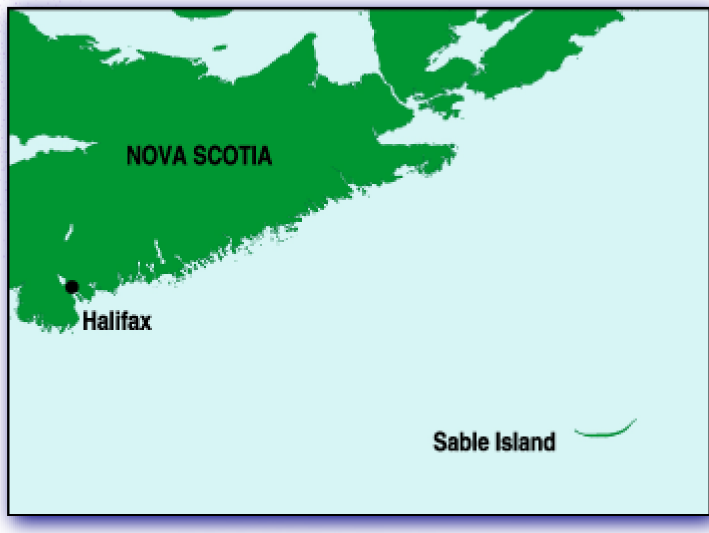
BRITISH GEOLOGICAL SURVEY

Sable Island Observatory *Monthly Magnetic Bulletin*

June 2018

18/06/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:

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Scotland, UK

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E-mail: enquiries@bgs.ac.uk
Internet: 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°55'55.2"N*	*299°59'27.6"E*
Geomagnetic:	*53°07'48"N*	*015°38'24"E*
Height above mean sea level:		*5m (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

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

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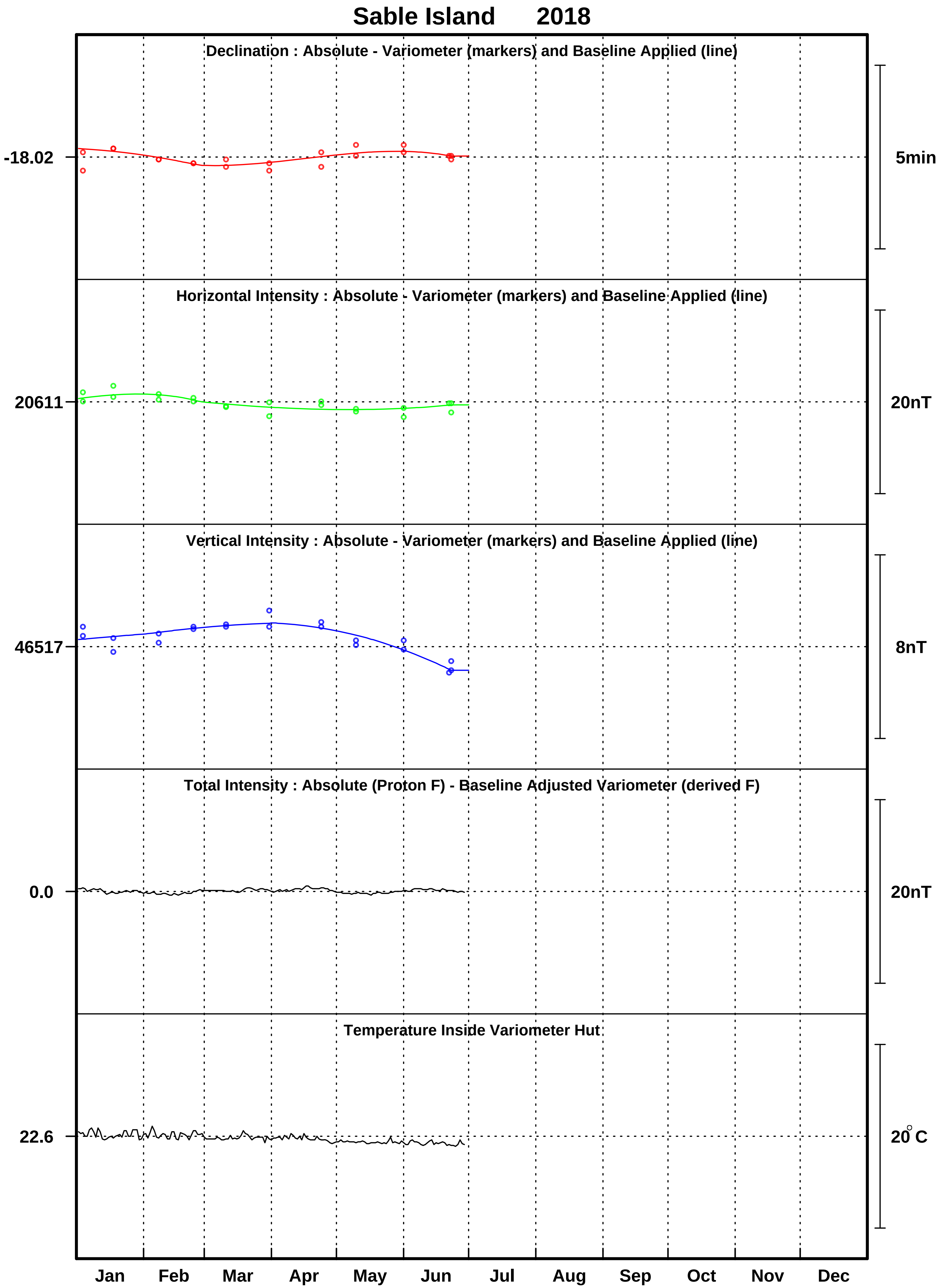
Reproduction of any part of this bulletin should be accompanied by the statement: 'Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved'. Publications making use of the data should include an acknowledgment statement of the form: 'The results presented in this paper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

SABLE ISLAND OBSERVATORY

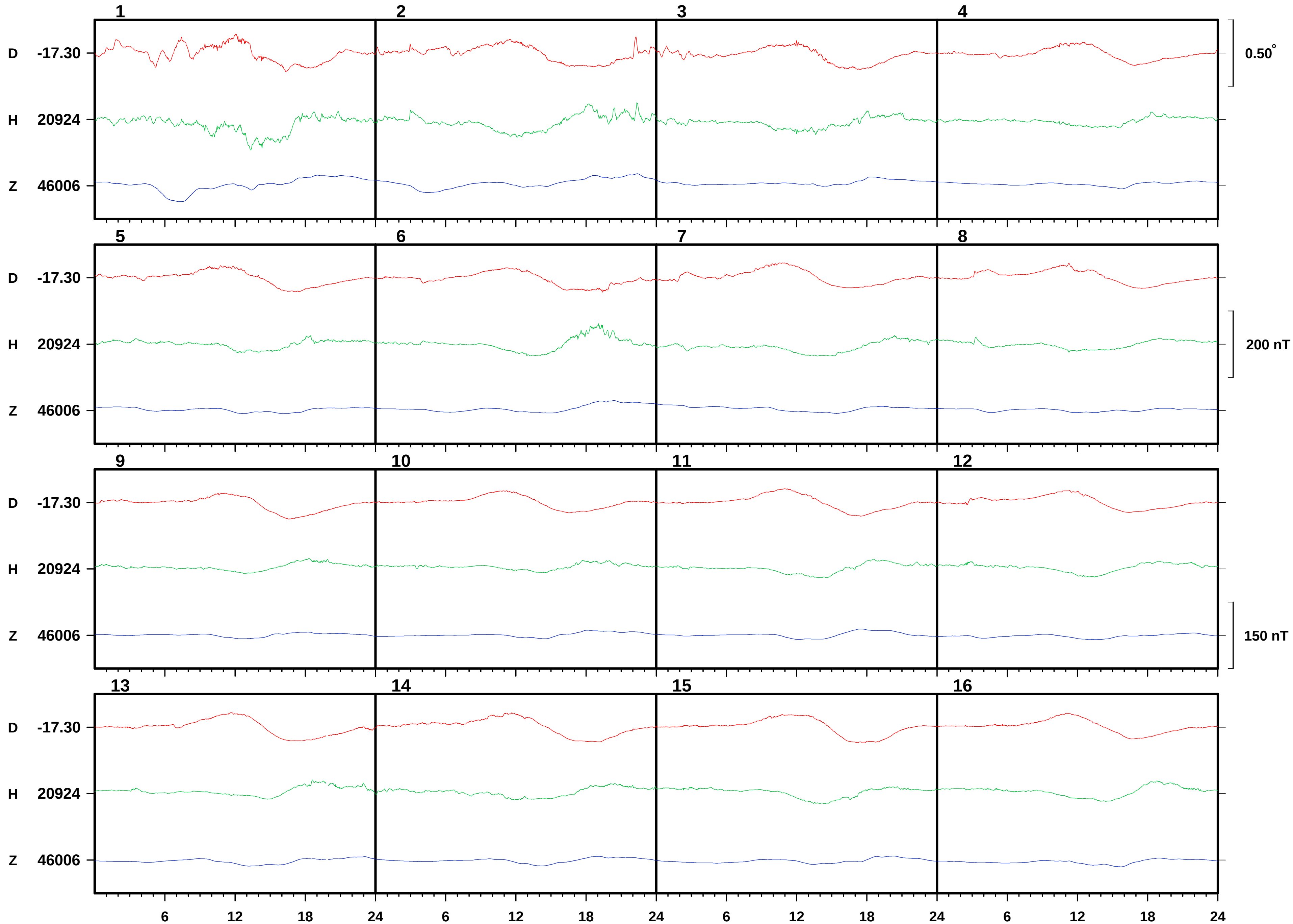
ABSOLUTE OBSERVATIONS

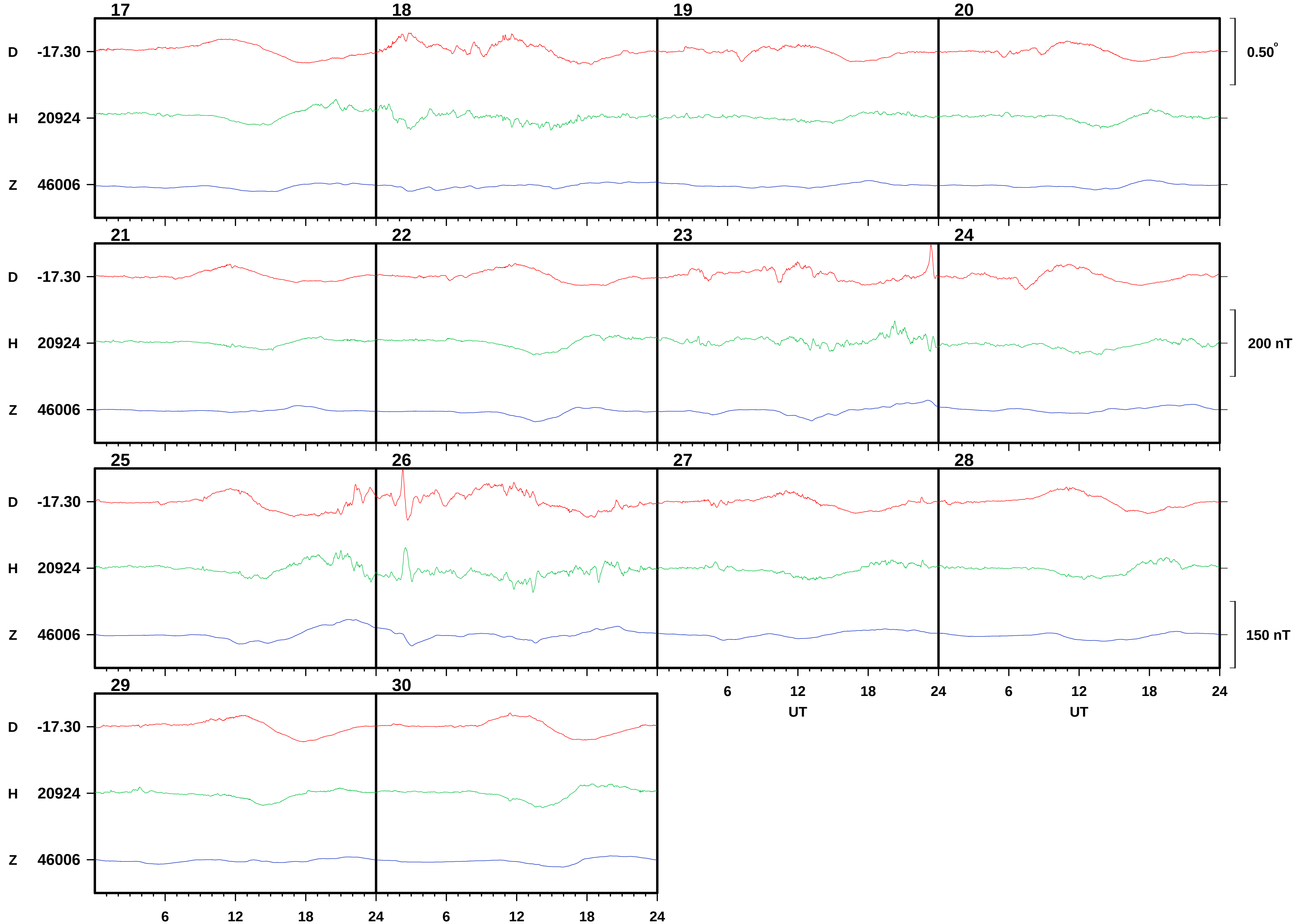
		Declination			Inclination		Total Field		Horizontal Intensity		Vertical Intensity		
Date	**Day Number**	**Time (UT)**	**Absolute (º)**	**Baseline (º)**	**Time (UT)**	**Absolute (º)**	**Site difference (nT)**	**Absolute corrected (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Absolute (nT)**	**Baseline (nT)**	**Observer**
21-Jun-18	172	17:21	-17.3371	-18.0167	17:37	65.5356	0.0	50553.7	20935.7	20611.1	46014.9	46516.1	GL
22-Jun-18	173	16:47	-17.3568	-18.0183	17:00	65.5399	0.0	50547.4	20929.6	20611.1	46010.8	46516.2	GL
22-Jun-18	173	17:18	-17.3594	-18.0167	17:30	65.5338	0.0	50549.9	20935.5	20610.1	46010.8	46516.6	GL



Sable Island 2018
Declination : Absolute - Variometer (markers) and Baseline Applied (line)
-18.02
5min
Horizontal Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
20611
20nT
Vertical Intensity : Absolute - Variometer (markers) and Baseline Applied (line)
46517
8nT
Total Intensity : Absolute (Proton F) - Baseline Adjusted Variometer (derived F)
0.0
20nT
Temperature Inside Variometer Hut
22.6
20°C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Sable Island June 2018

