BRITISH GEOLOGICAL SURVEY

Ascension Island Observatory *Monthly Magnetic Bulletin*

December 2020

20/12/AS

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

ASCENSION ISLAND OBSERVATORY MAGNETIC DATA

1. Introduction

Ascension Island observatory was installed by the British Geological Survey (BGS) with financial support from a consortium of oil companies and became operational in September 1992.

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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Internet: www.geomag.bgs.ac.uk

2. Position

Ascension Island Observatory, one of the geomagnetic observatories maintained and operated by BGS, is situated on a site adjacent to the Cable and Wireless Earth Station on Donkey Plain. The observatory co-ordinates are:

Geographic: *7° 56' 56.4" S* *345° 37' 26.4" E*
Geomagnetic: *2° 57' 22" S* *057° 32' 20" E*
Height above mean sea level: *177 m*

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 13th generation International Geomagnetic Reference Field (IGRF) at epoch 2020.5. 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 operational in August 2002. 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. The one-minute values provide input for various data products, available on-line at www.geomag.bgs.ac.uk/data_service/home

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 Ascension Island magnetic observatory, operated by the British Geological Survey.’

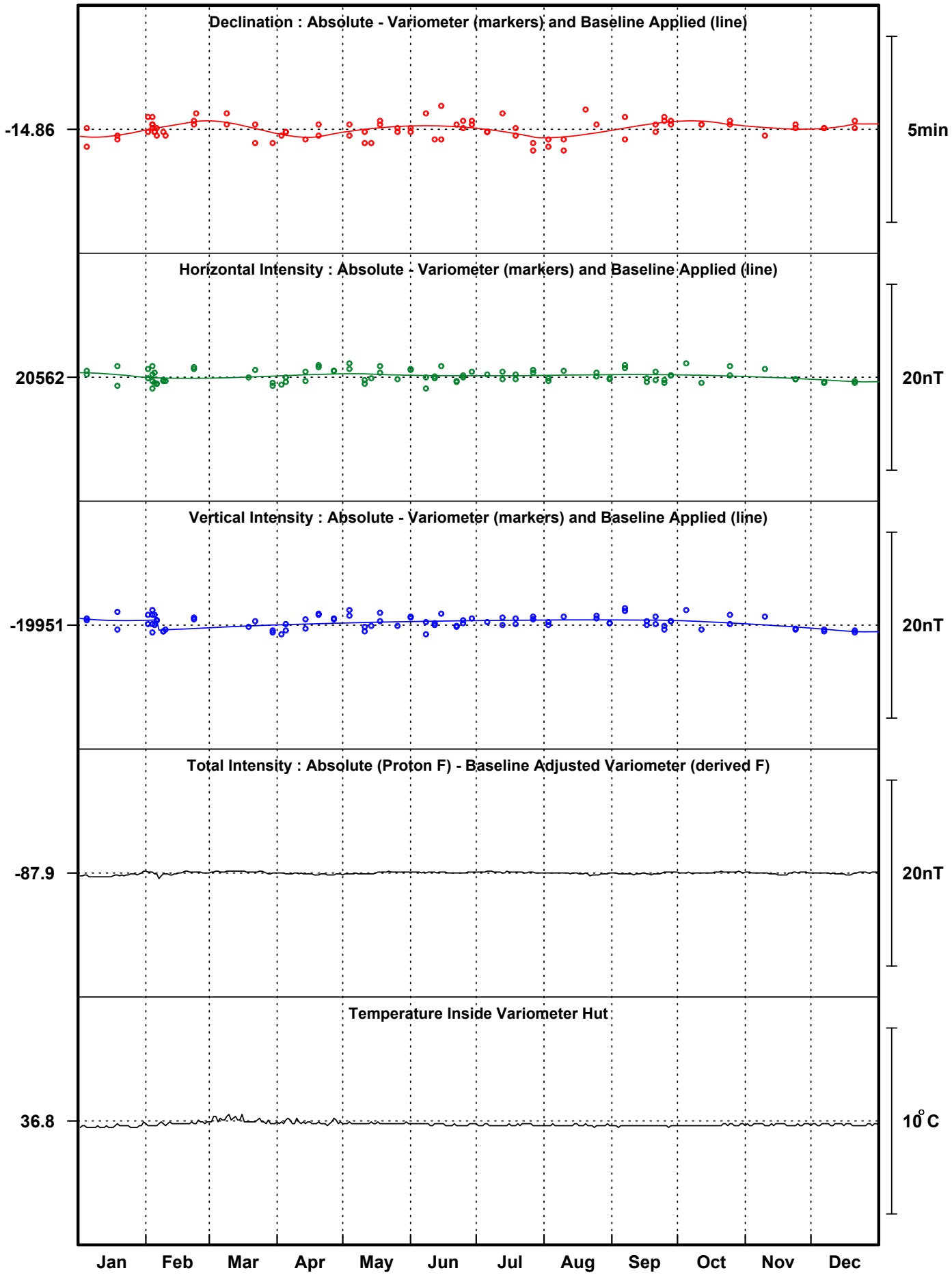
Commercial users can contact the geomagnetism team for information on the range of applications and services offered. Full contact details are available at www.geomag.bgs.ac.uk/contactus/staff

