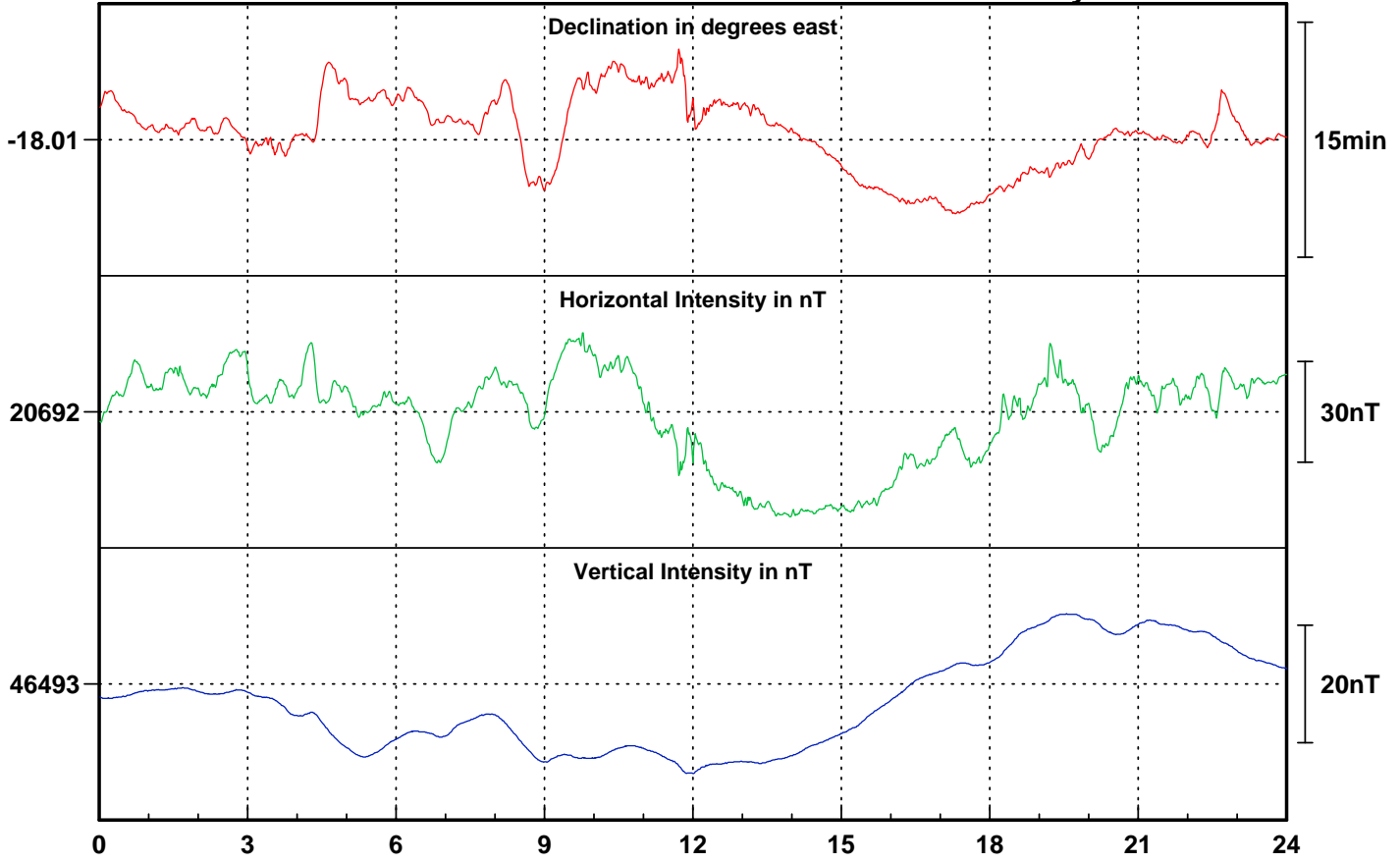
Day number: 261



Date: 19-09-2013

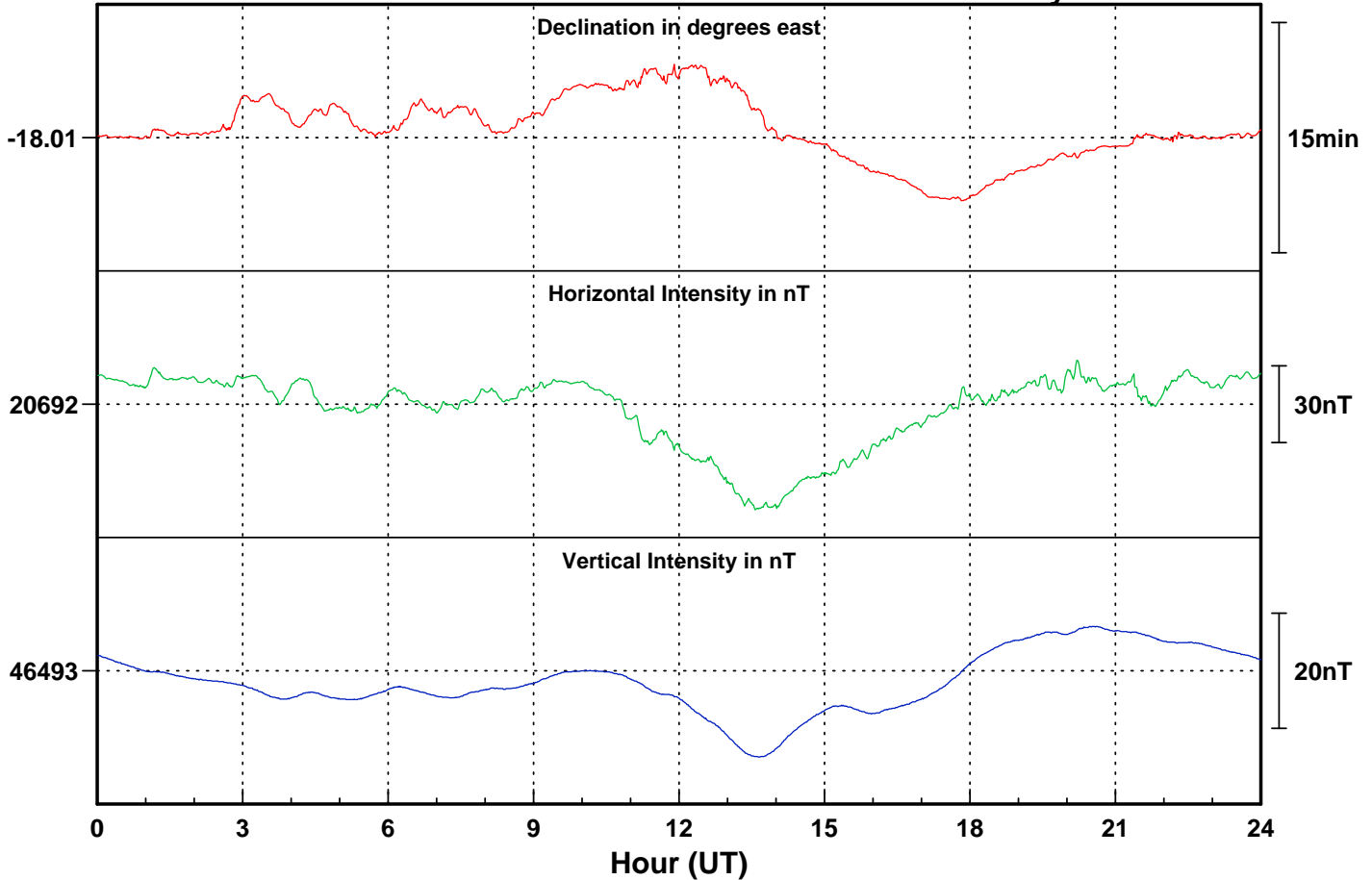
# Sable Island

Day number: 262



Date: 20-09-2013