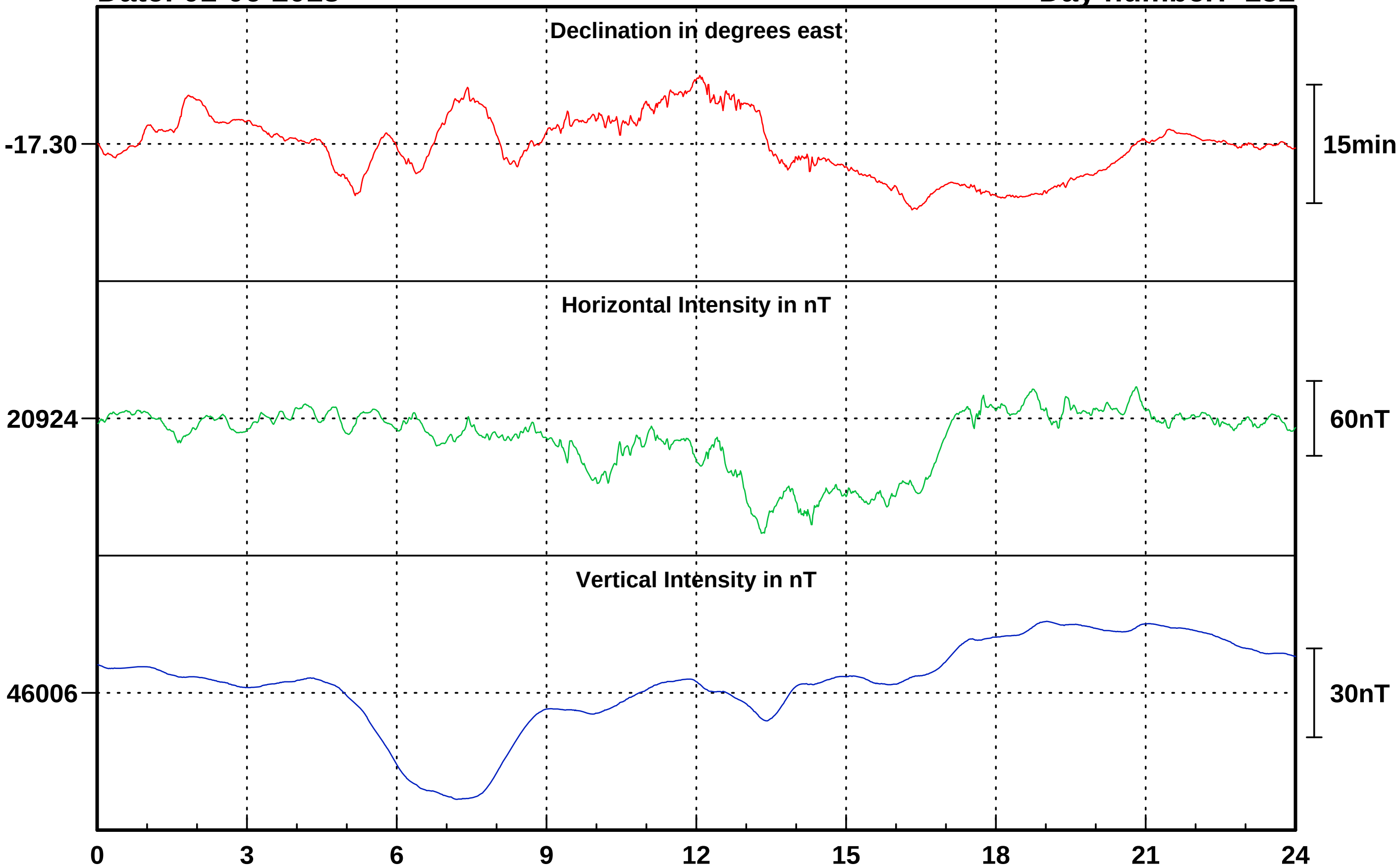




Sable Island June 2018

Sable Island

Date: 01-06-2018 Day number: 152



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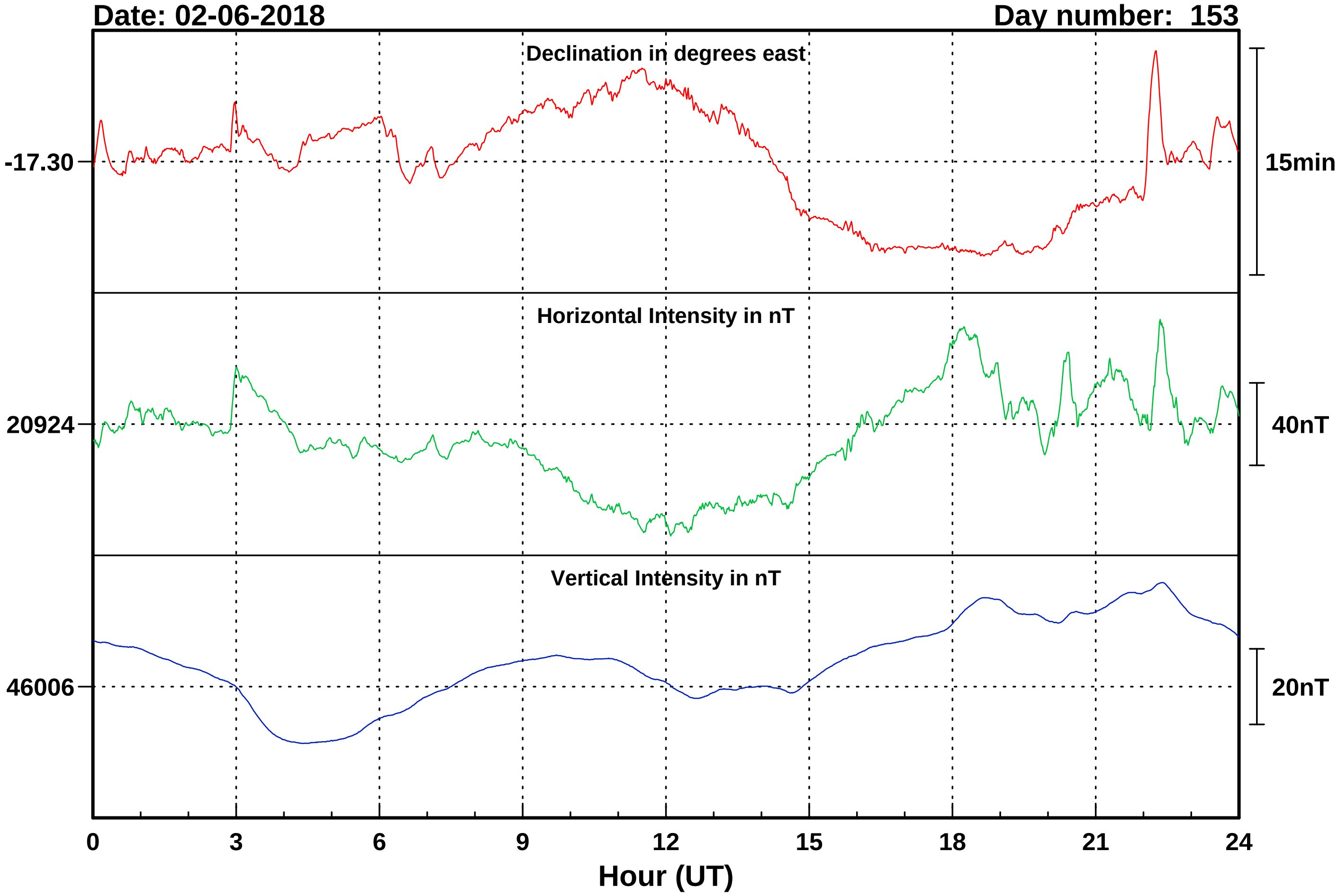
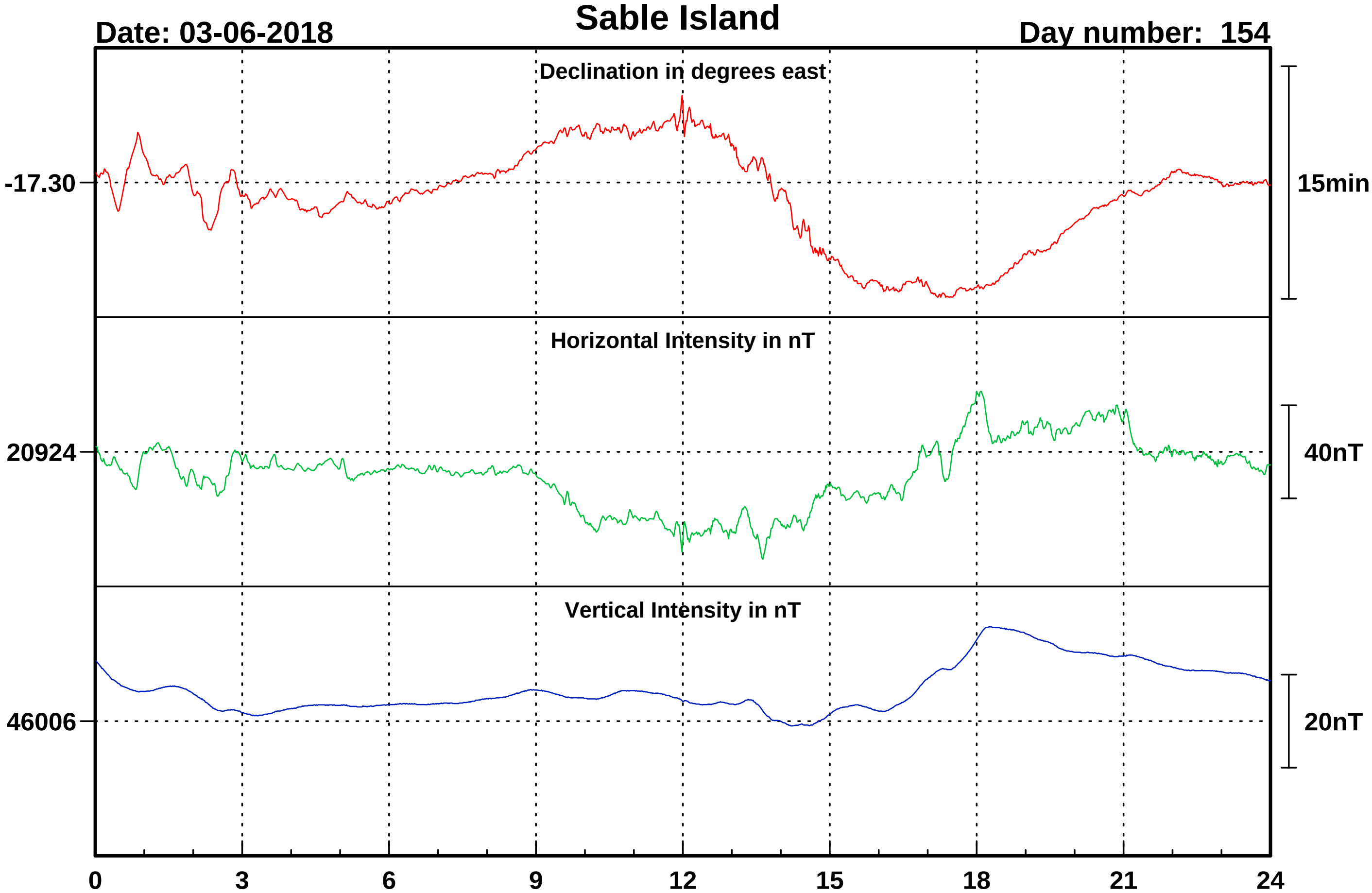
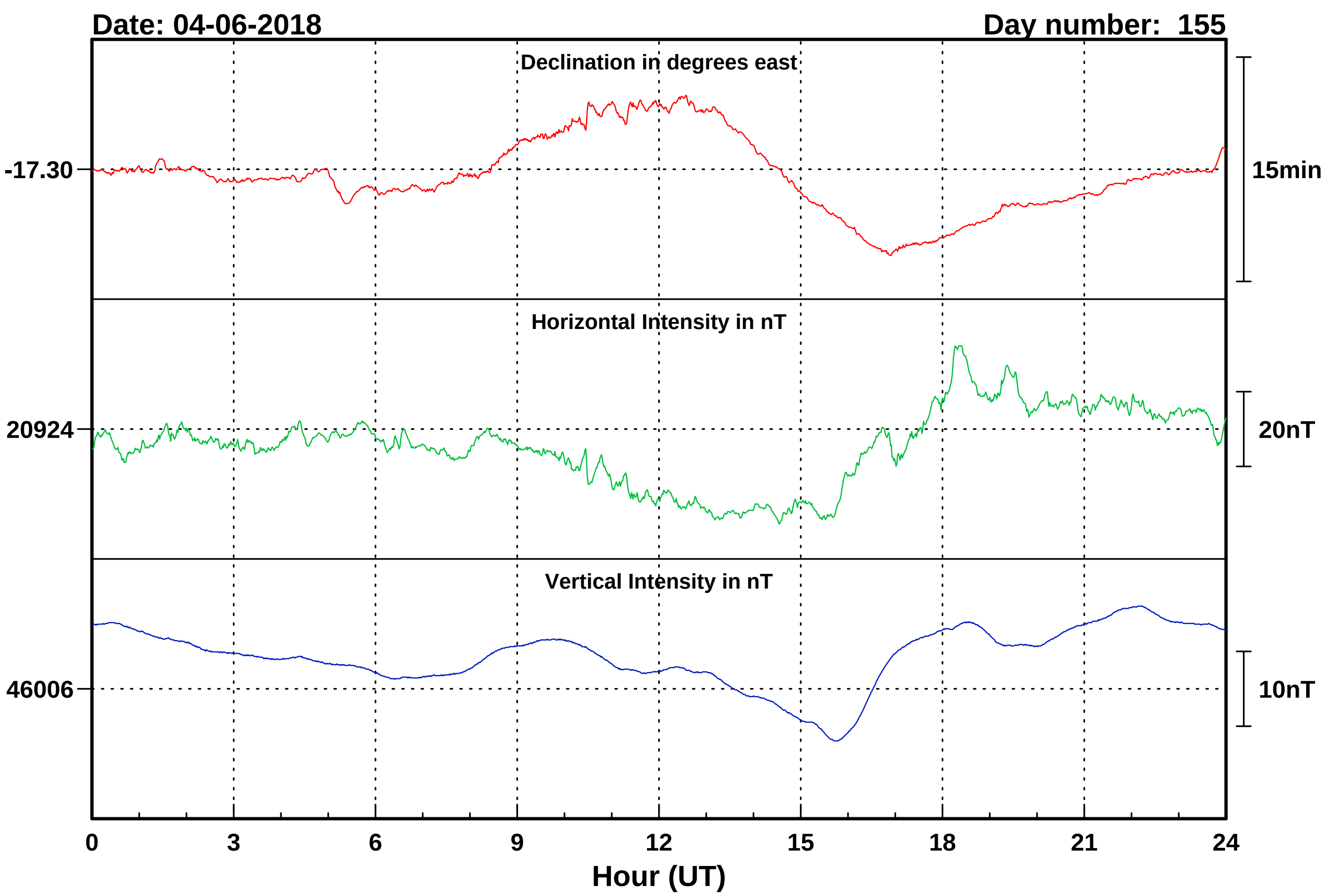