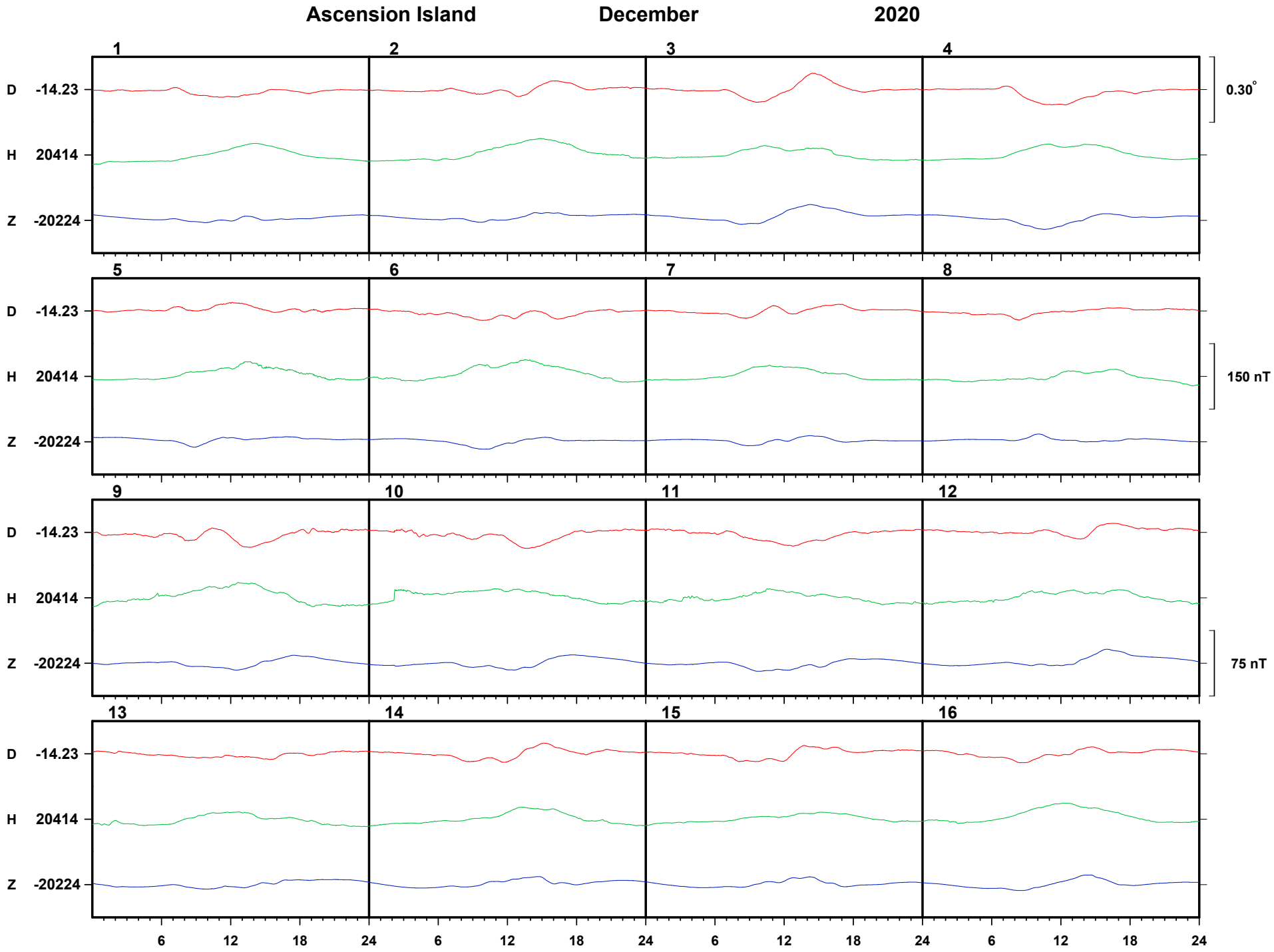
ASCENSION ISLAND OBSERVATORY

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**
06-Dec-20	341	07:36	-14.2477	-14.8567	07:50	-44.7281	87.9	28741.9	20419.8	20561.3	-20226.9	-19951.8	JS
06-Dec-20	341	08:02	-14.2556	-14.8567	08:17	-44.7199	87.9	28747.0	20426.3	20561.4	-20227.6	-19951.6	JS
20-Dec-20	355	08:27	-14.2572	-14.8567	08:43	-44.7454	87.9	28740.2	20412.5	20561.3	-20231.9	-19951.9	JS
20-Dec-20	355	08:55	-14.2674	-14.8533	09:07	-44.7447	87.9	28742.0	20414.0	20561.5	-20232.9	-19951.7	JS