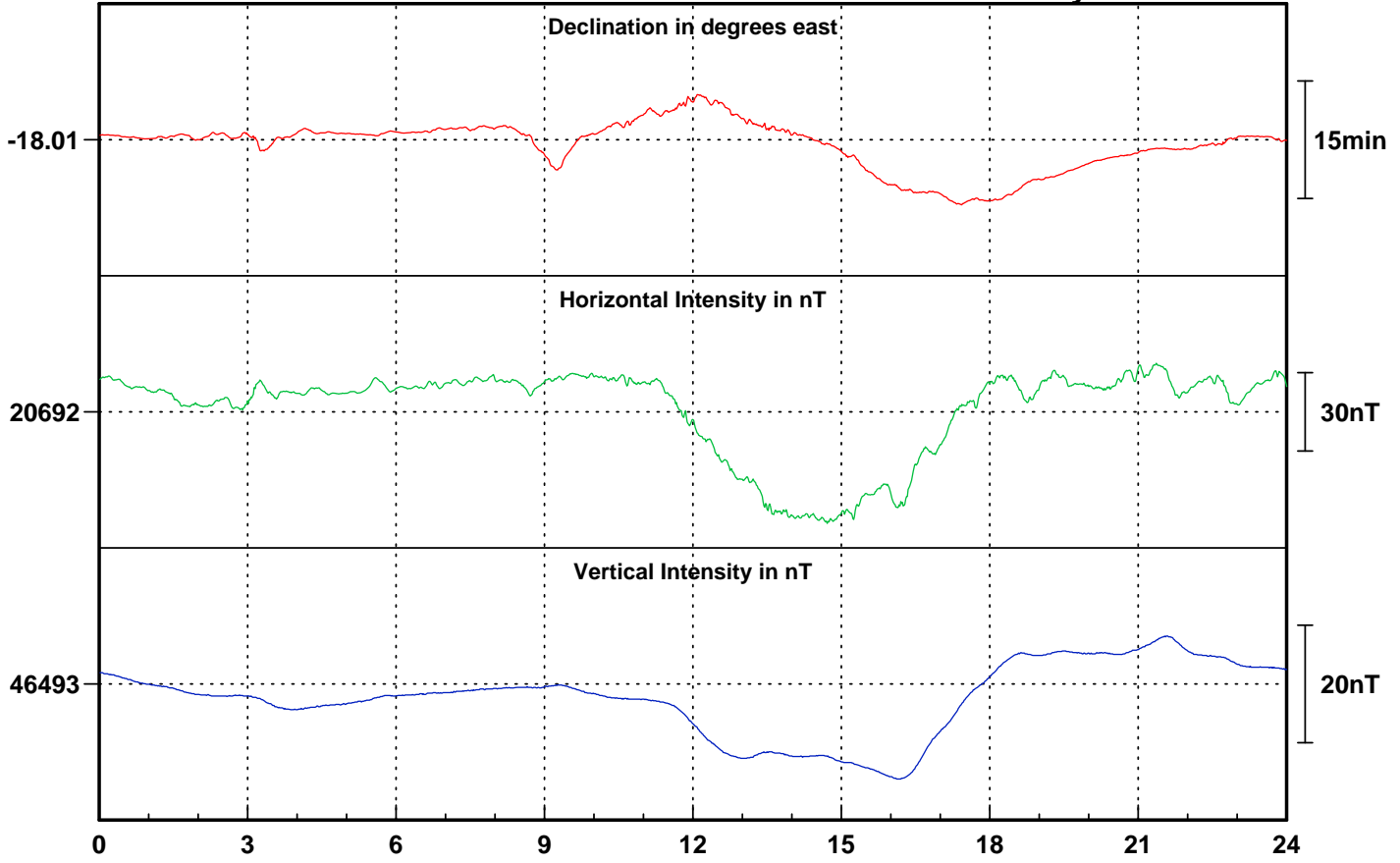
Day number: 263



Date: 21-09-2013

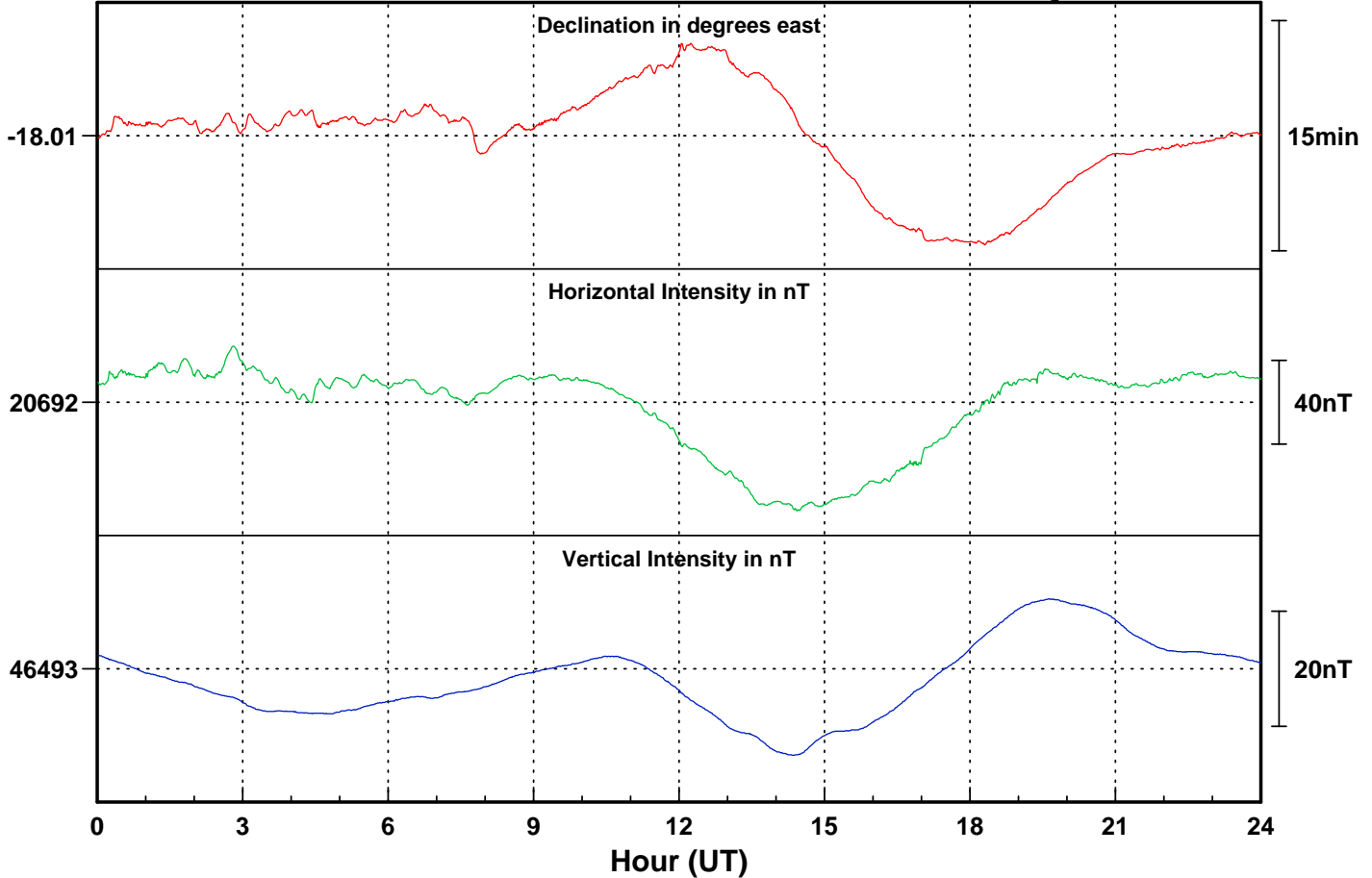
# Sable Island

Day number: 264



Date: 22-09-2013