Sable Island





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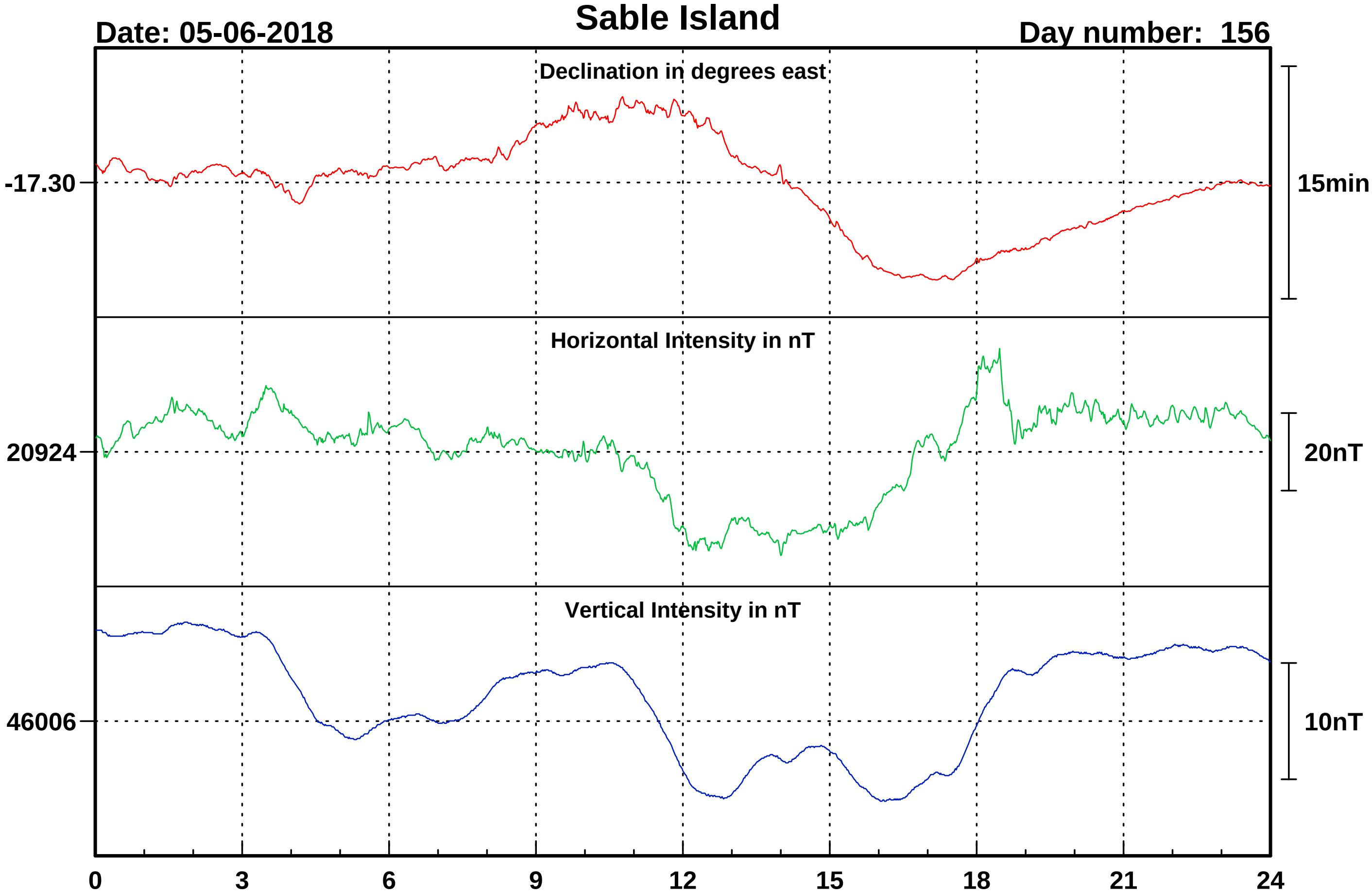
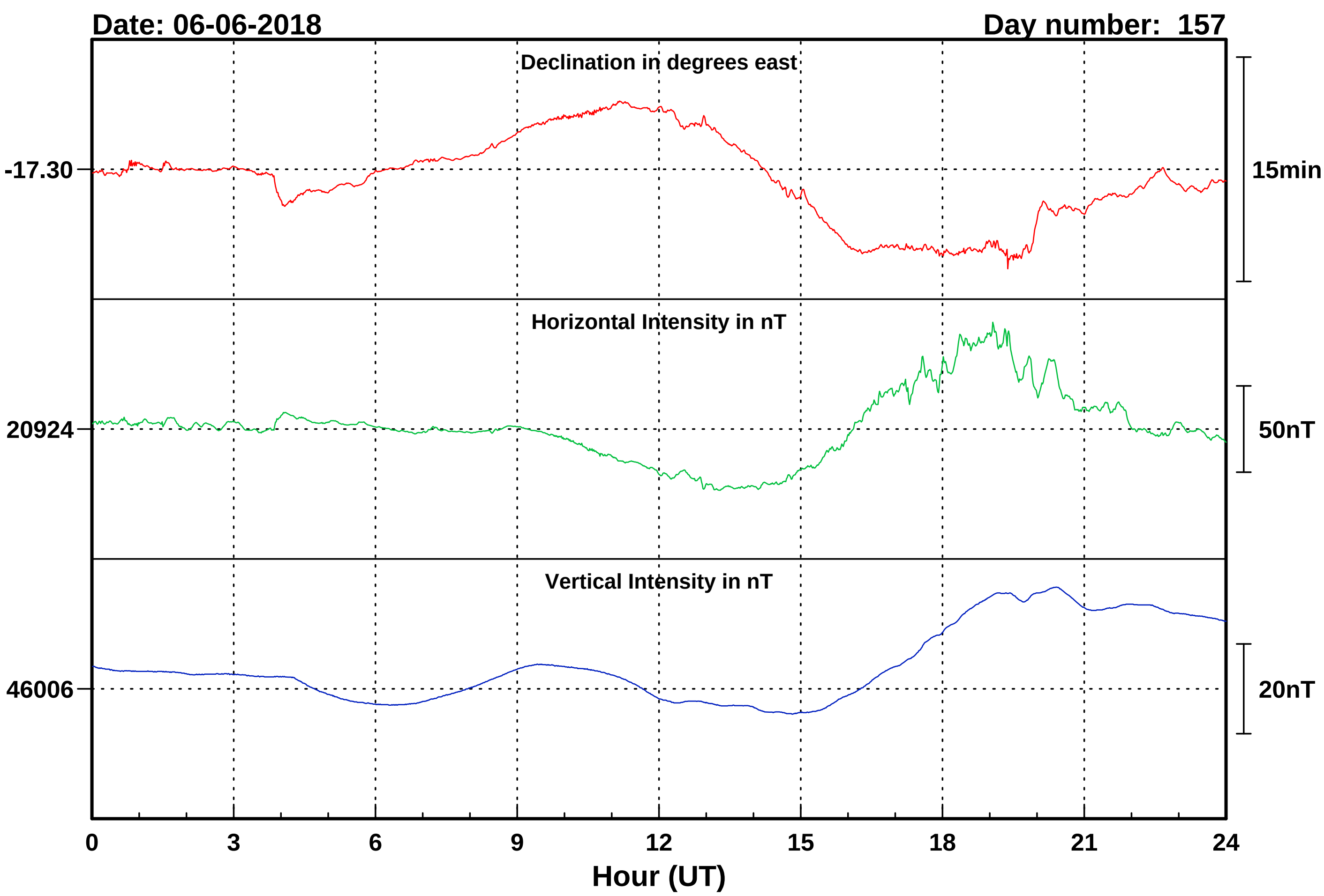
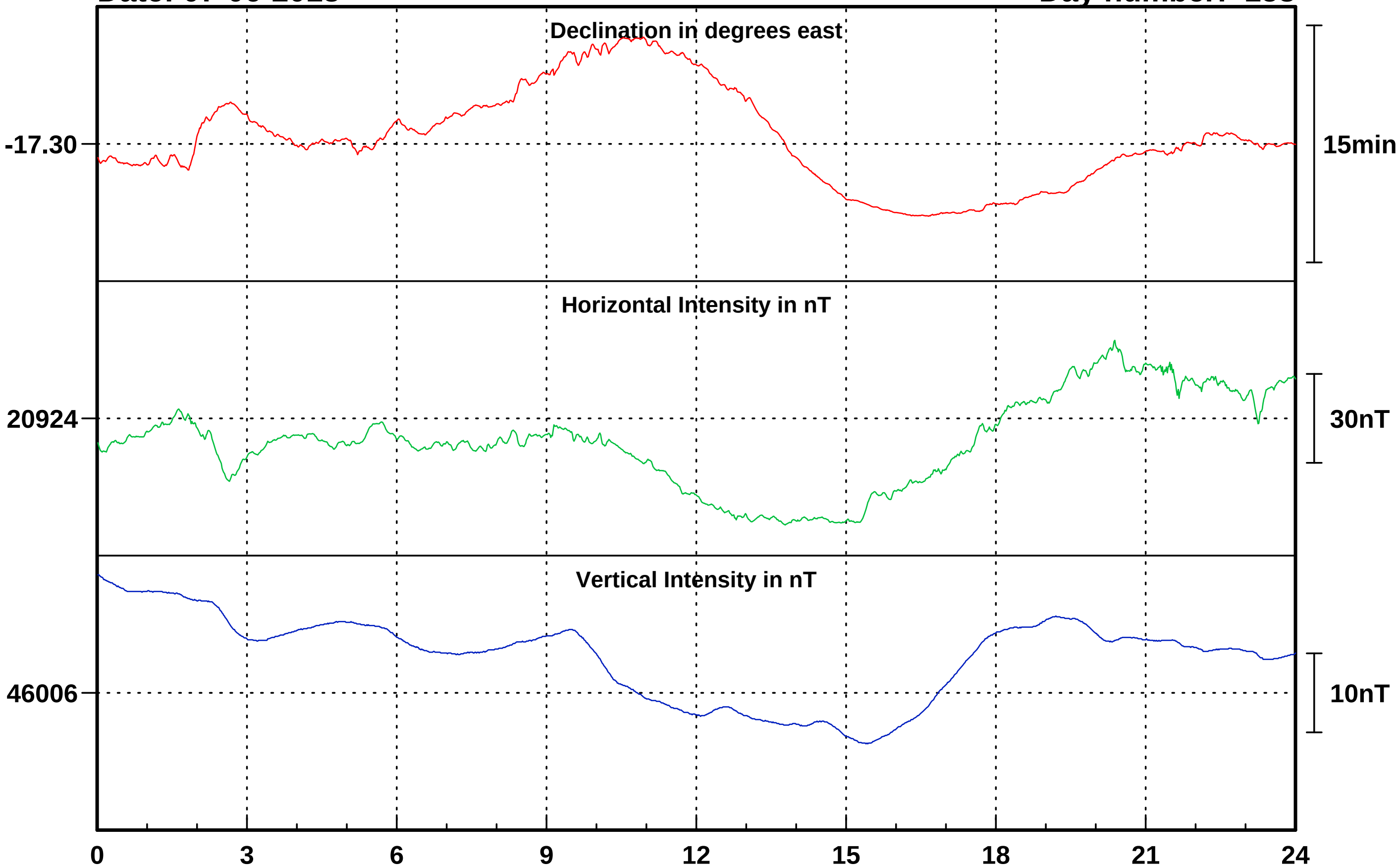