Ascension Island 2020




Ascension Island
December
2020
1
2
3
4
D -14.23
H 20414
Z -20224
0.30°
5
6
7
8
150 nT
9
10
11
12
75 nT
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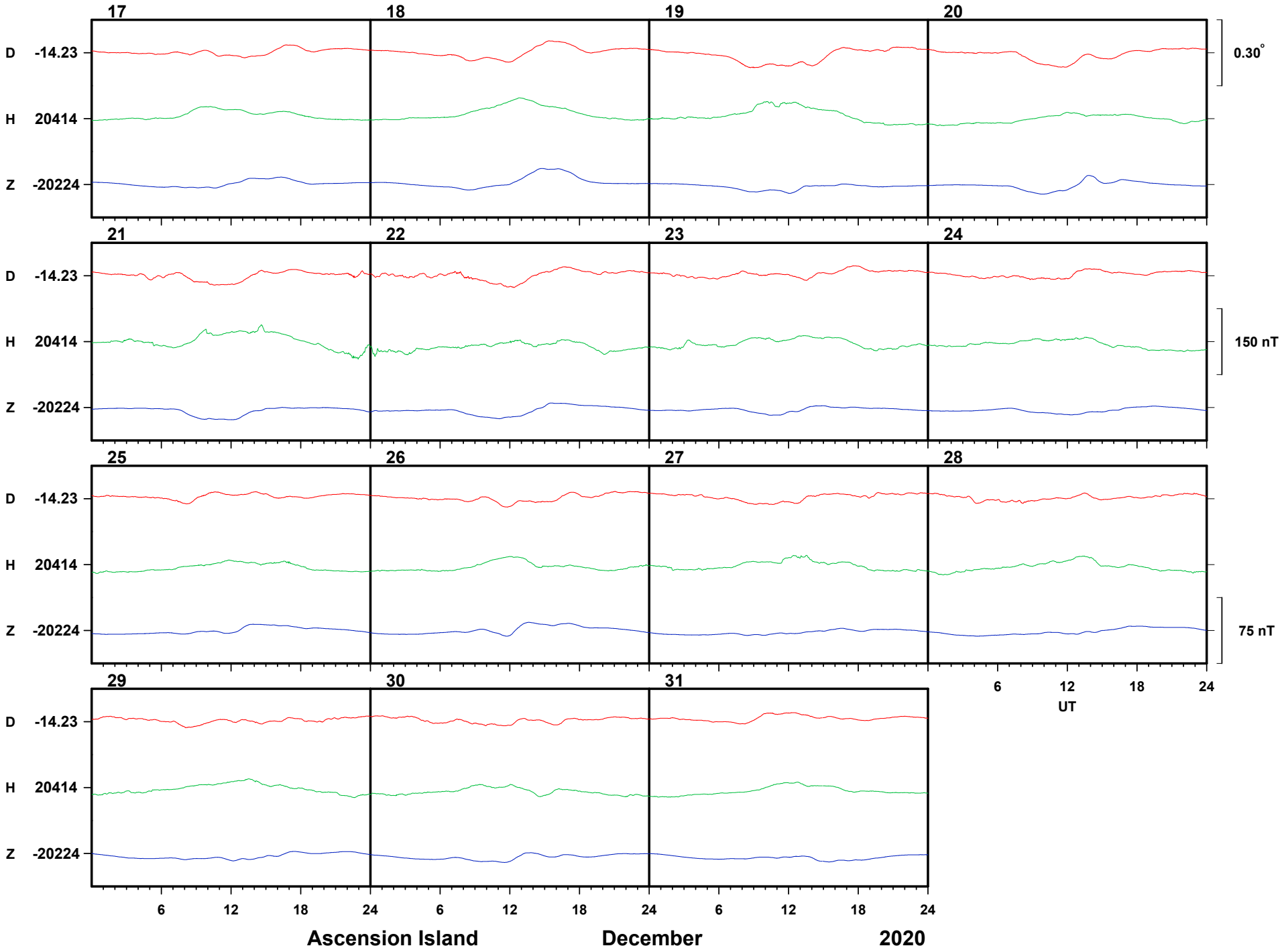
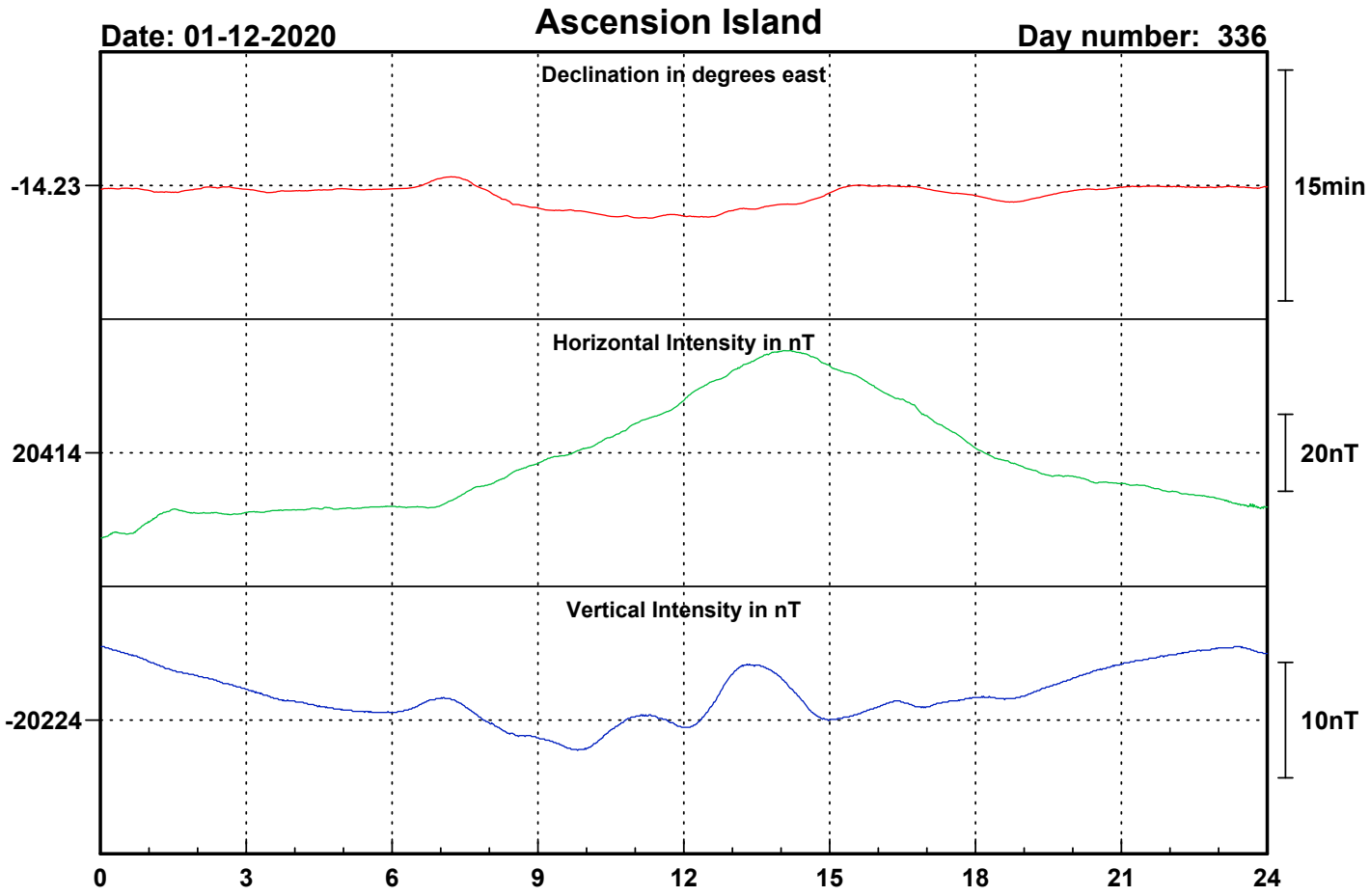
15
16
6
12
18
24