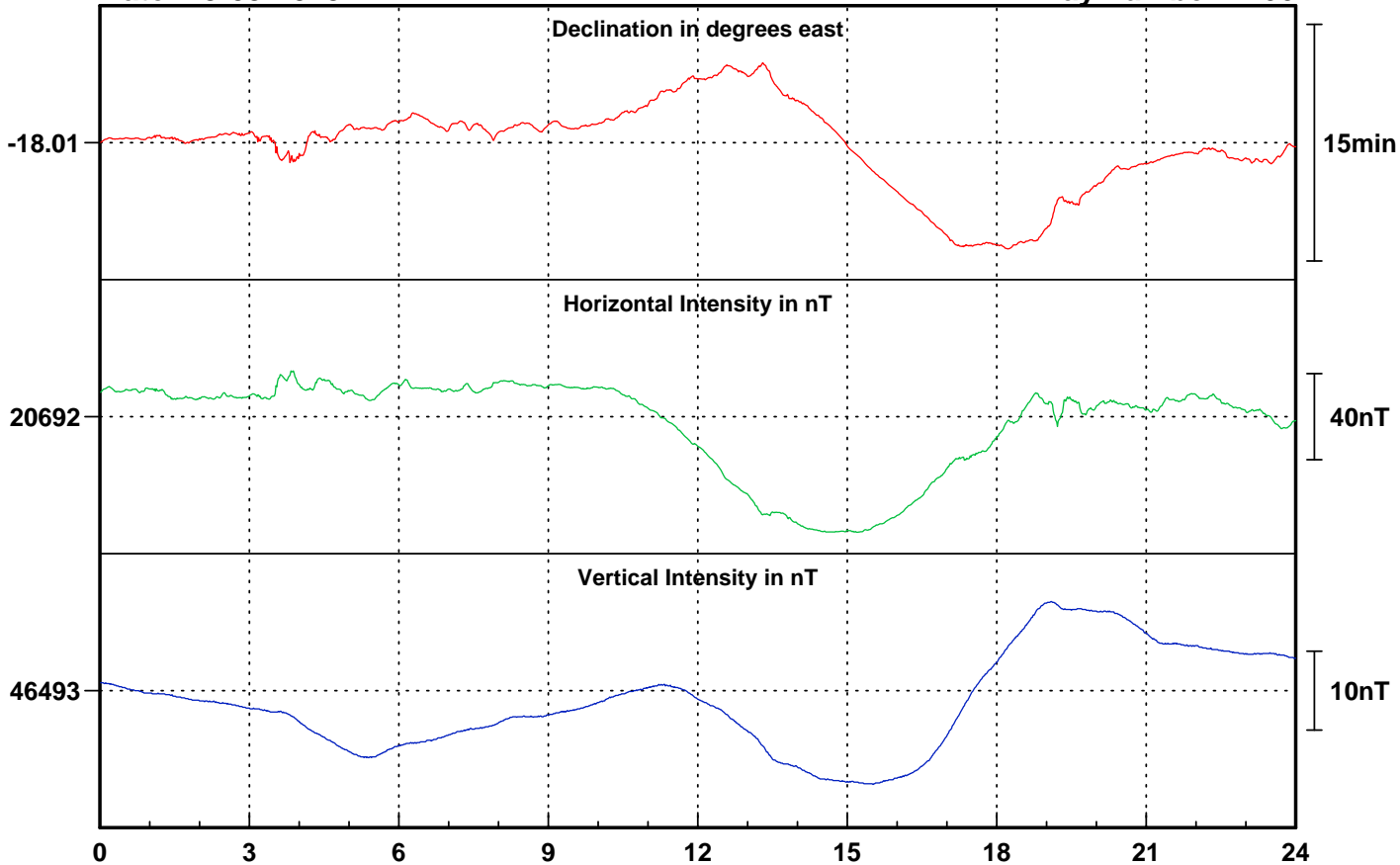
Day number: 265



Date: 23-09-2013

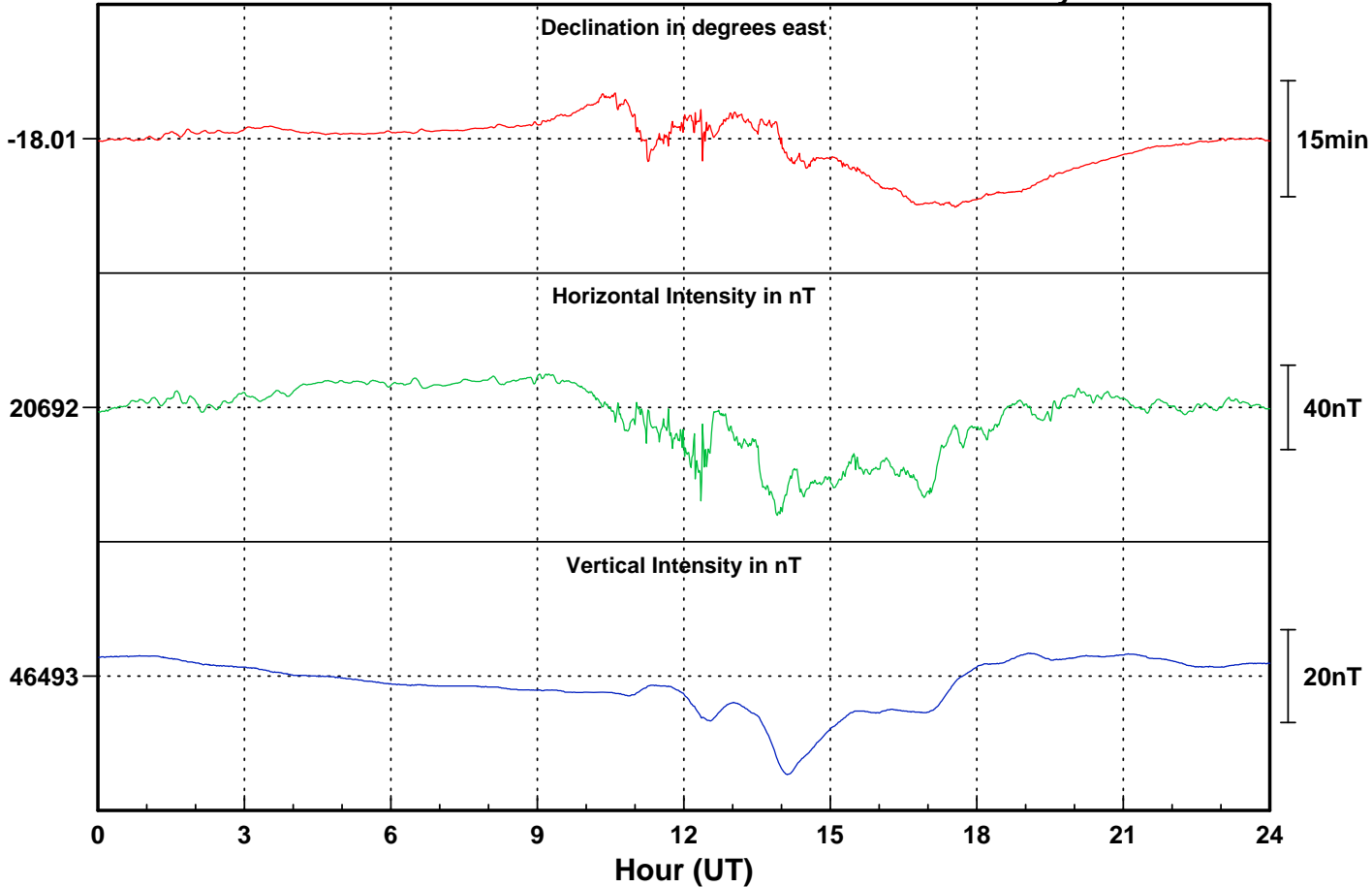
# Sable Island

Day number: 266



Date: 24-09-2013