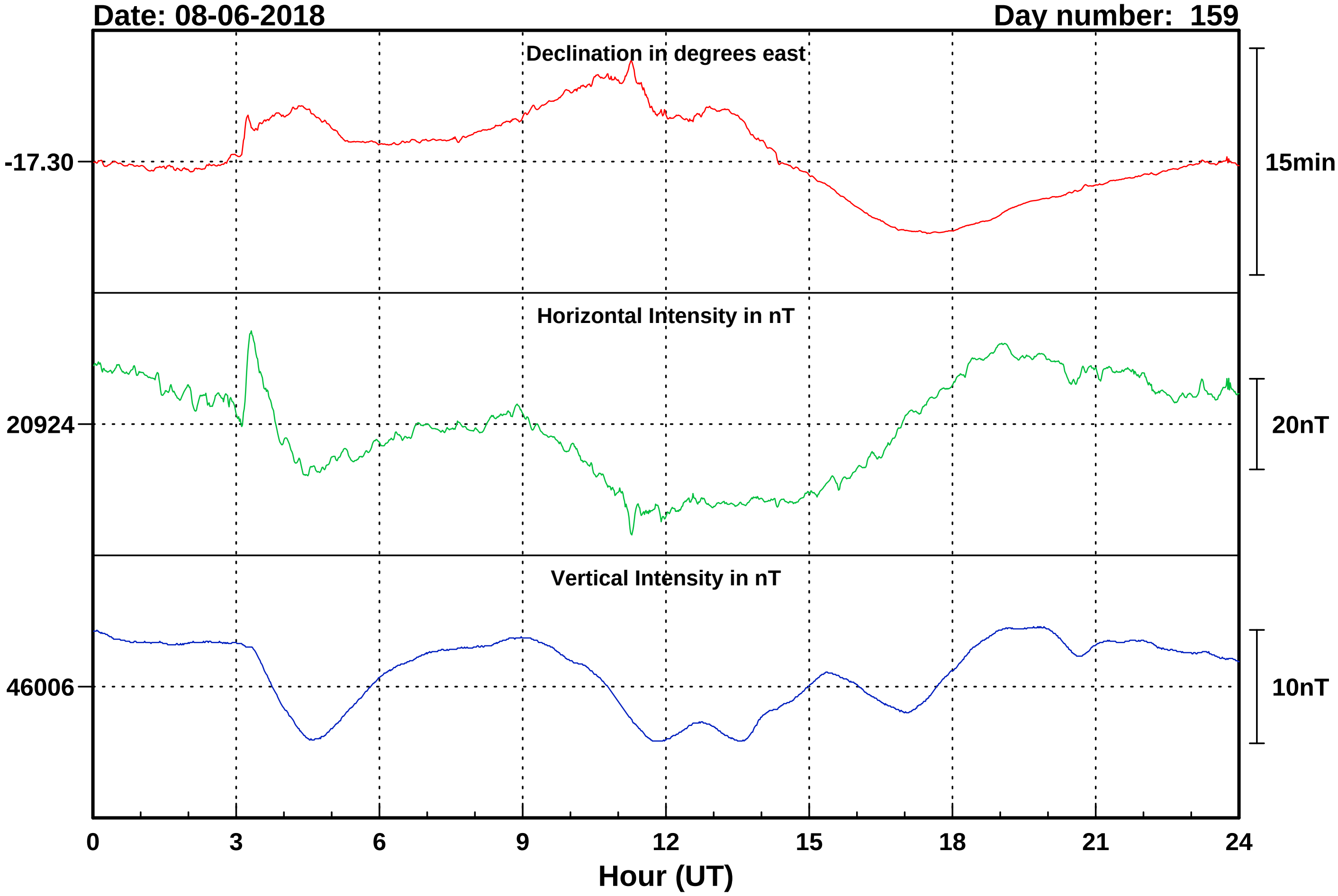


Sable Island

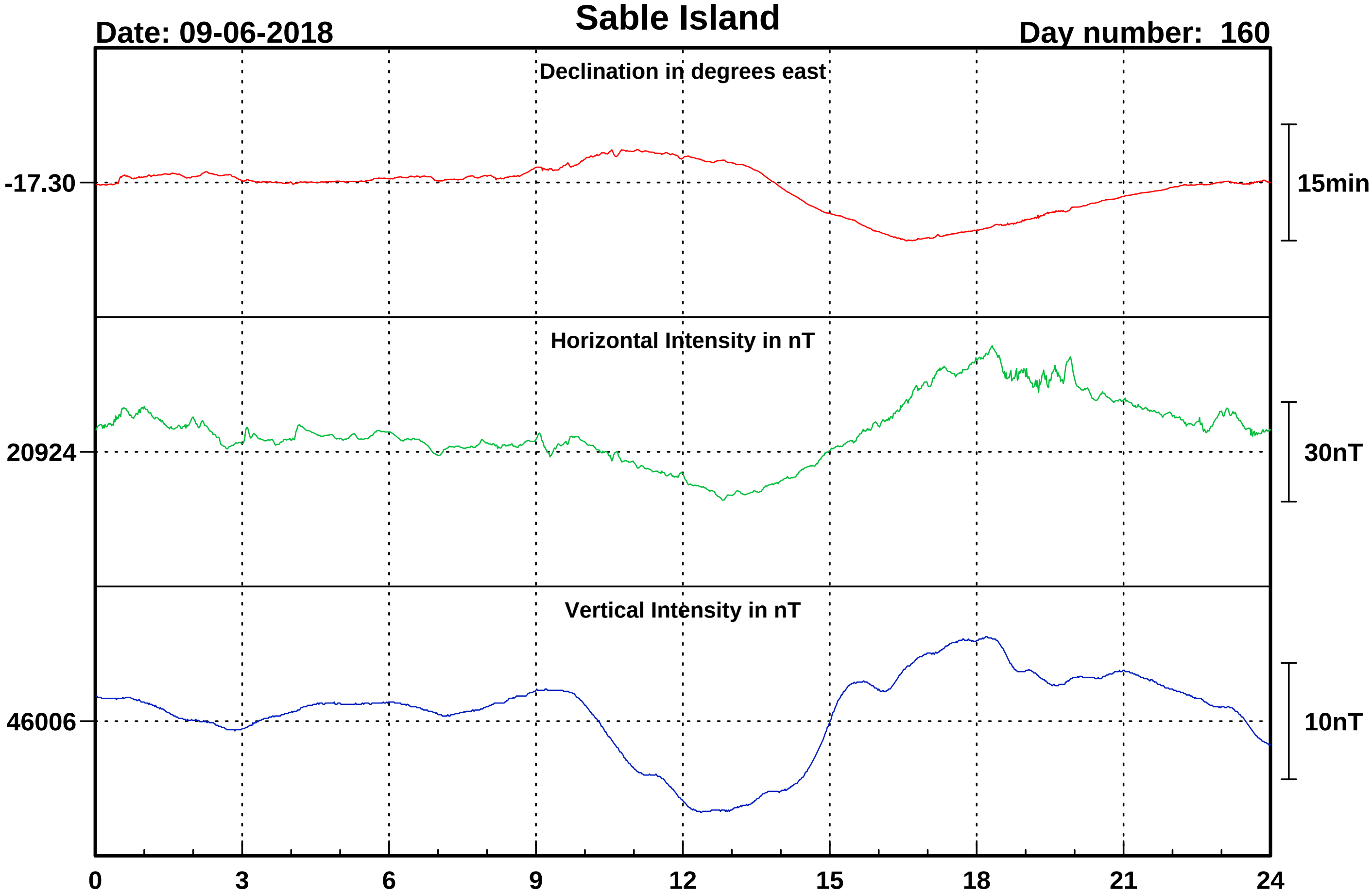
Date: 07-06-2018 Day number: 158

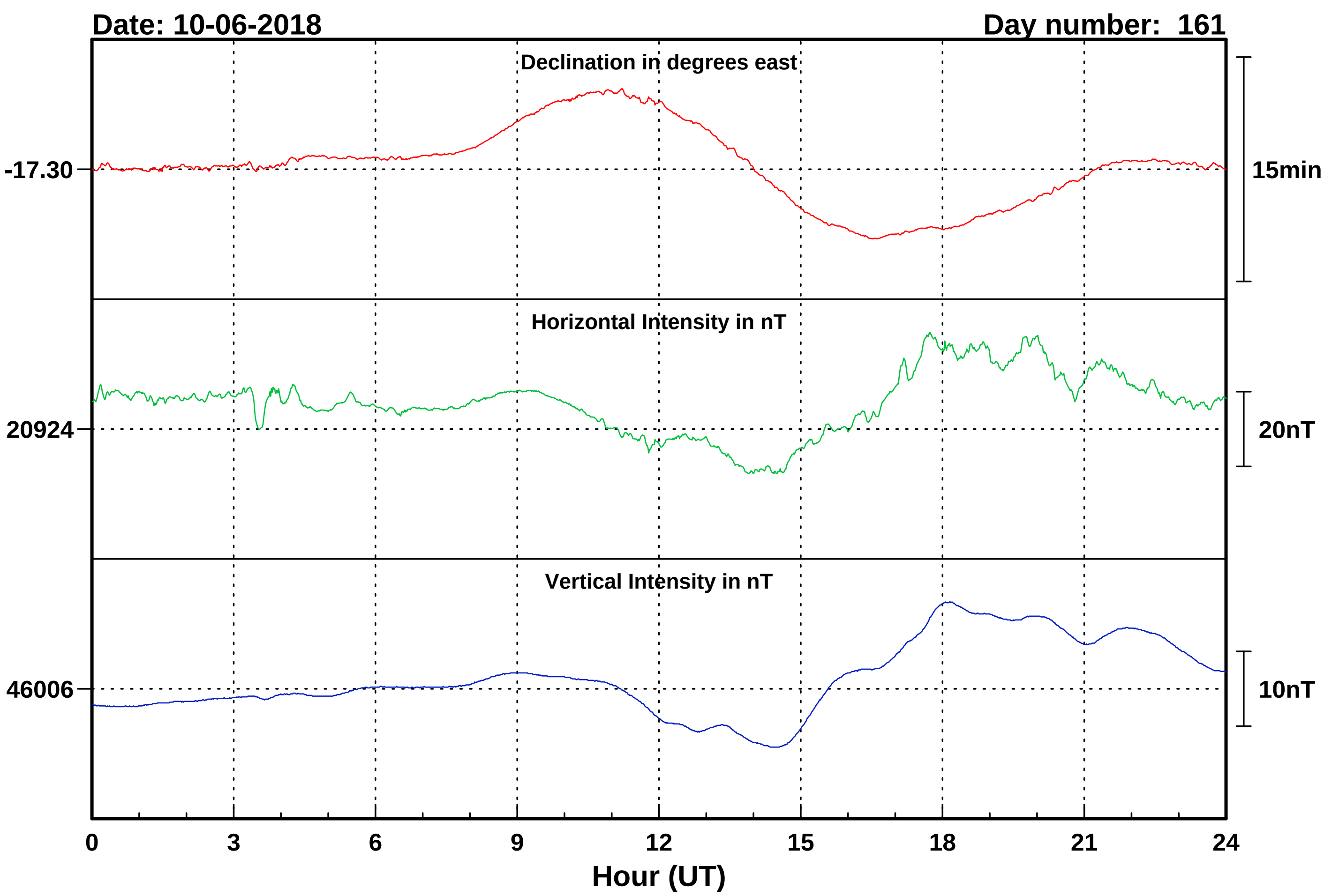


Date: 08-06-2018 Day number: 159

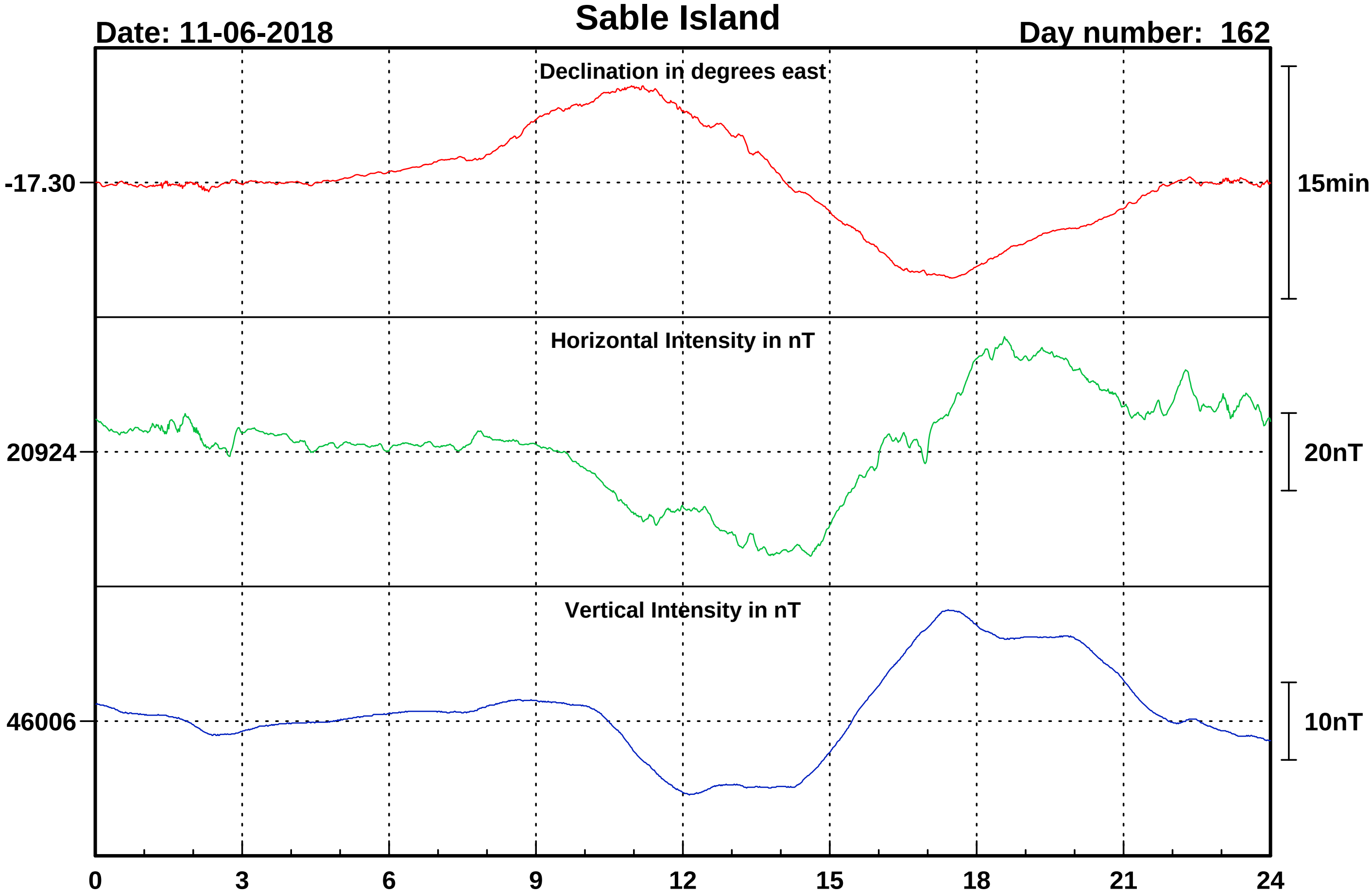


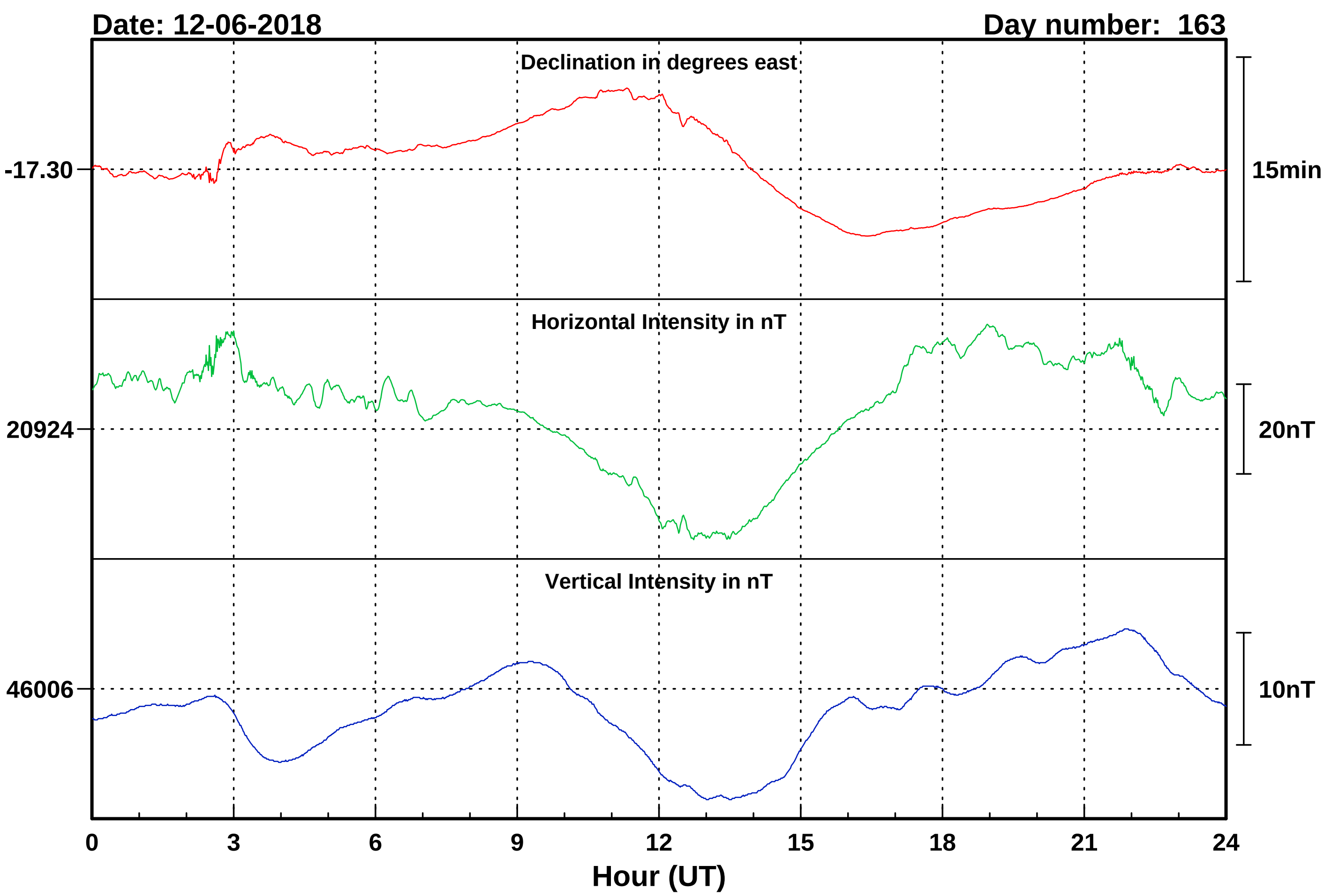
Sable Island





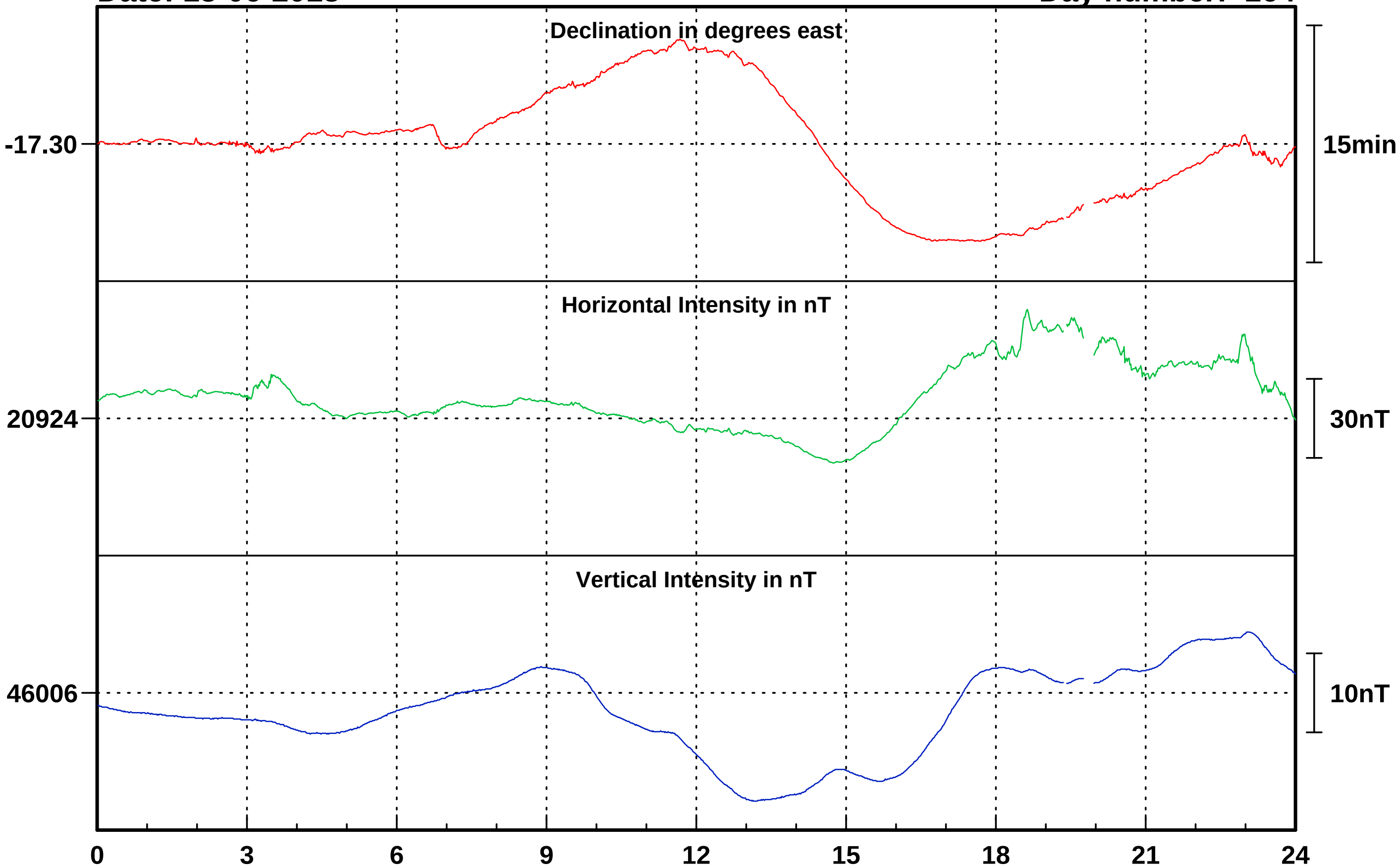
Sable Island



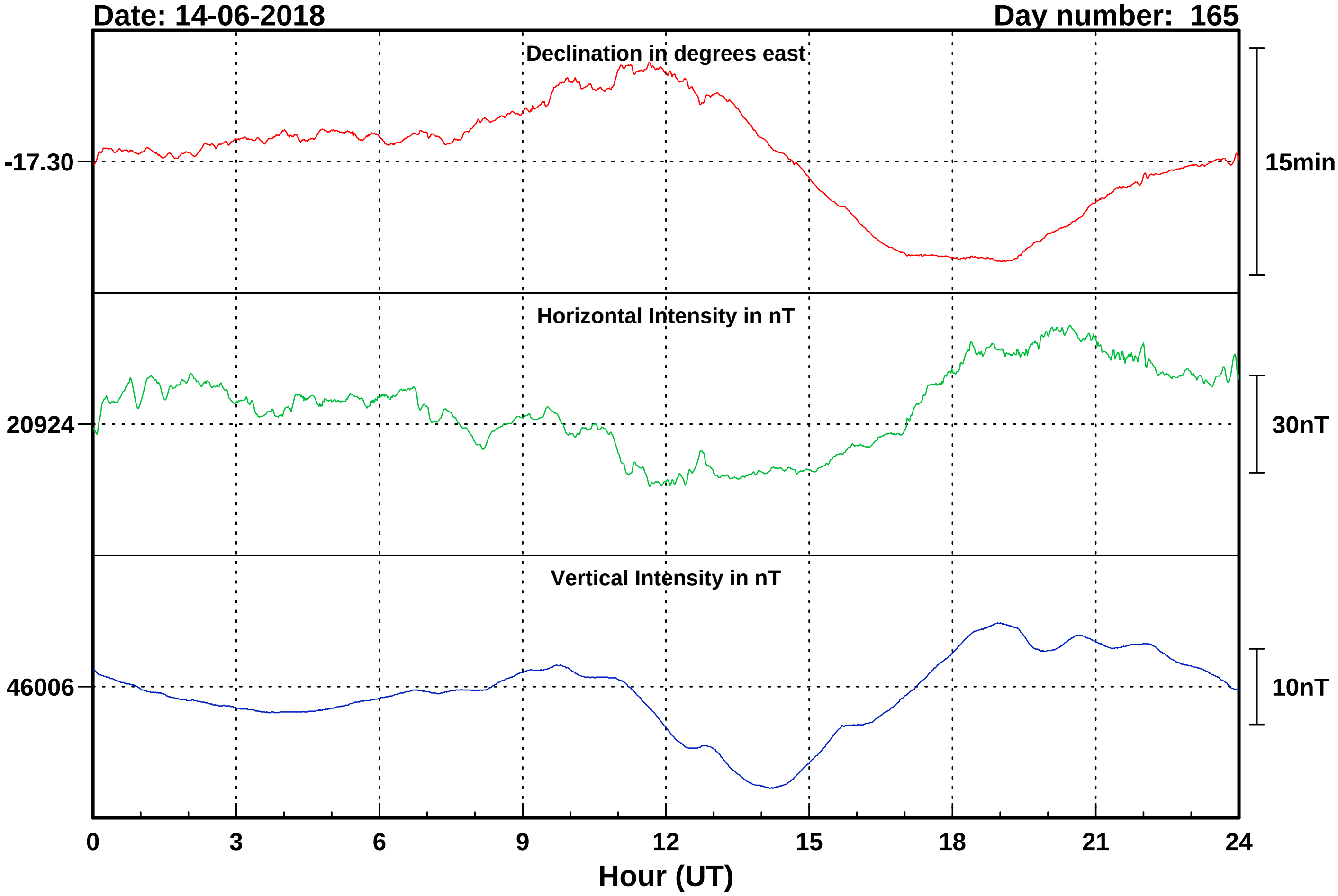


Sable Island

Date: 13-06-2018 **Day number: 164**

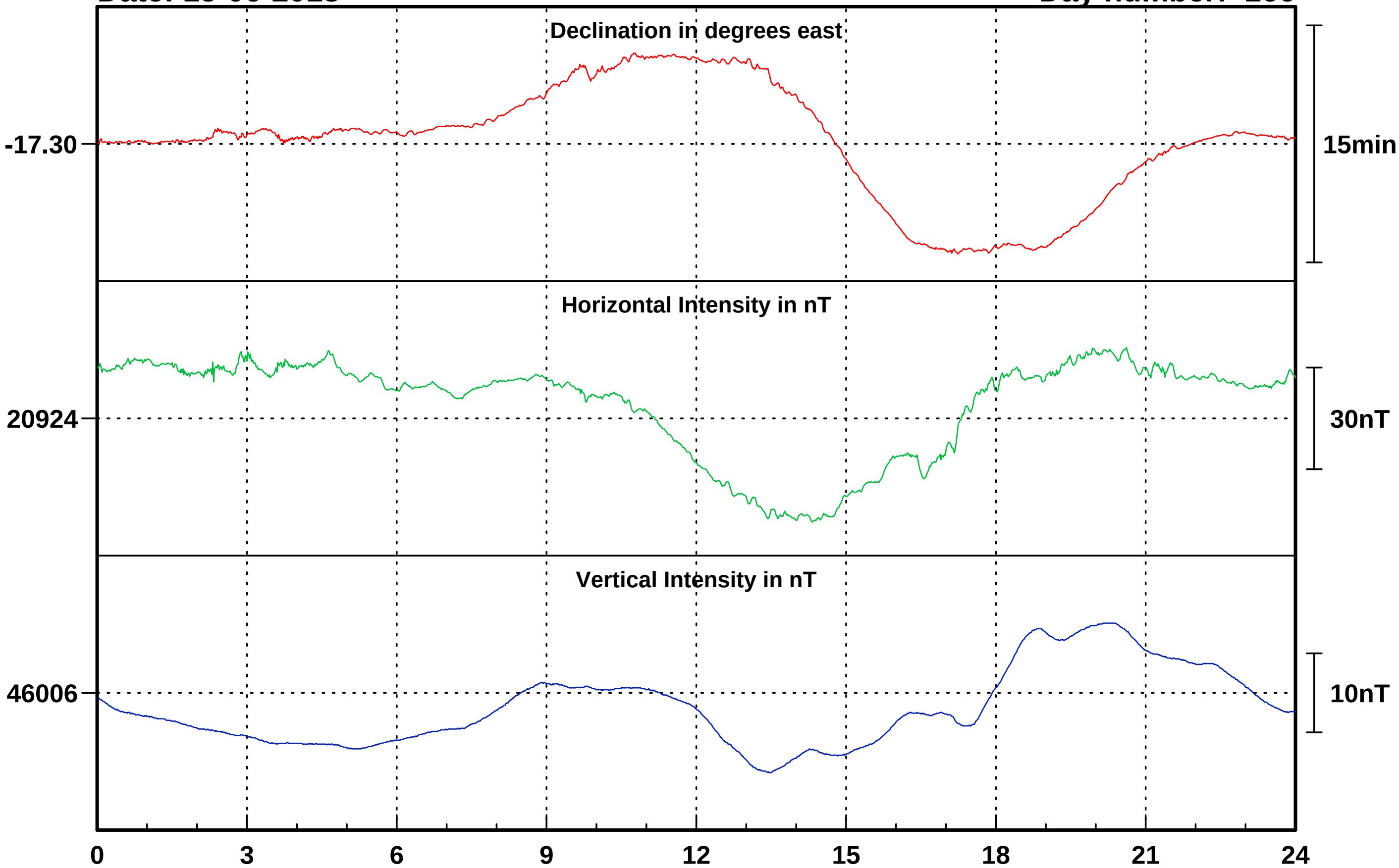


Date: 14-06-2018 **Day number: 165**



Sable Island

Date: 15-06-2018 Day number: 166



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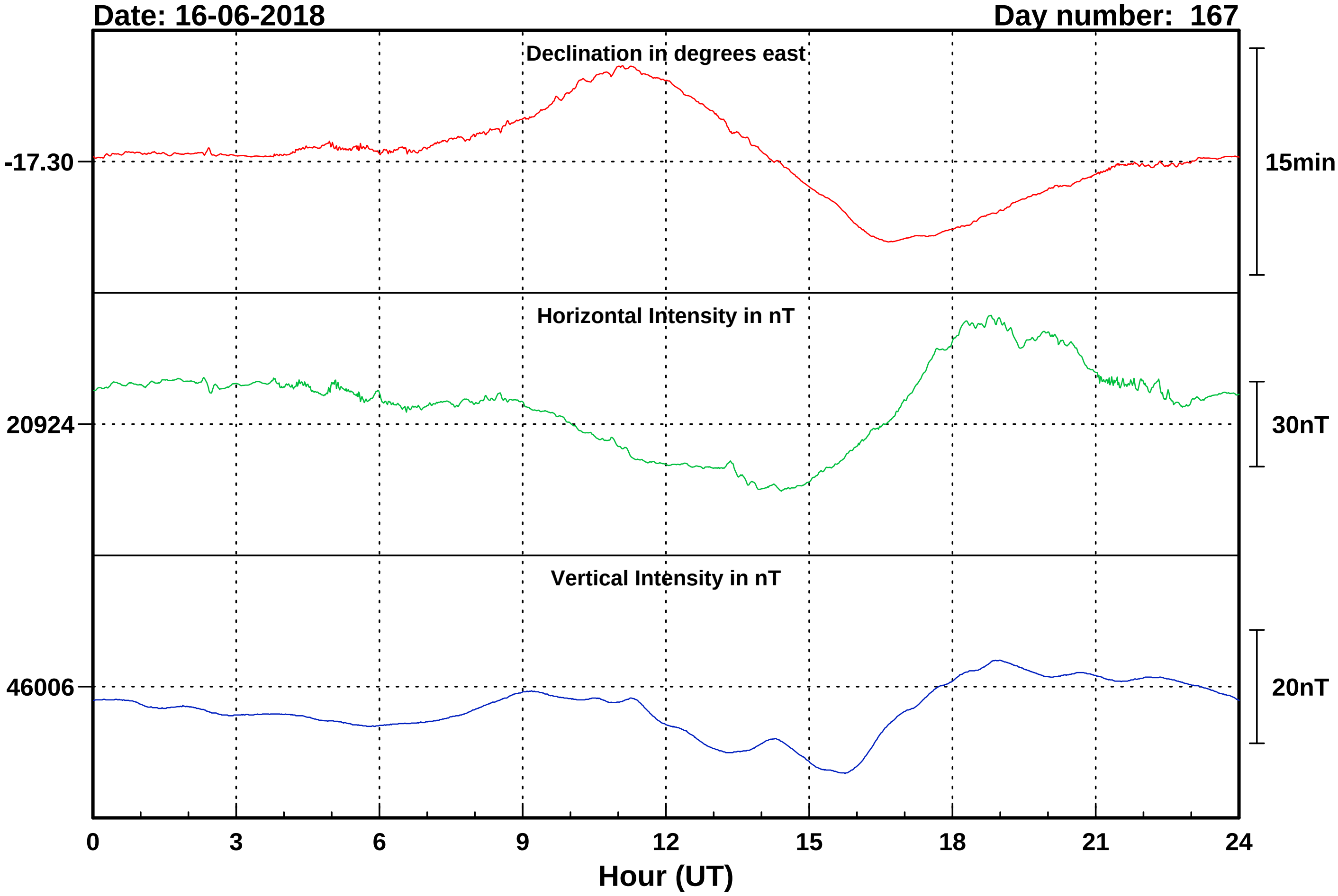
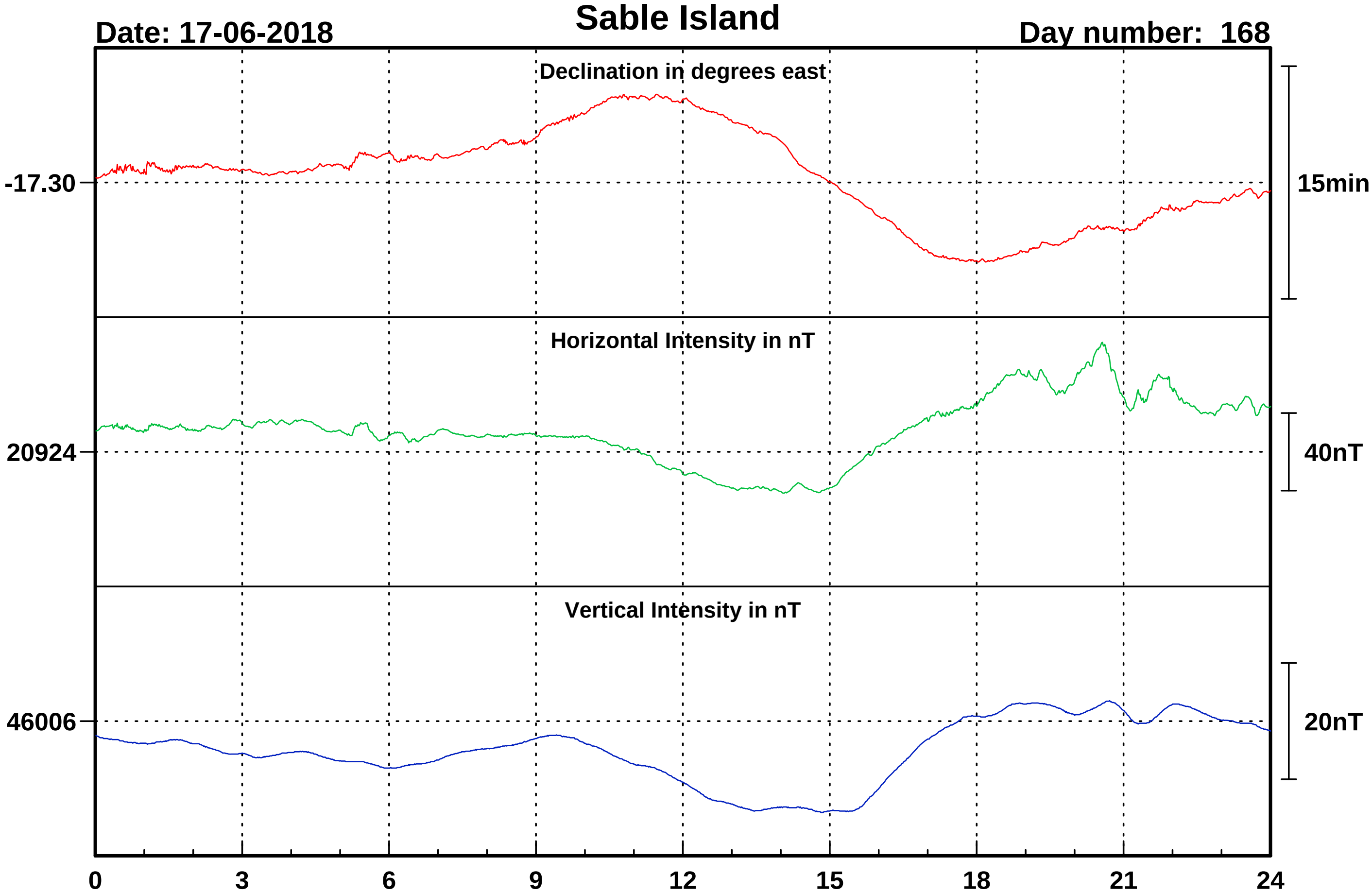
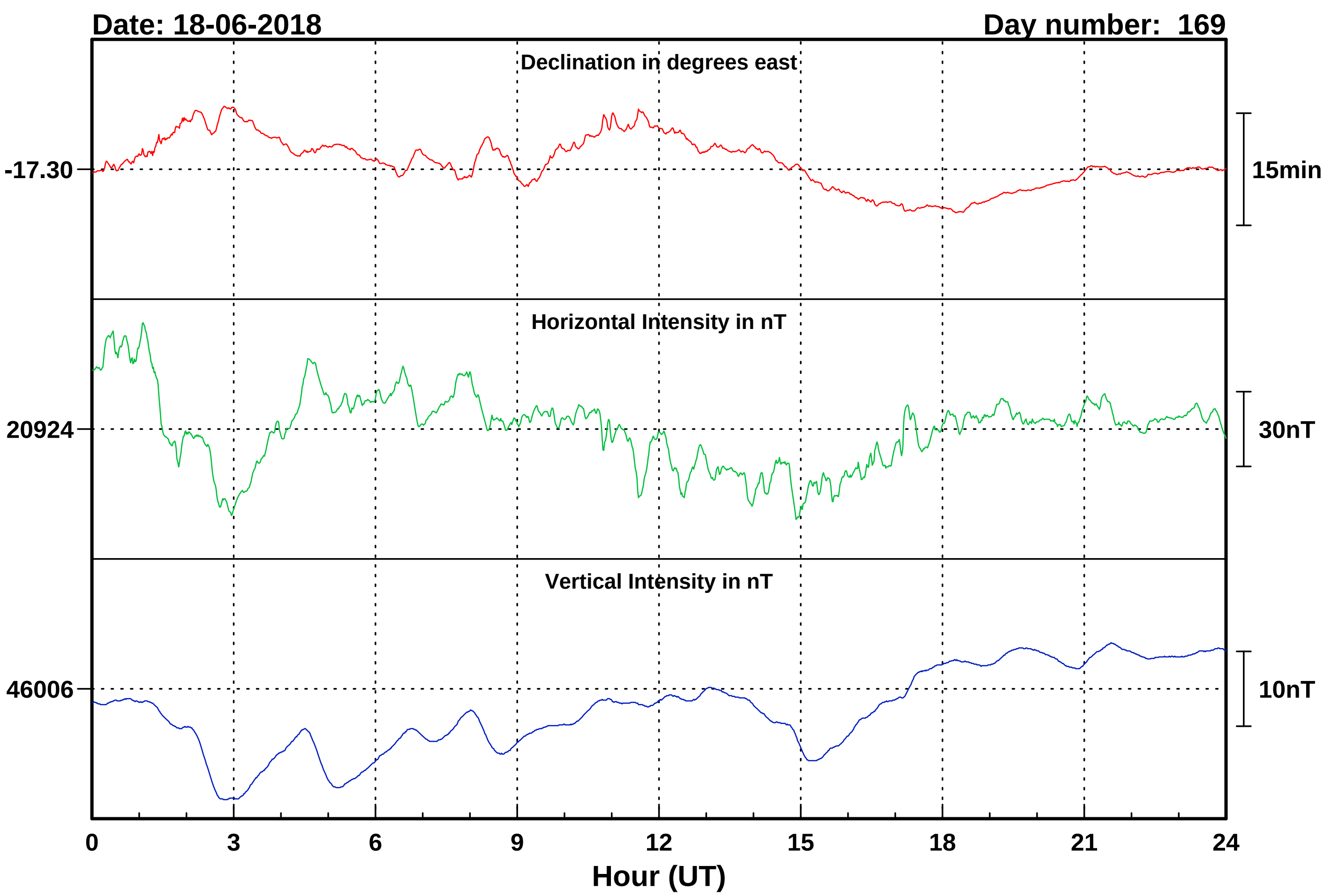
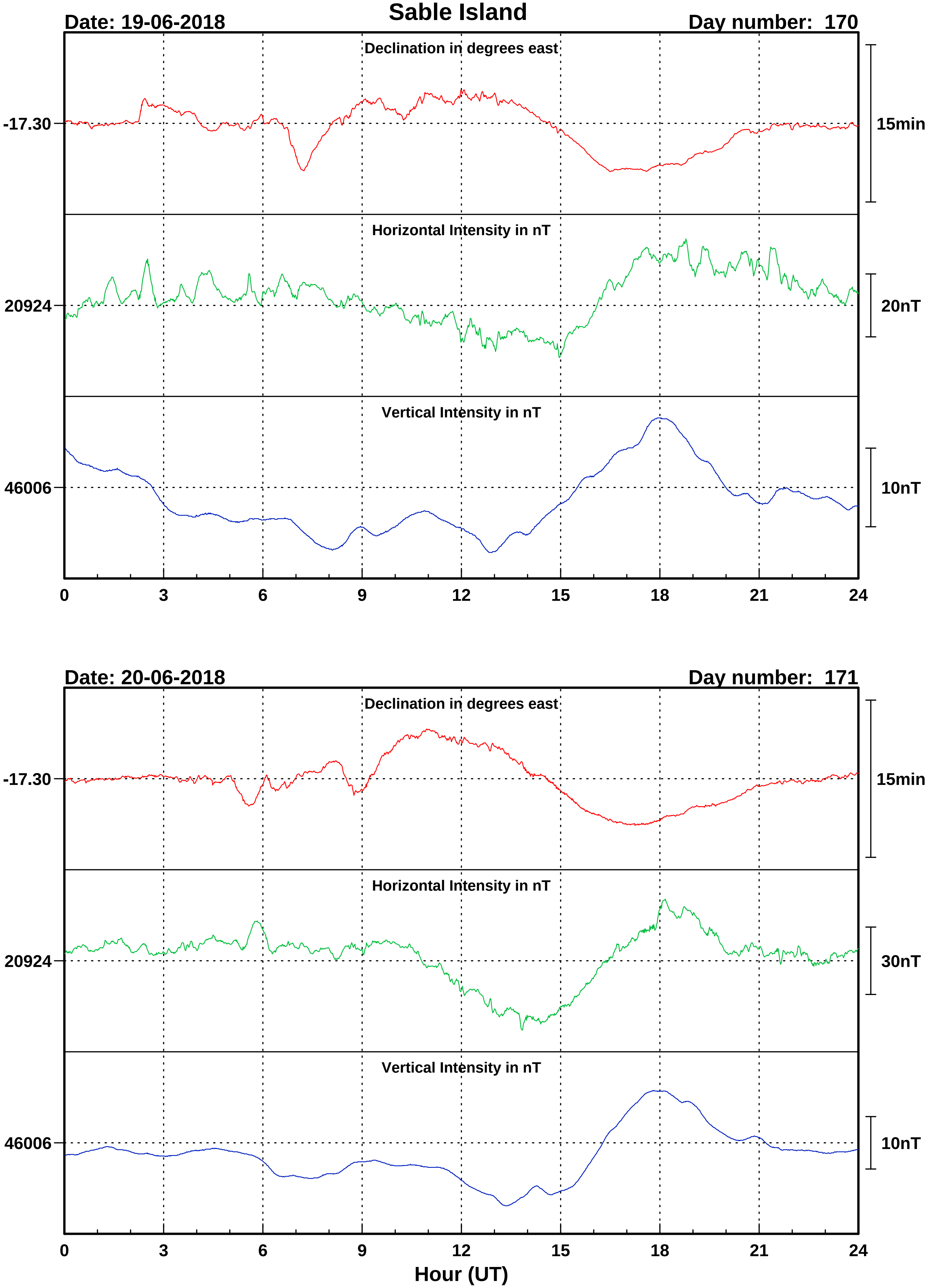