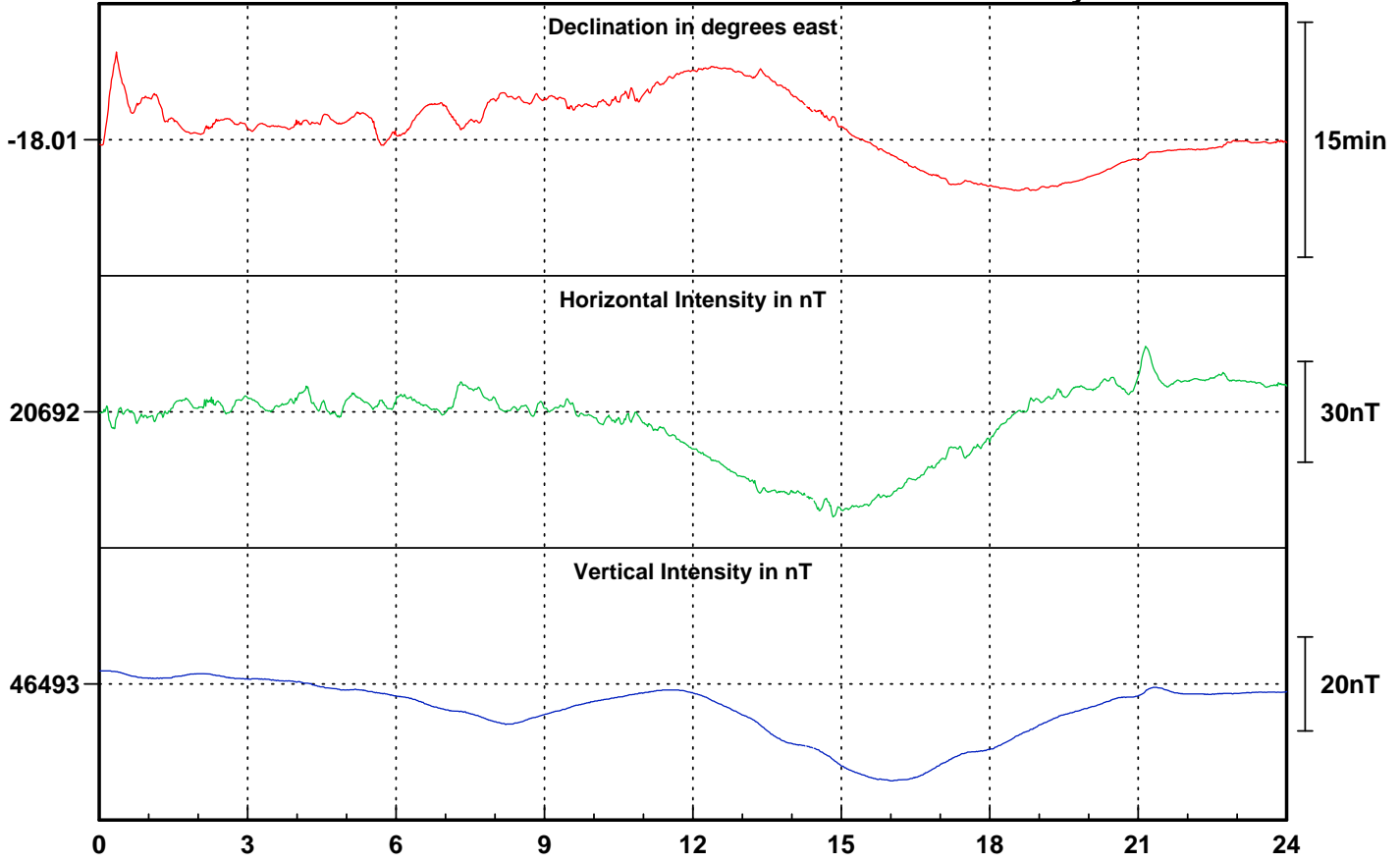
Day number: 267



Date: 25-09-2013

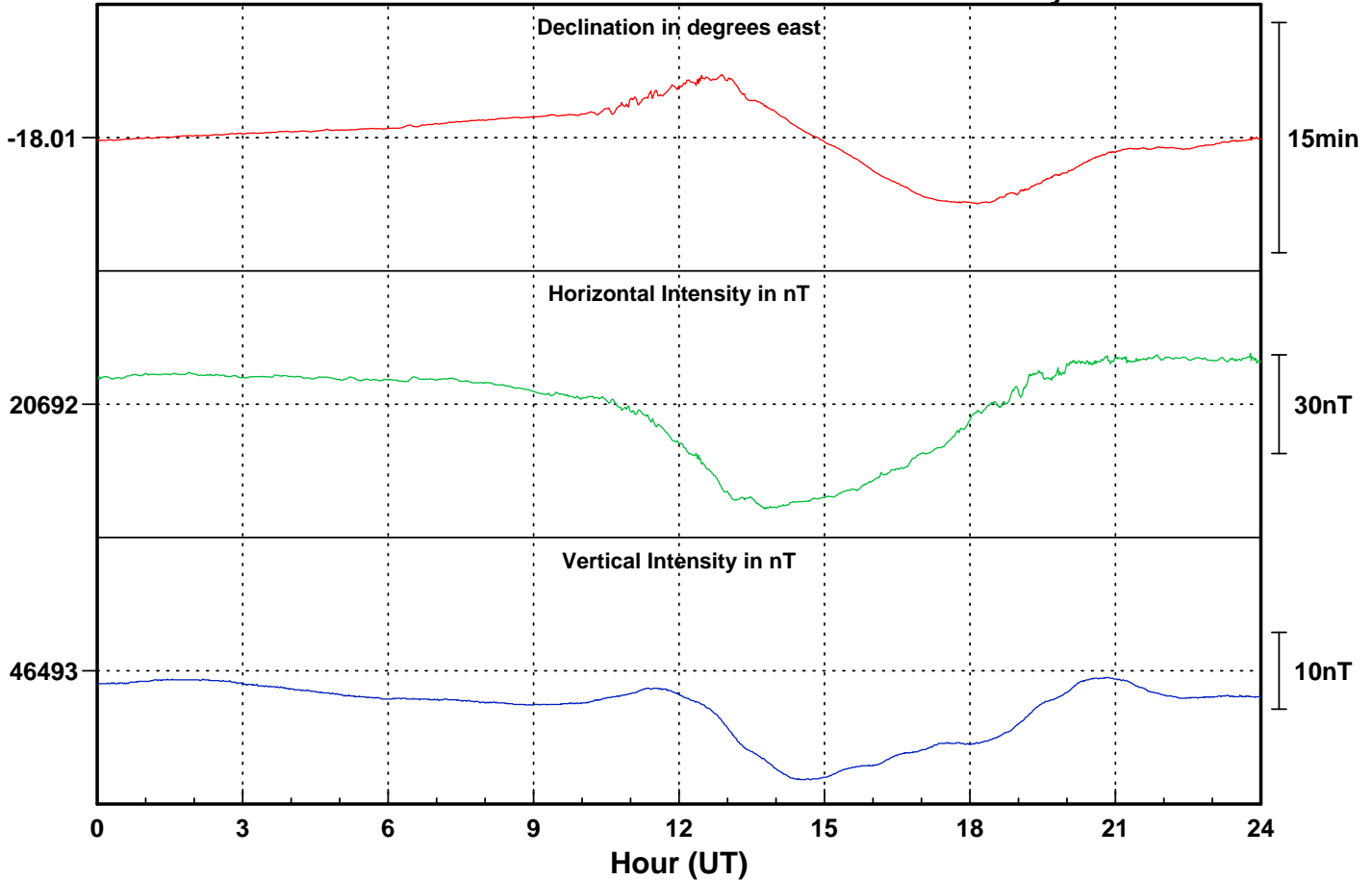
# Sable Island

Day number: 268



Date: 26-09-2013