Sable Island



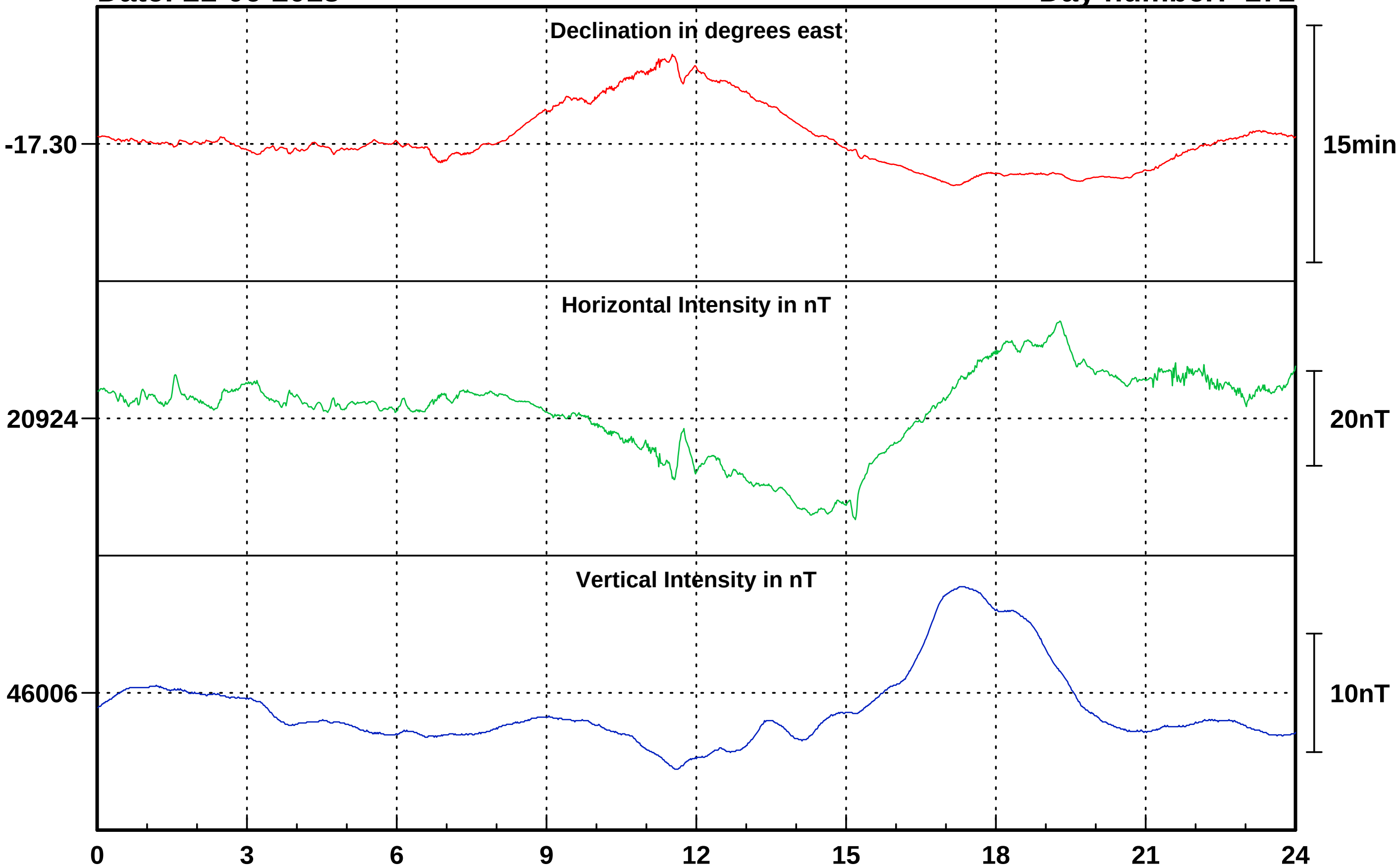


Sable Island

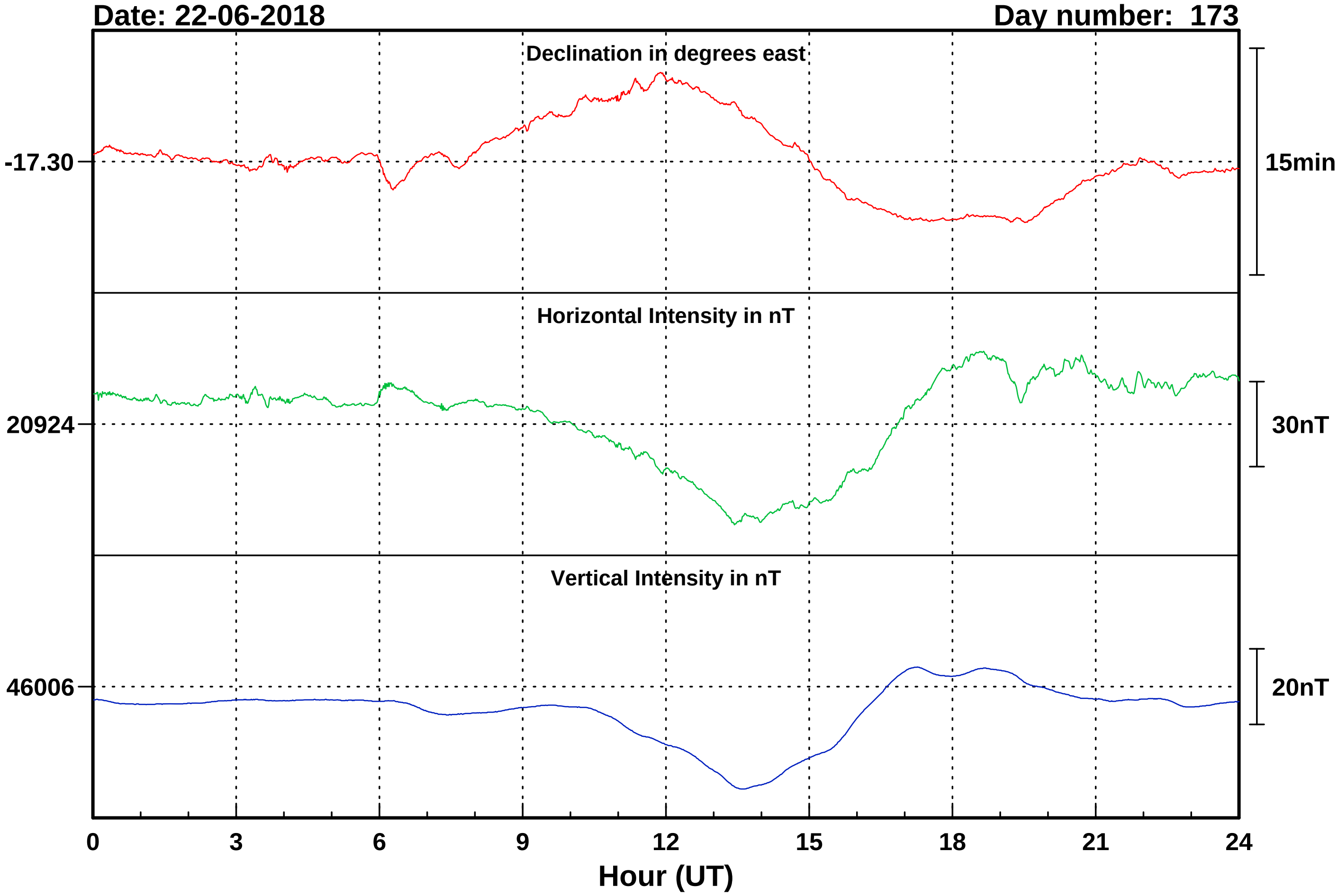


Sable Island

Date: 21-06-2018 Day number: 172

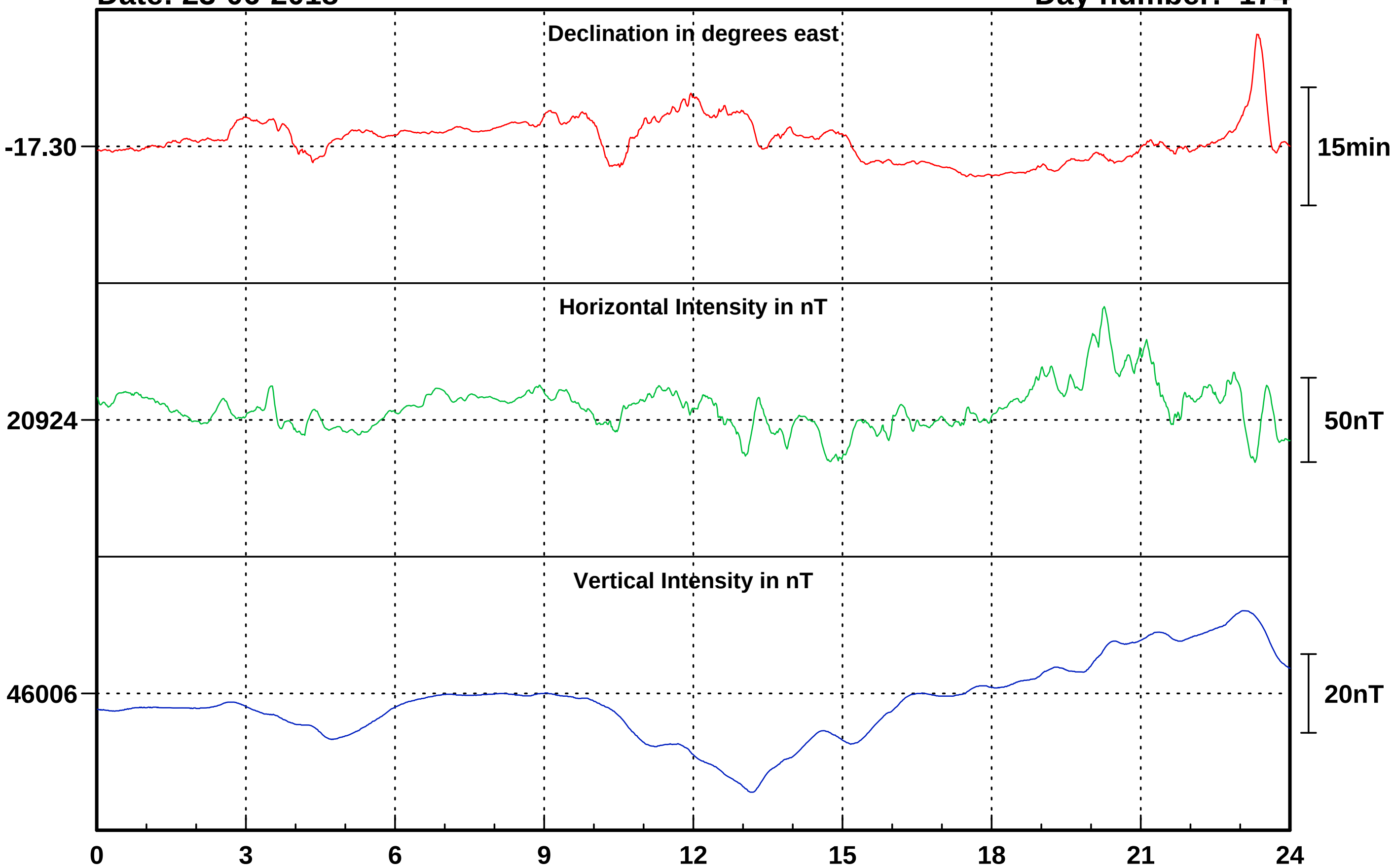


Date: 22-06-2018 Day number: 173



Sable Island

Date: 23-06-2018 Day number: 174



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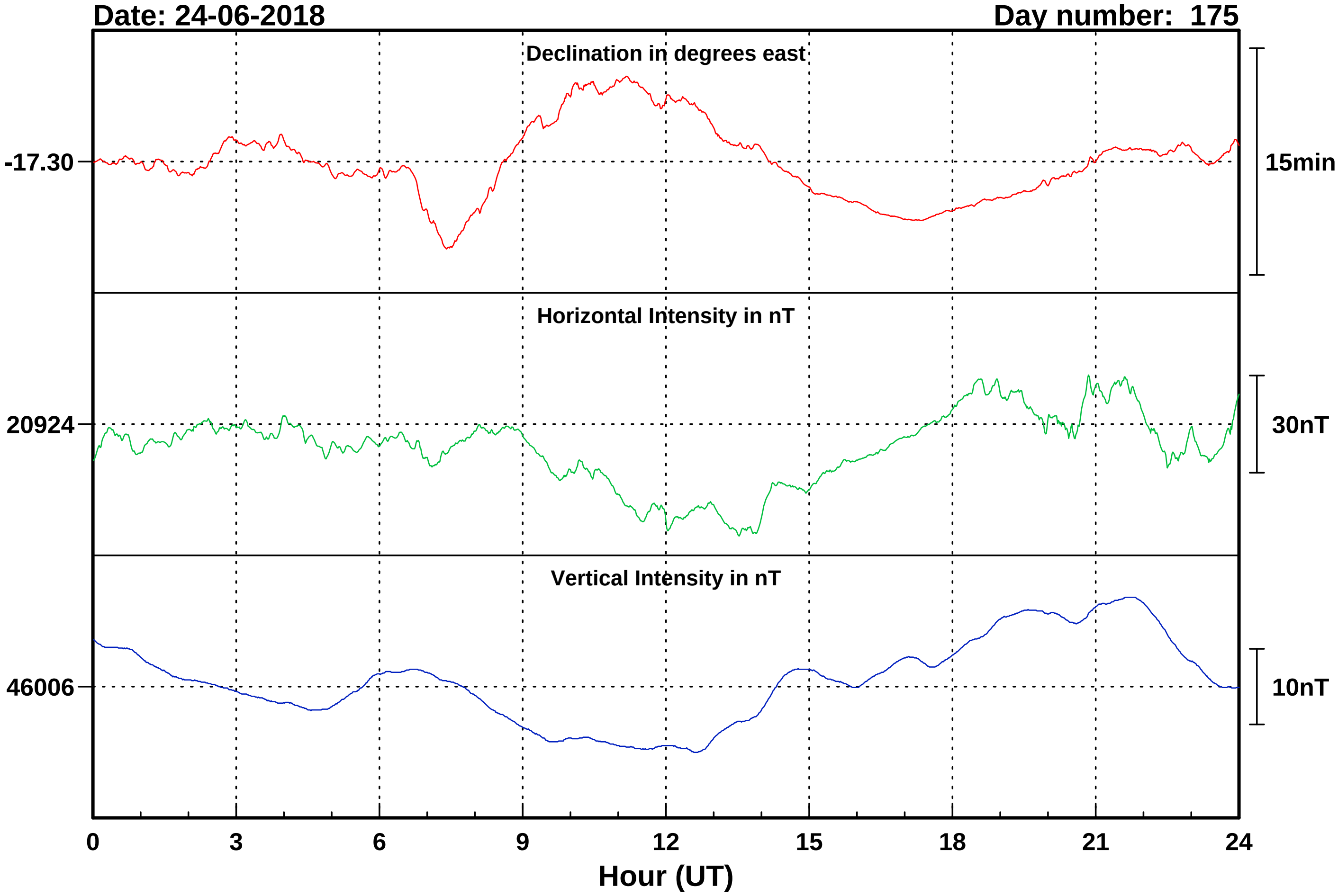
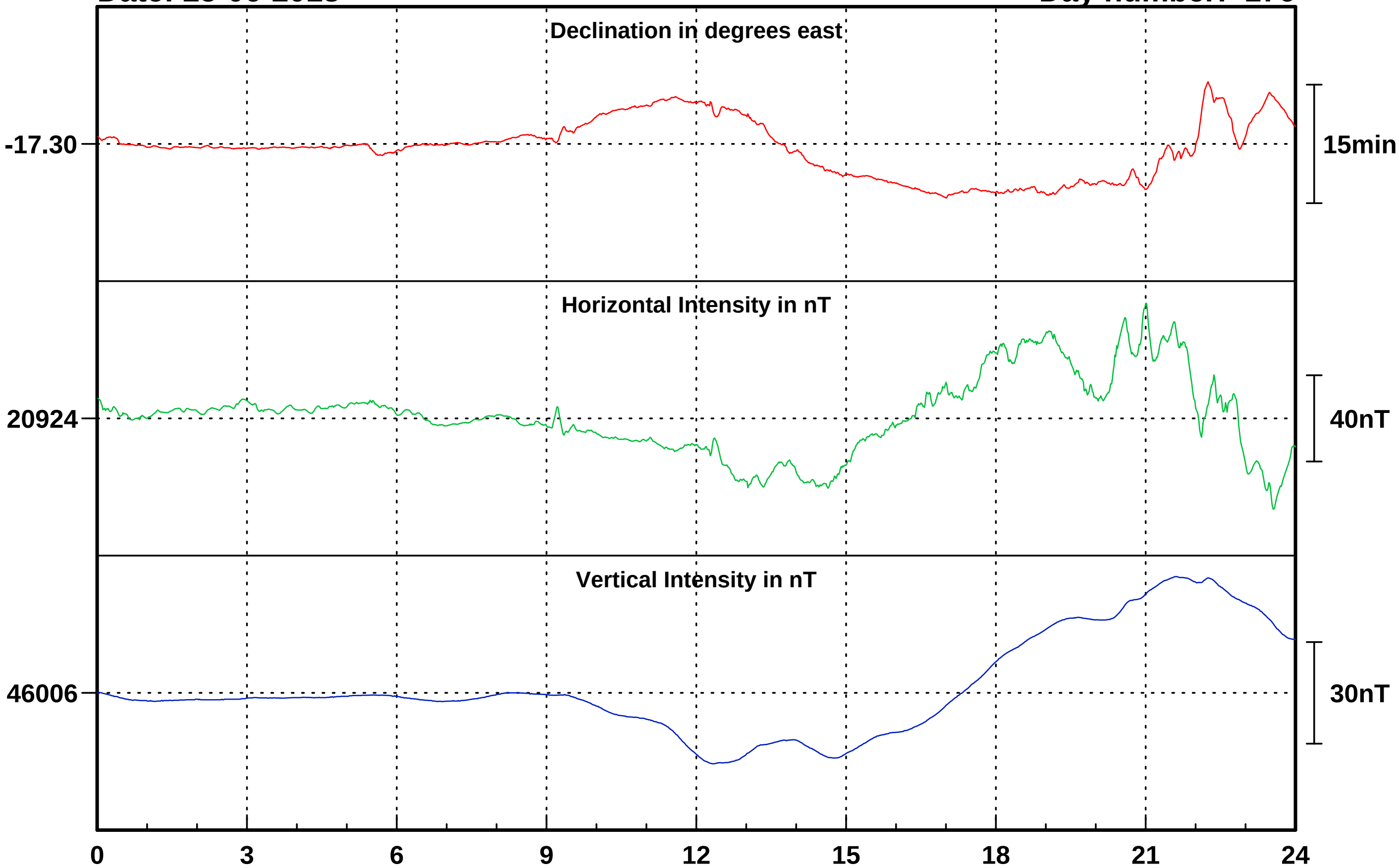
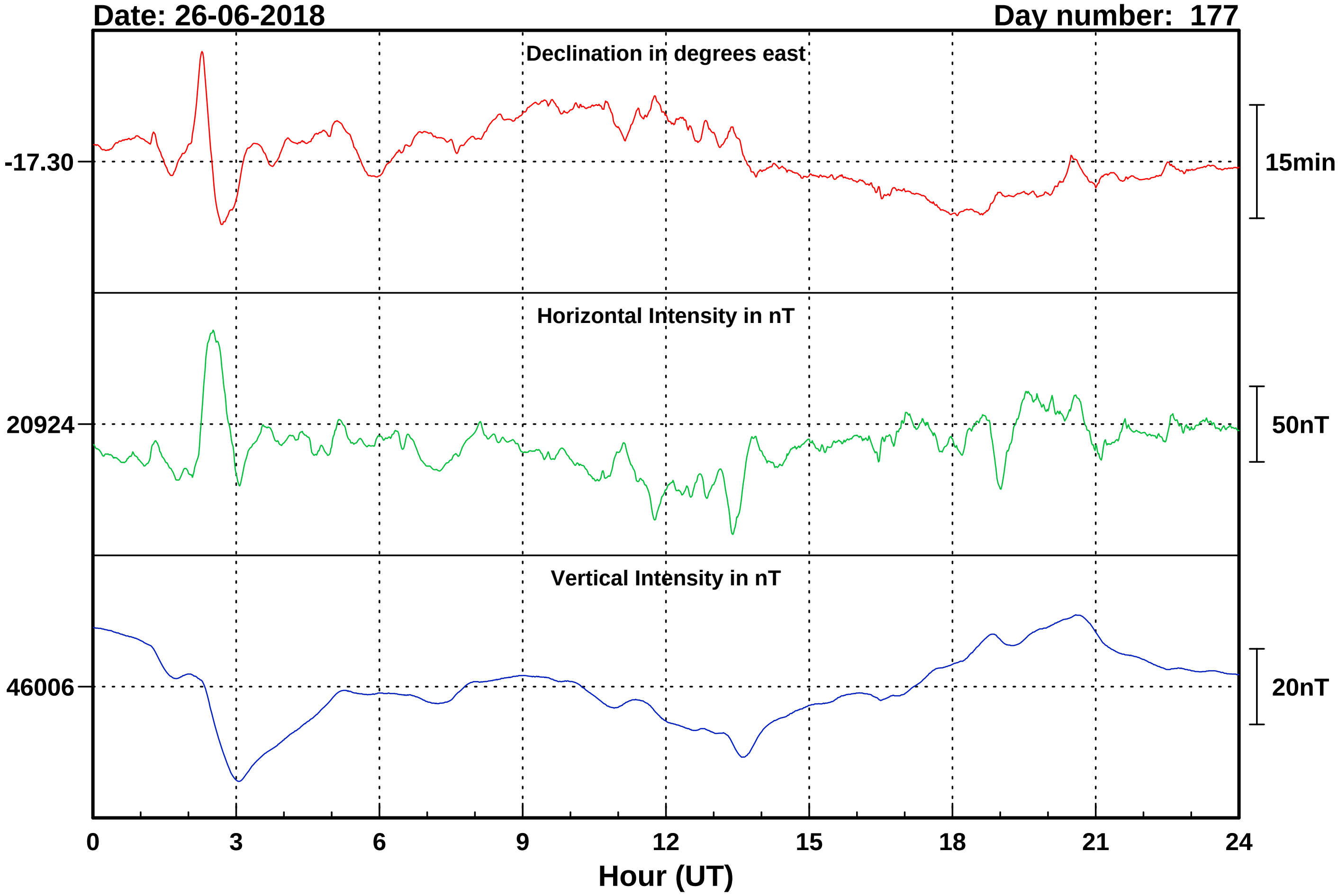