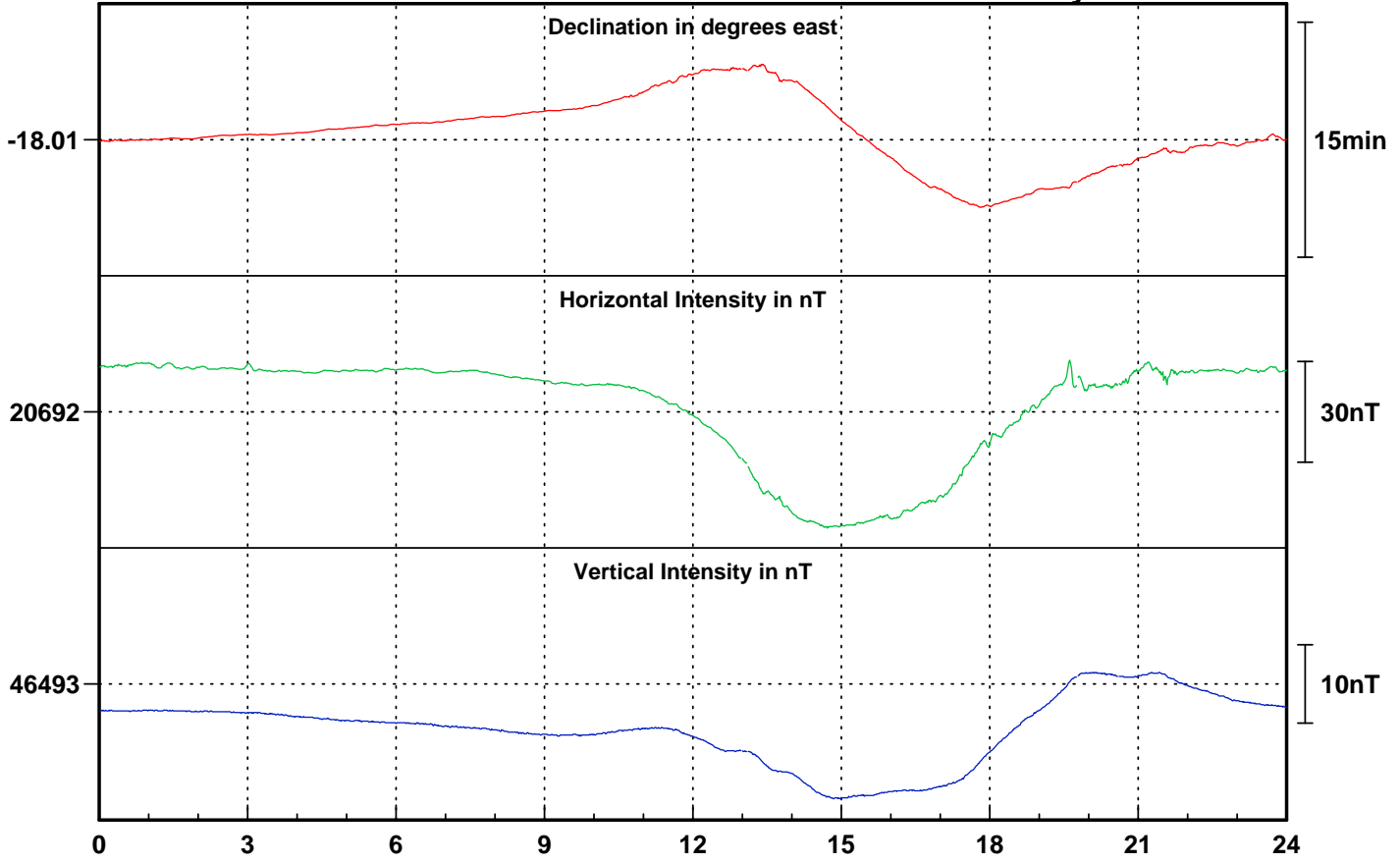
Day number: 269



Date: 27-09-2013

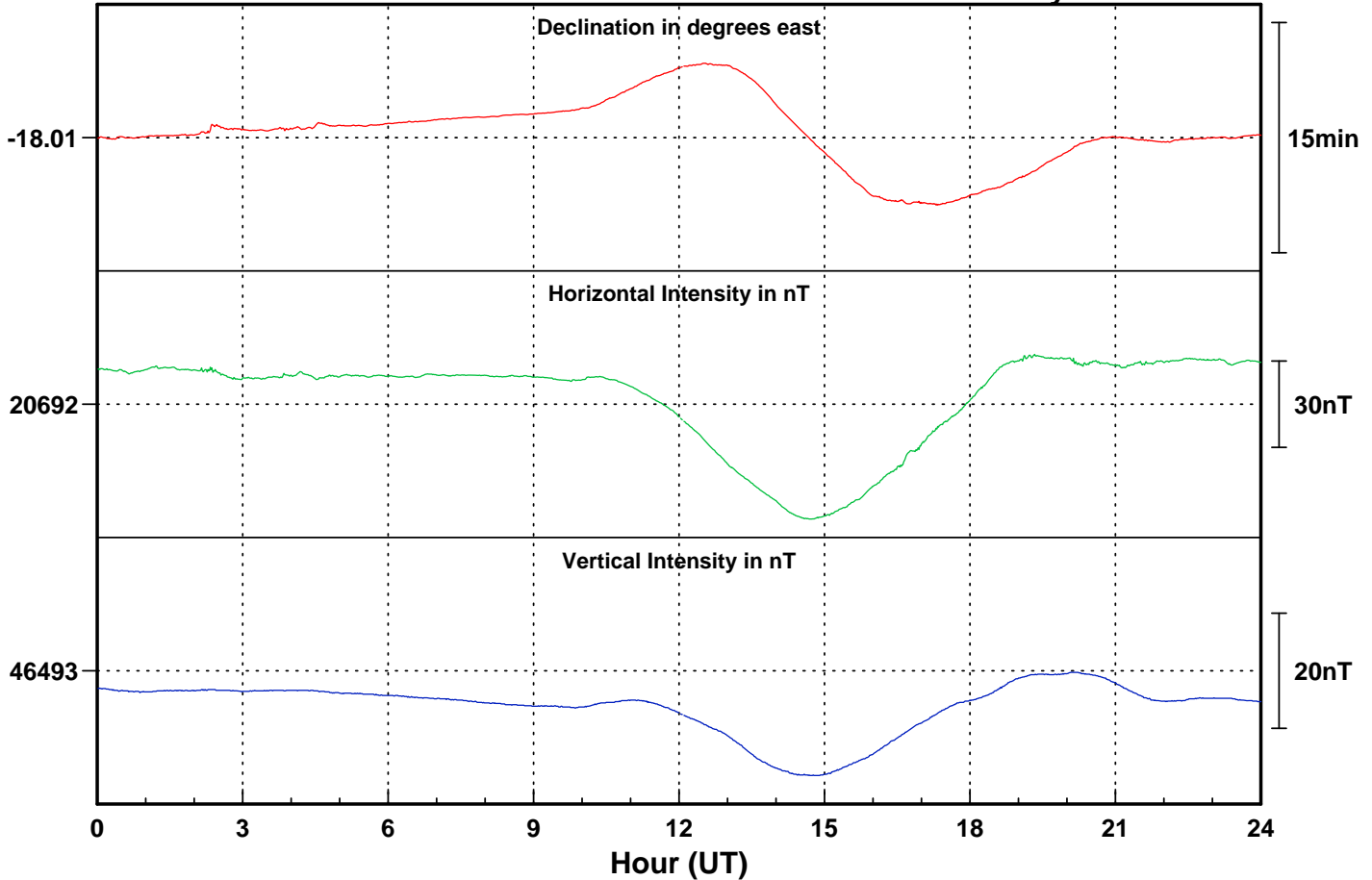
# Sable Island

Day number: 270



Date: 28-09-2013

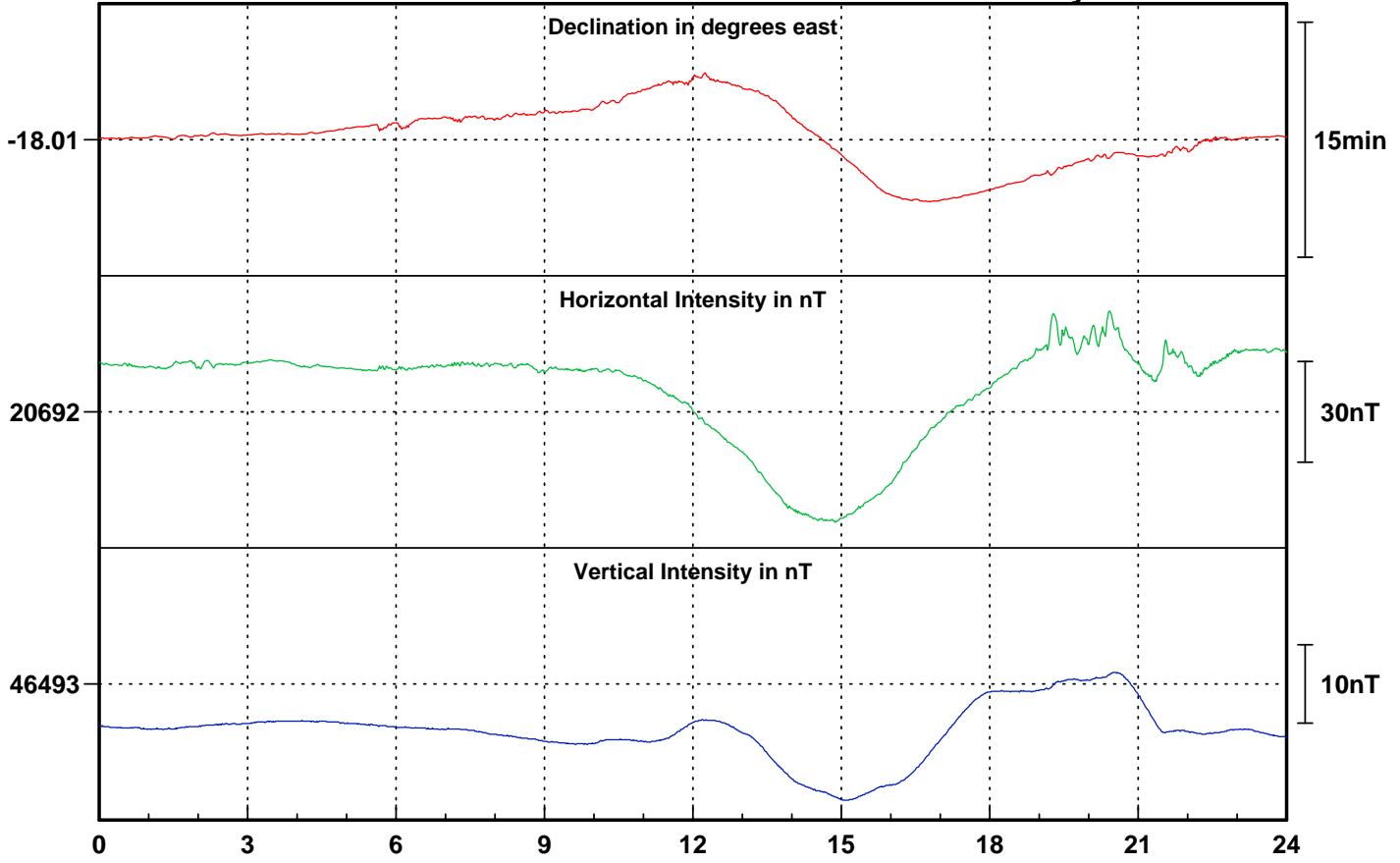
Day number: 271



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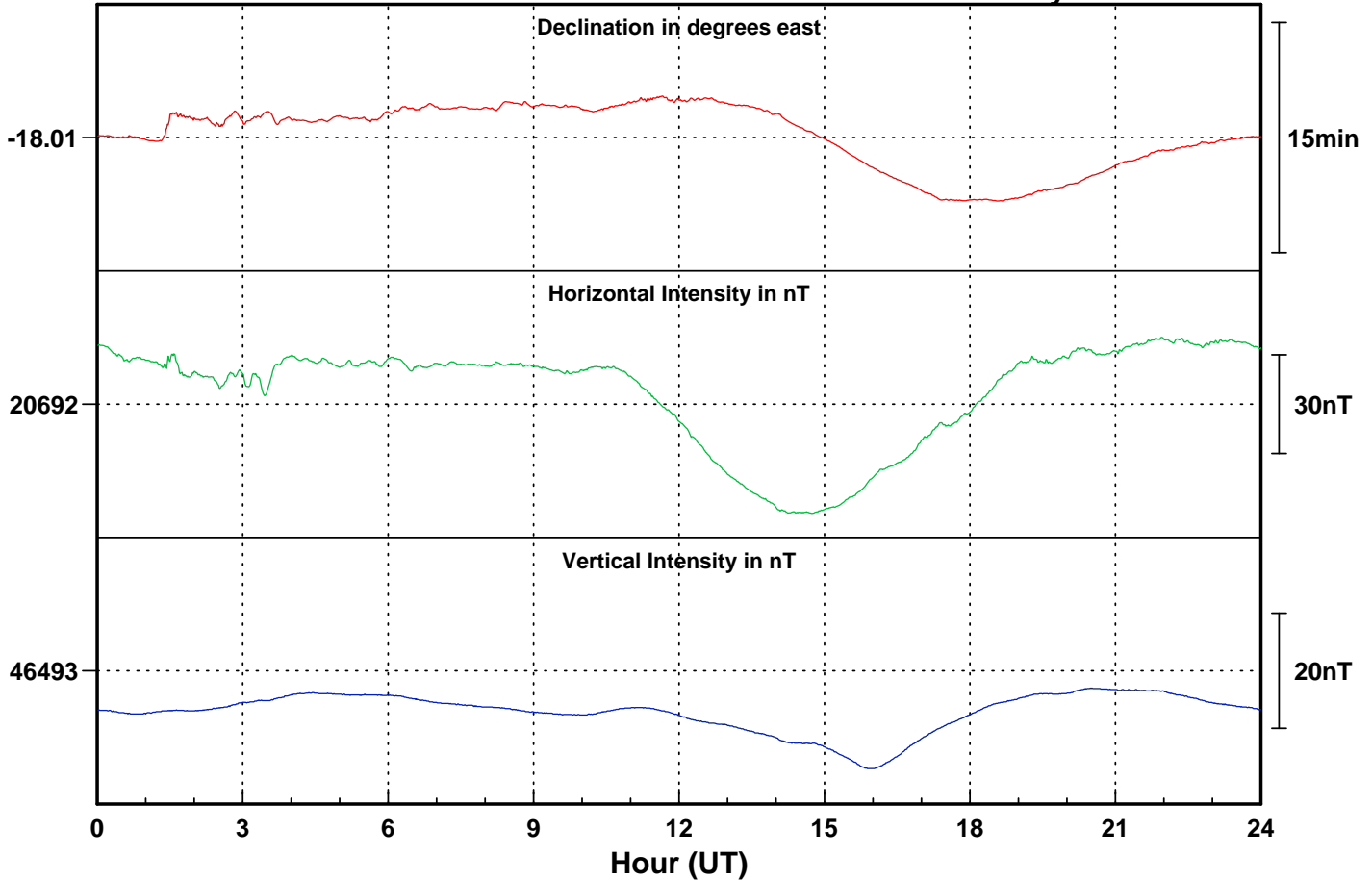
# Sable Island