Sable Island

Date: 25-06-2018 Day number: 176

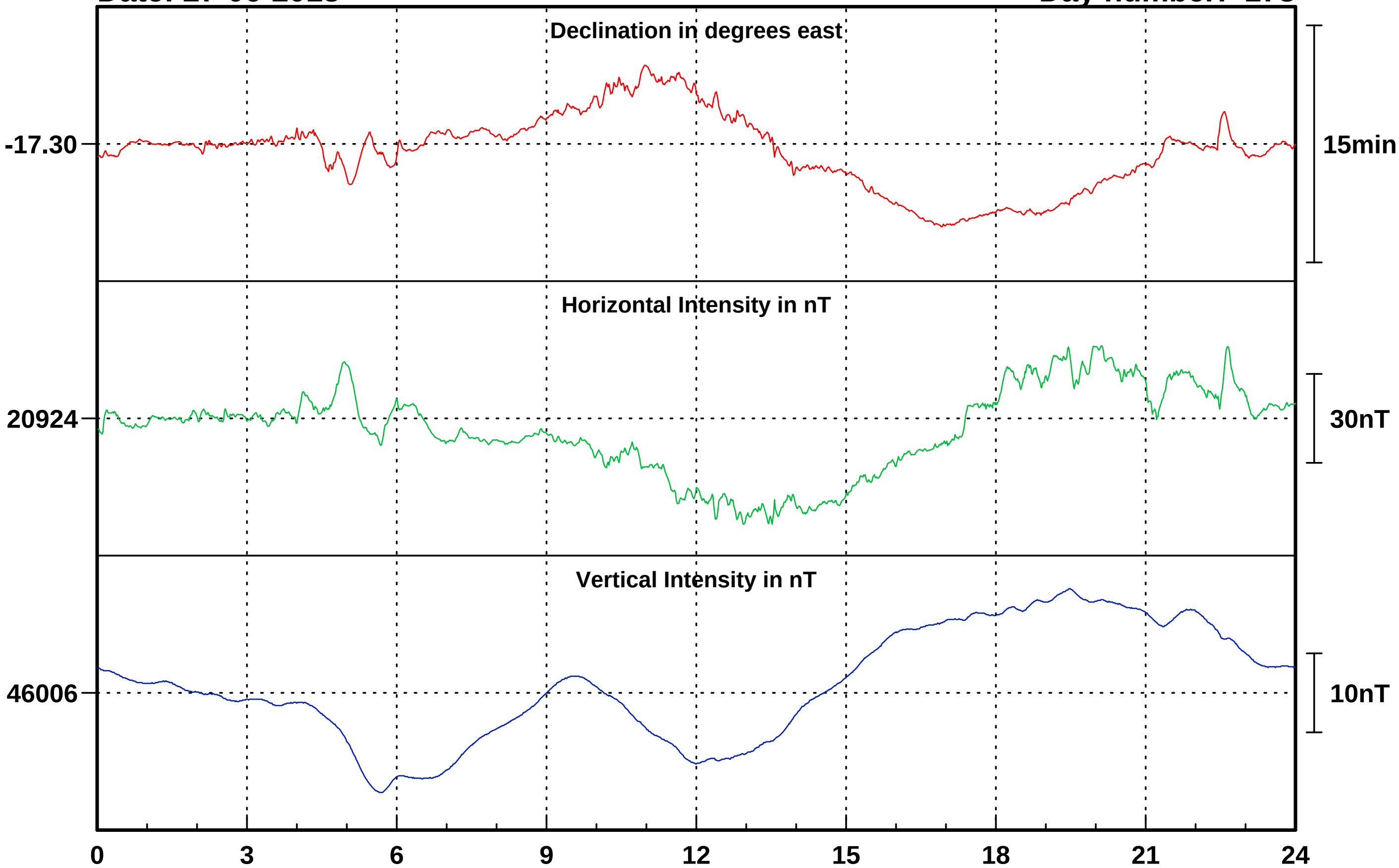


Date: 26-06-2018 Day number: 177

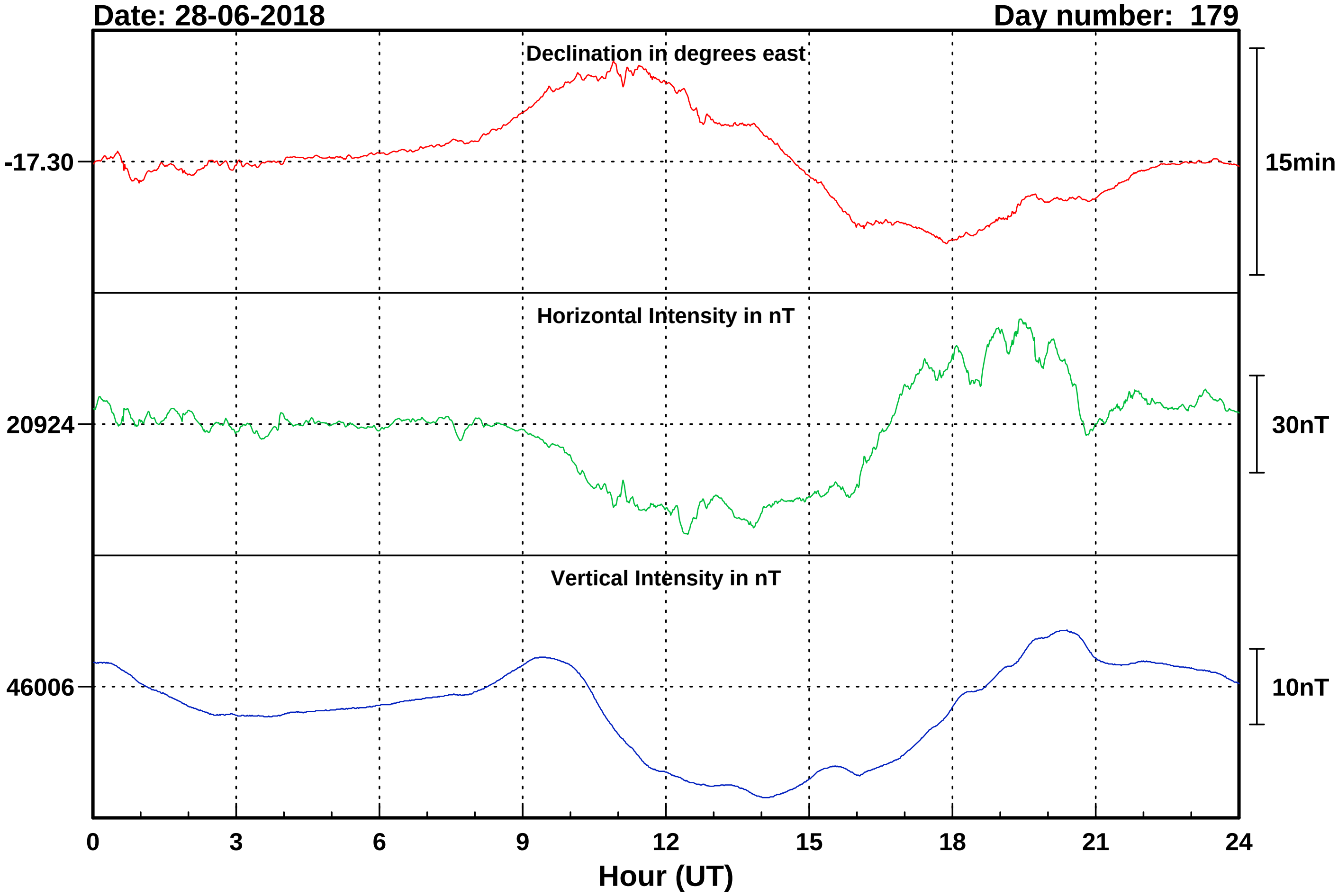


Sable Island

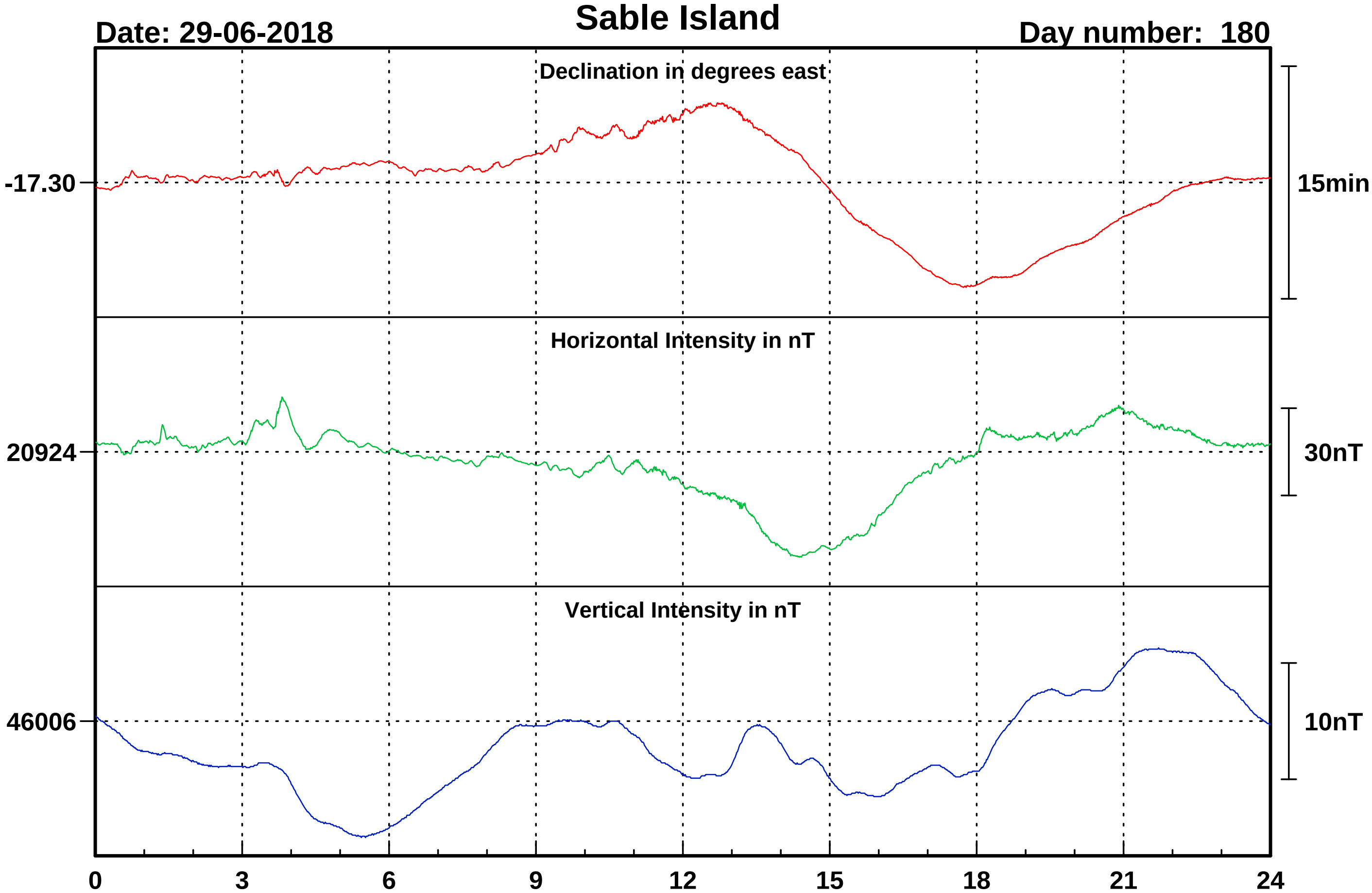
Date: 27-06-2018 Day number: 178

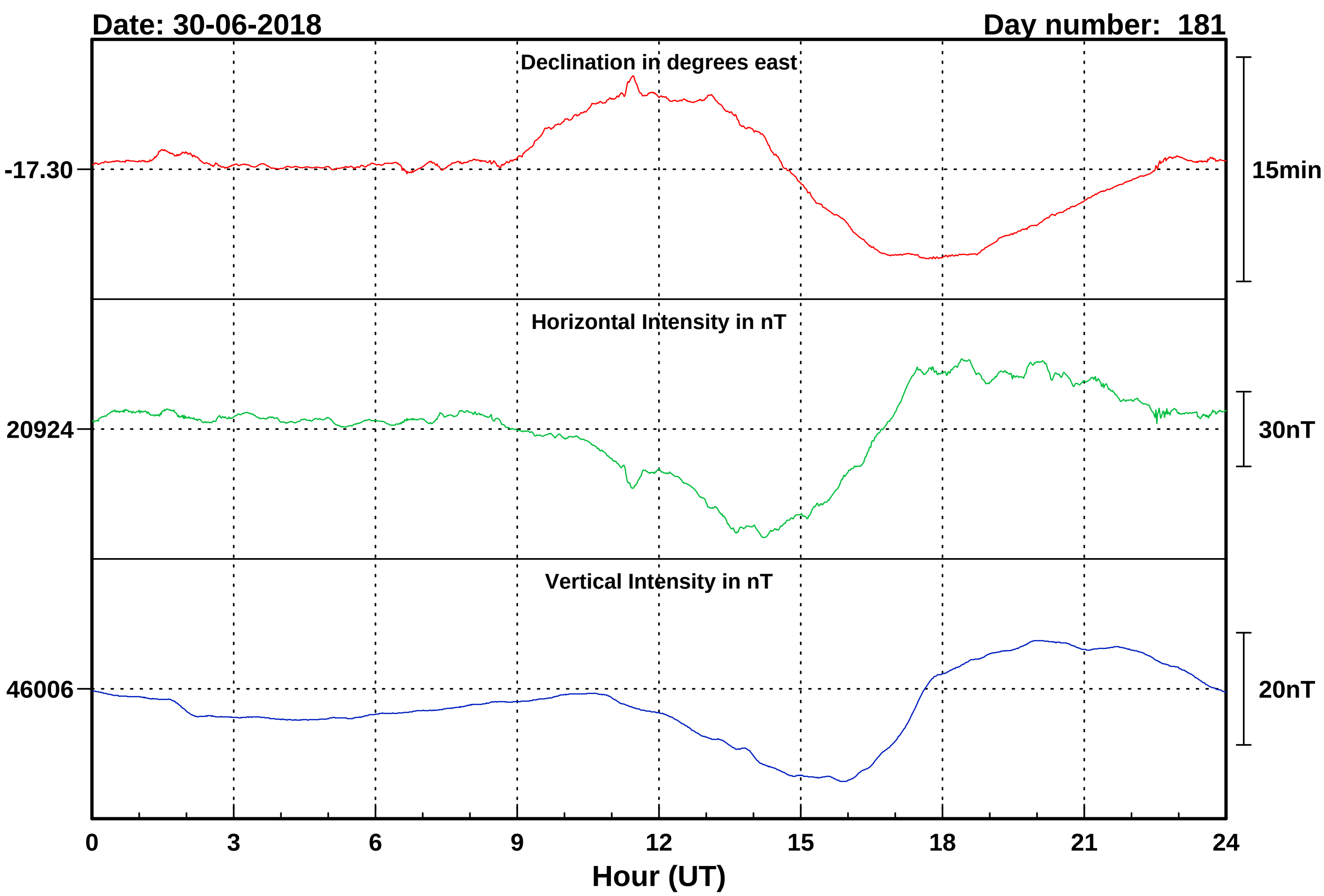


Date: 28-06-2018 Day number: 179

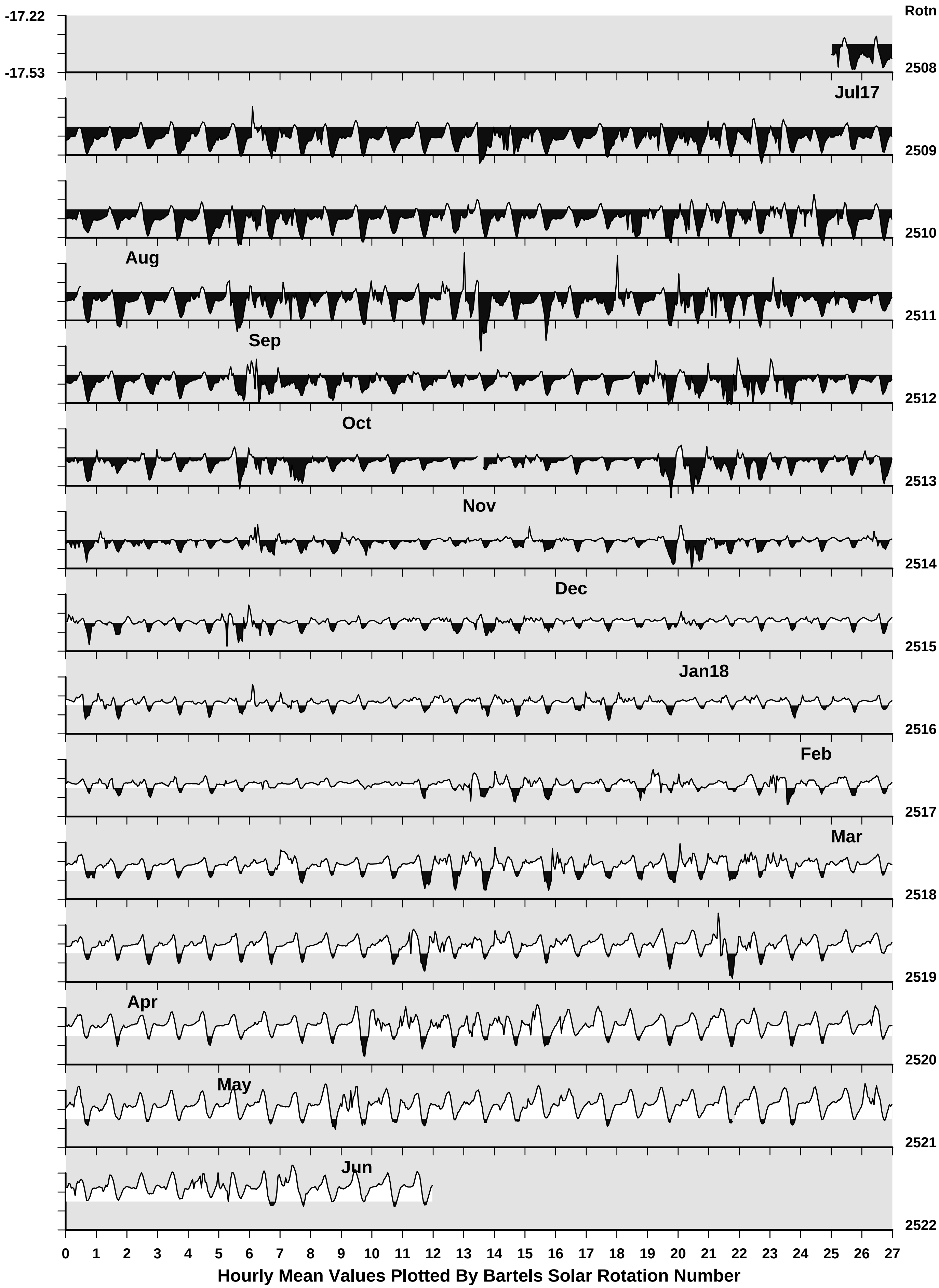


Sable Island

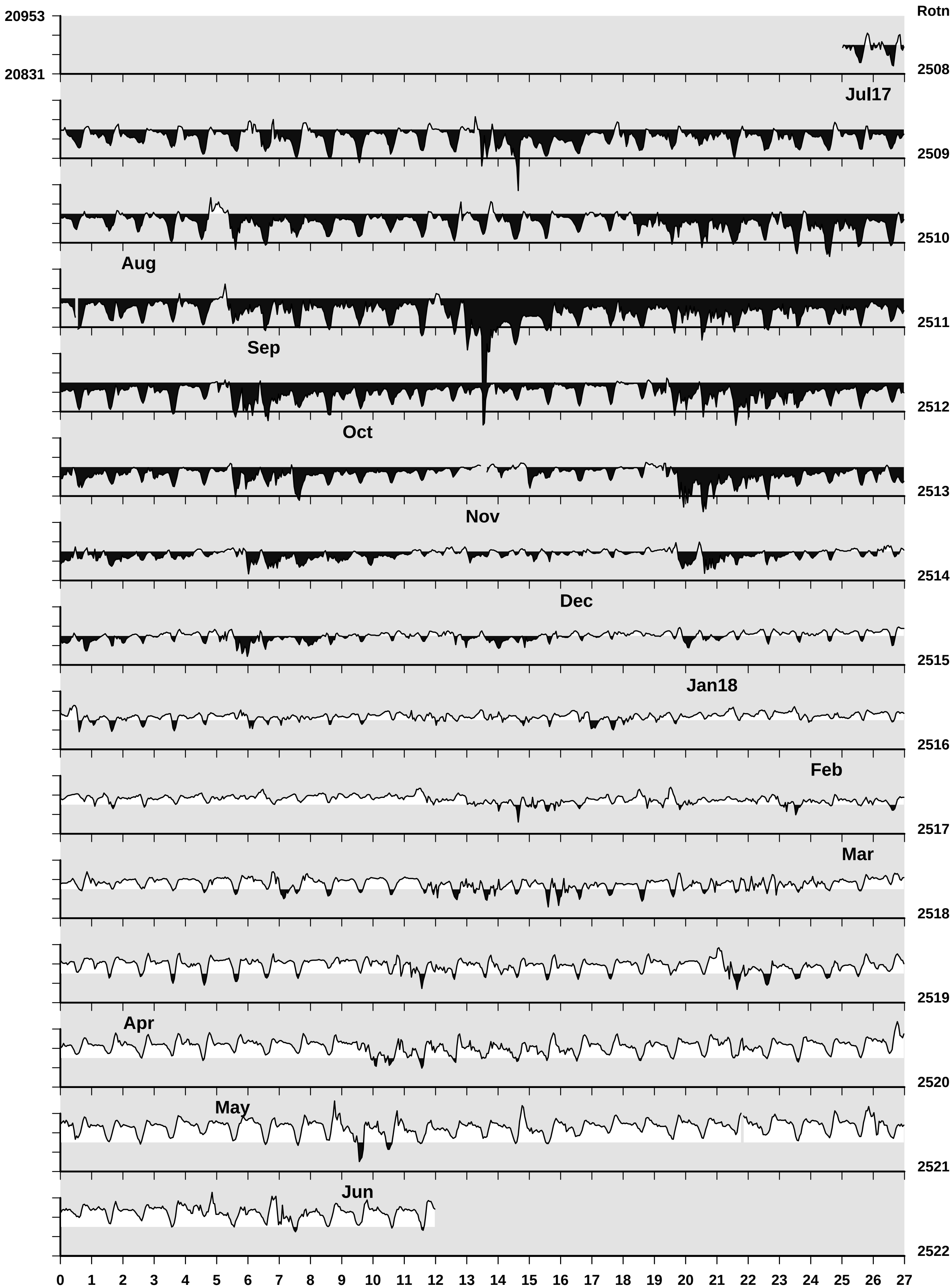




Sable Island Observatory: Declination (degrees)

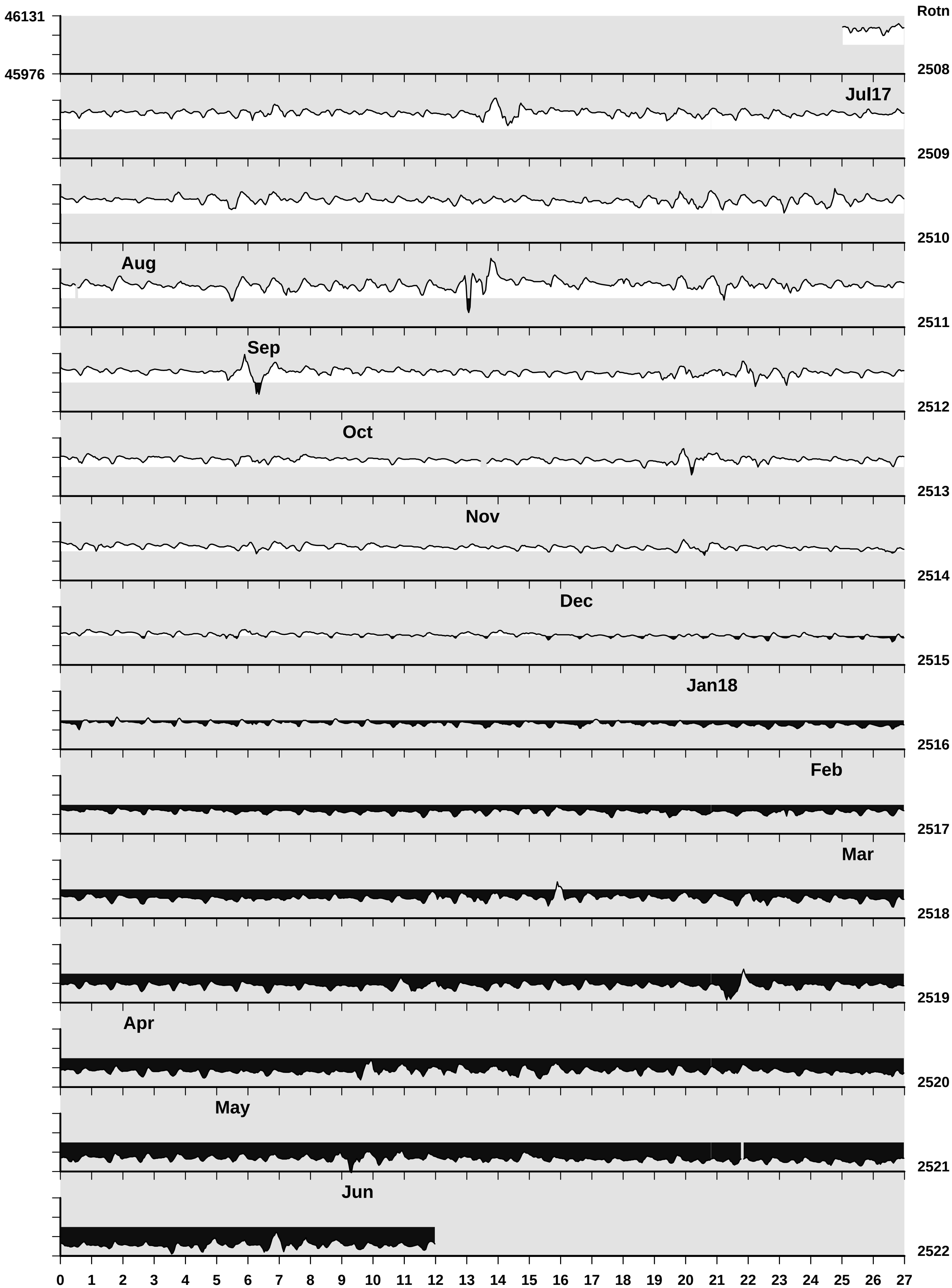


Sable Island Observatory: Horizontal Intensity (nT)

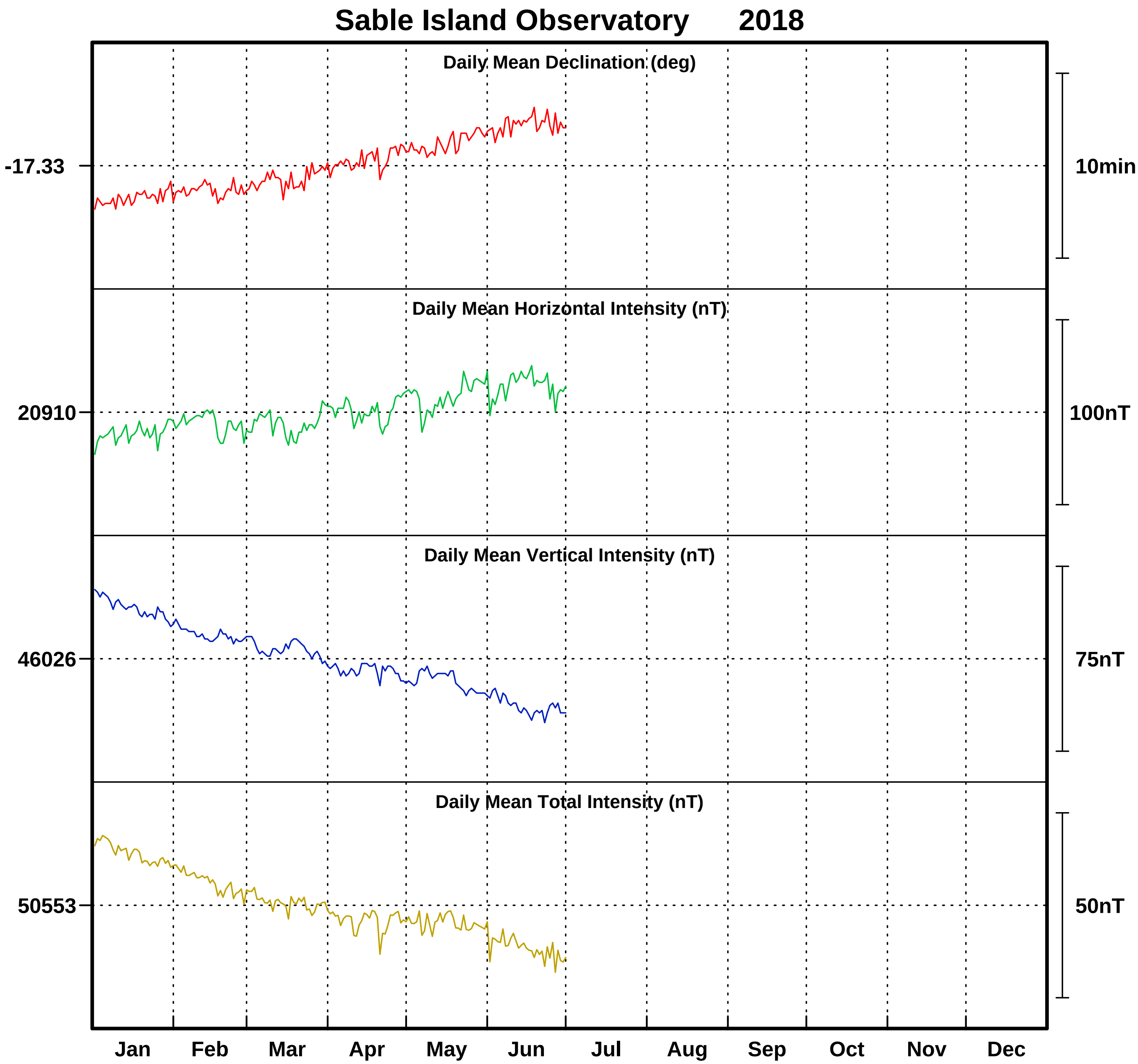


Hourly Mean Values Plotted By Bartels Solar Rotation Number

Sable Island Observatory: Vertical Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number



Sable Island Observatory 2018
Daily Mean Declination (deg)
-17.33
10min
Daily Mean Horizontal Intensity (nT)
20910
100nT
Daily Mean Vertical Intensity (nT)
46026
75nT
Daily Mean Total Intensity (nT)
50553
50nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Sable Island Observatory 2018

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	-17° 21.7´	20899 nT	65° 35.3´	19946 nT	-6236 nT	46047 nT	50567 nT
February	-17° 21.3´	20904 nT	65° 34.7´	19952 nT	-6235 nT	46036 nT	50559 nT
March	-17° 20.7´	20904 nT	65° 34.5´	19953 nT	-6232 nT	46030 nT	50554 nT
April	-17° 19.6´	20911 nT	65° 33.9´	19962 nT	-6228 nT	46021 nT	50549 nT
May	-17° 18.7´	20919 nT	65° 33.2´	19971 nT	-6225 nT	46017 nT	50548 nT
June	-17° 17.7´	20924 nT	65° 32.6´	19978 nT	-6221 nT	46006 nT	50541 nT

Note

i. The values shown here are provisional.