Day number: 272



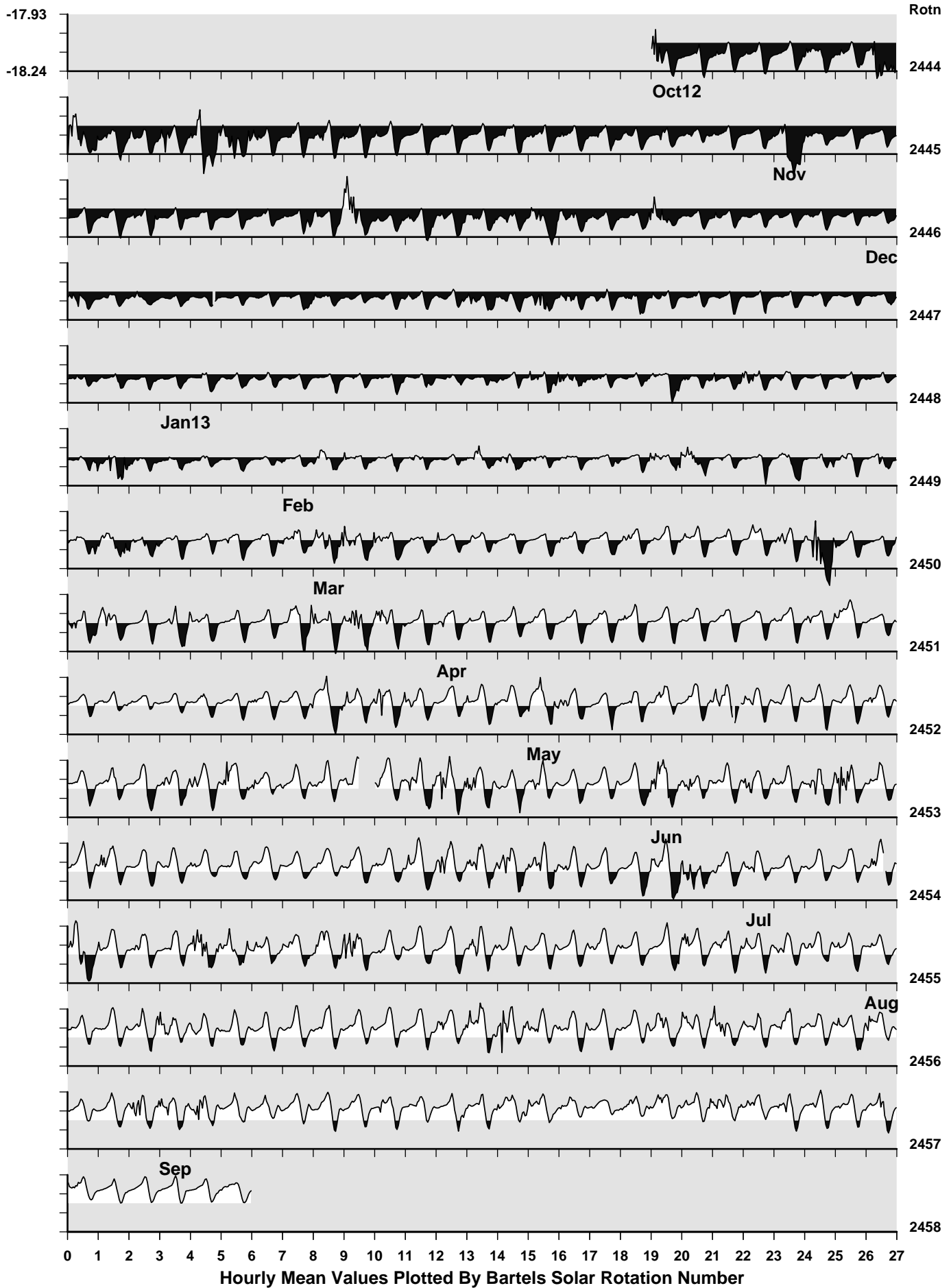
Date: 30-09-2013

Day number: 273



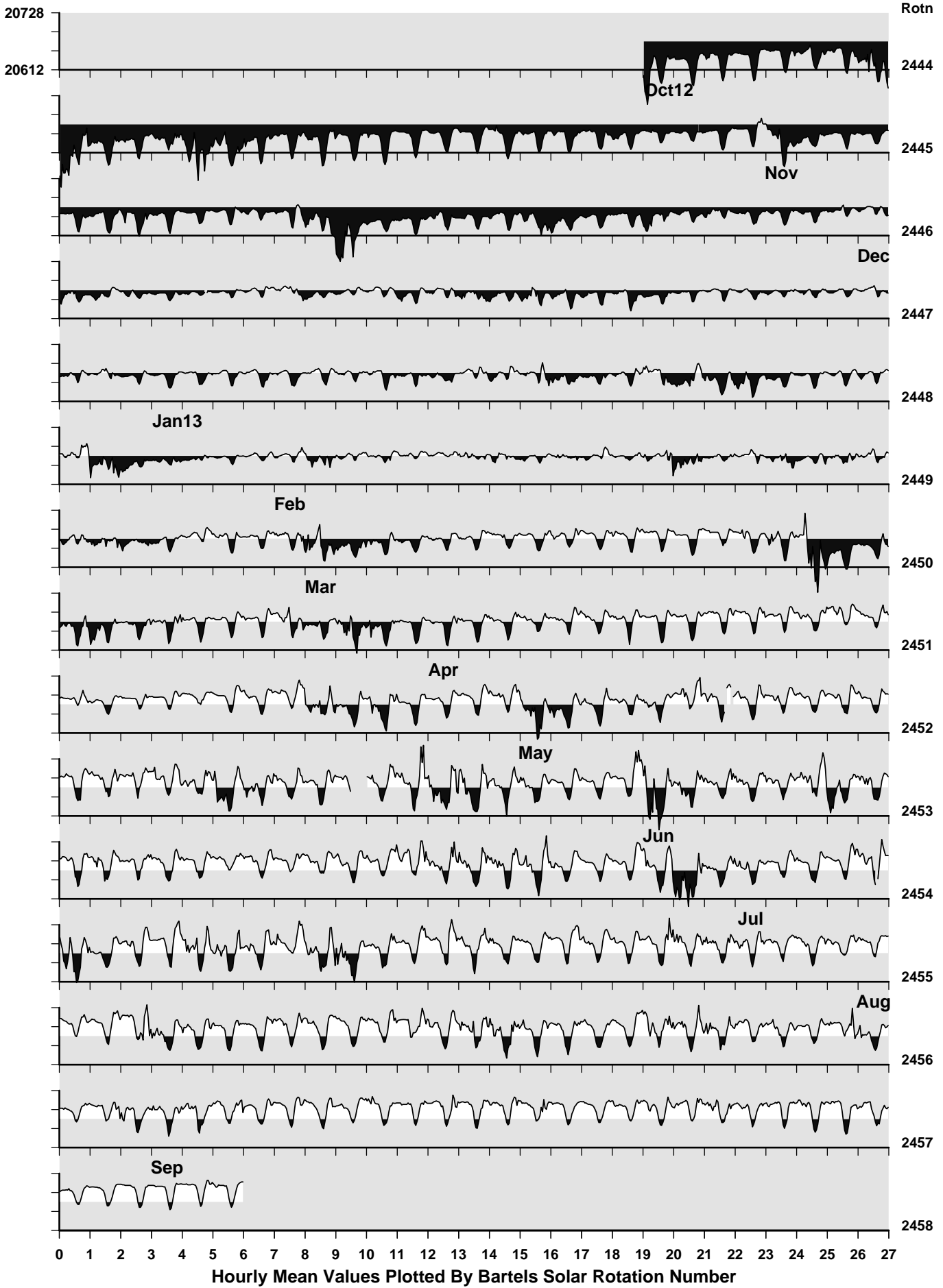


# Sable Island Observatory: Declination (degrees)

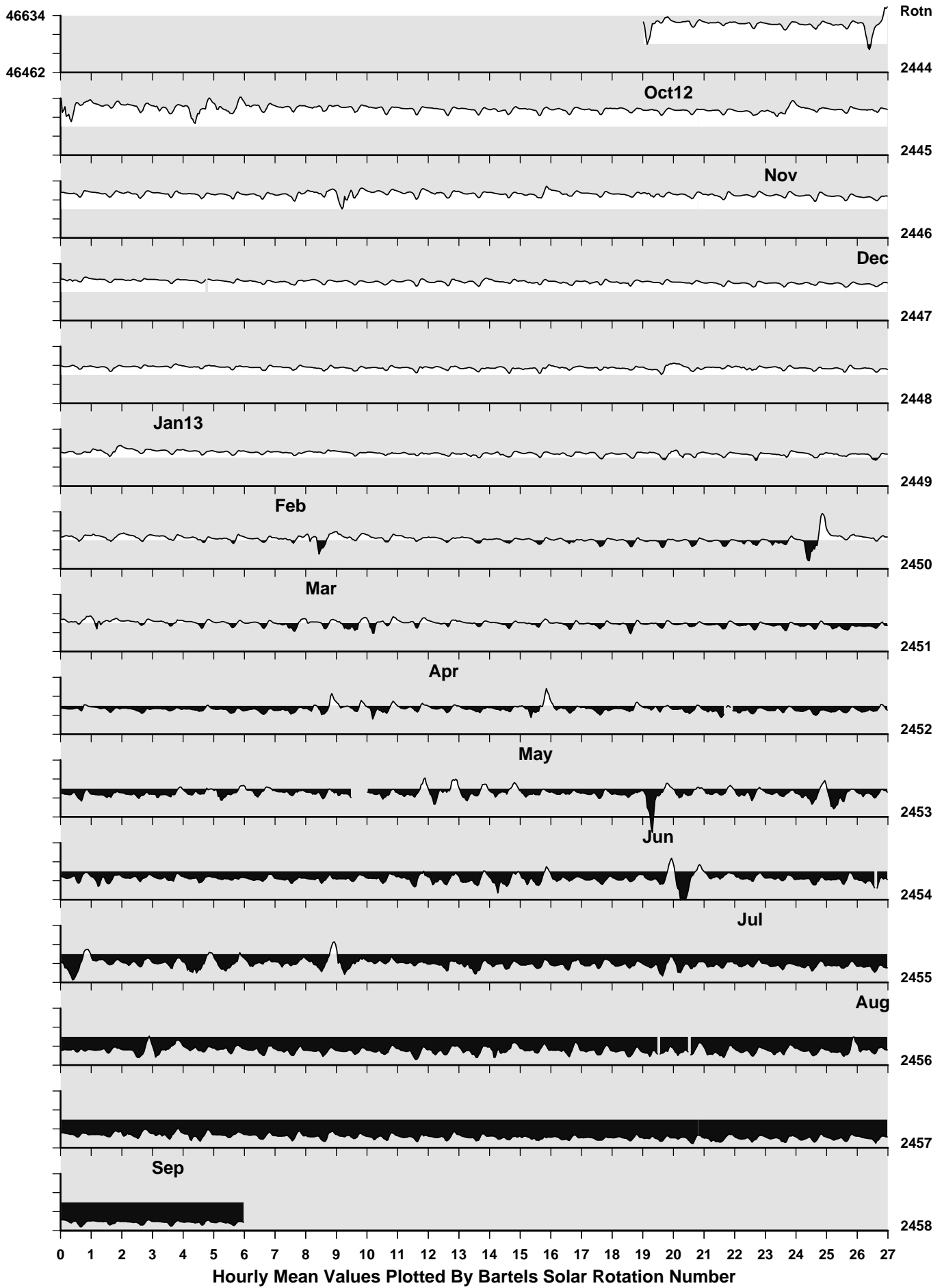


Hourly Mean Values Plotted By Bartels Solar Rotation Number

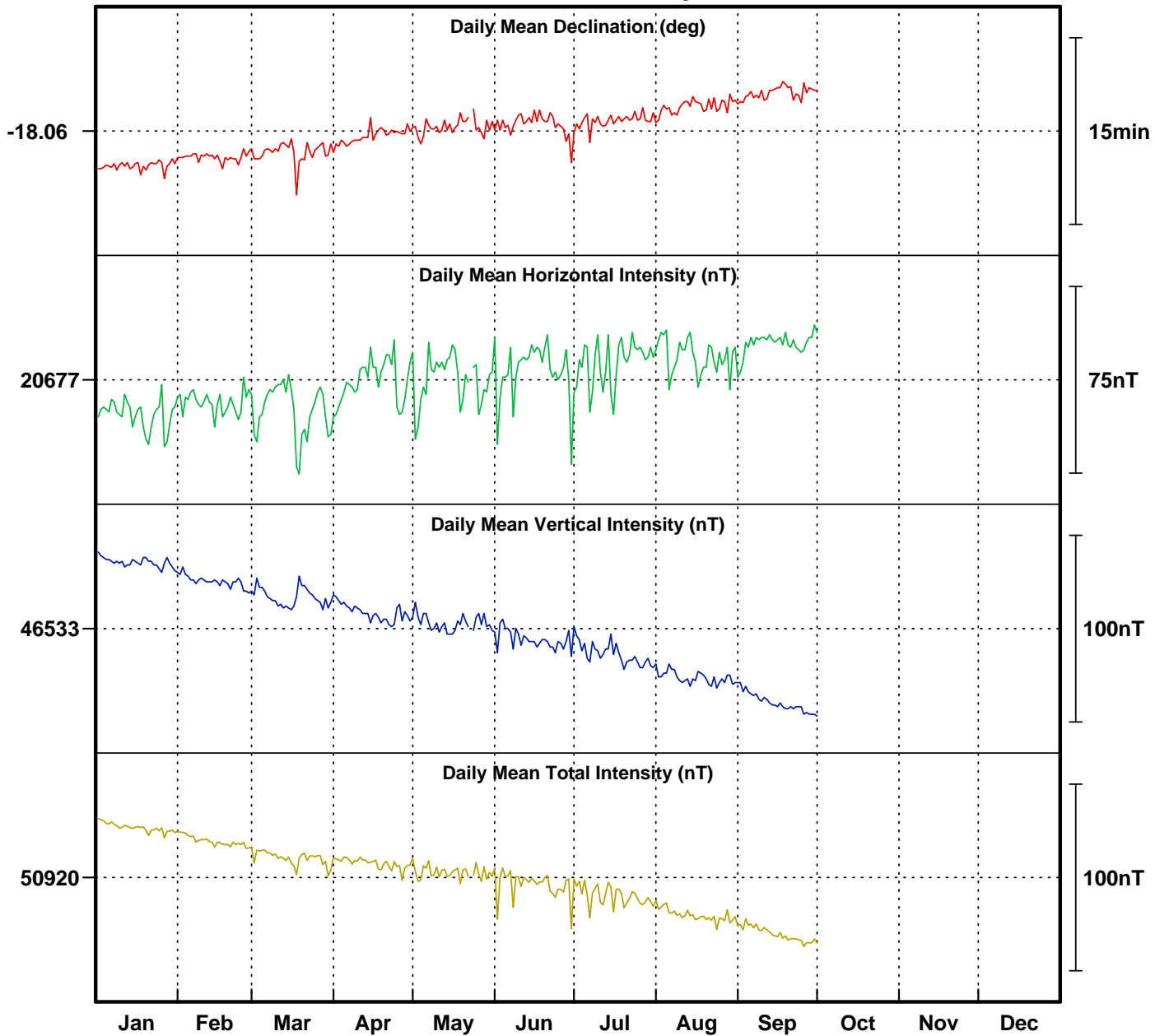
# Sable Island Observatory: Horizontal Intensity fhT<sub>L</sub>



# Sable Island Observatory: Vertical Intensity (nT)



# Sable Island Observatory 2013



### Monthly Mean Values for Sable Island Observatory 2013

Month	<i>D</i>	<i>H</i>	<i>I</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>F</i>
January	-18° 6.6′	20663 nT	66° 4.3′	19640 nT	-6423 nT	46568 nT	50947 nT
February	-18° 5.9′	20668 nT	66° 3.8′	19645 nT	-6420 nT	46558 nT	50939 nT
March	-18° 5.5′	20664 nT	66° 3.8′	19643 nT	-6417 nT	46550 nT	50930 nT
April	-18° 4.1′	20677 nT	66° 2.7′	19657 nT	-6413 nT	46541 nT	50928 nT
May	-18° 3.4′	20677 nT	66° 2.6′	19659 nT	-6409 nT	46536 nT	50923 nT
June	-18° 3.2′	20680 nT	66° 2.2′	19662 nT	-6409 nT	46527 nT	50916 nT
July	-18° 2.9′	20684 nT	66° 1.7′	19666 nT	-6408 nT	46519 nT	50910 nT
August	-18° 1.7′	20686 nT	66° 1.2′	19671 nT	-6402 nT	46506 nT	50899 nT
September	-18° 0.7′	20692 nT	66° 0.5′	19678 nT	-6398 nT	46493 nT	50889 nT

#### Note

i. The values shown here are provisional.