17
18
19
20
D -14.23
H 20414
Z -20224
0.30°
21
22
23
24
150 nT
25
26
27
28
75 nT
29
30
31
6
12
18
24
UT
Ascension Island
December
2020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Day number: 336
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
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10nT
0
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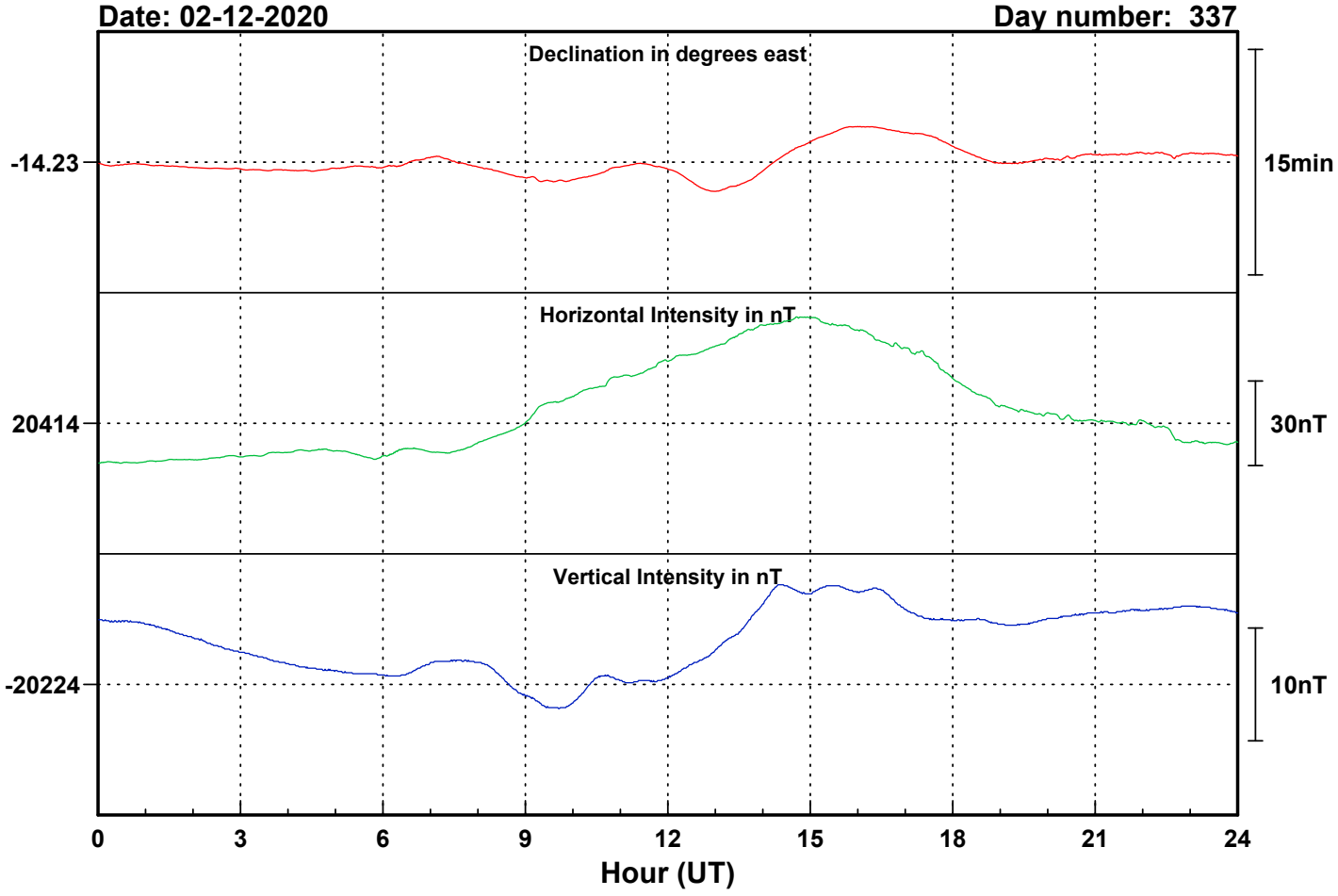
24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Declination in degrees east
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15min
Horizontal Intensity in nT
20414
30nT
Vertical Intensity in nT
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10nT
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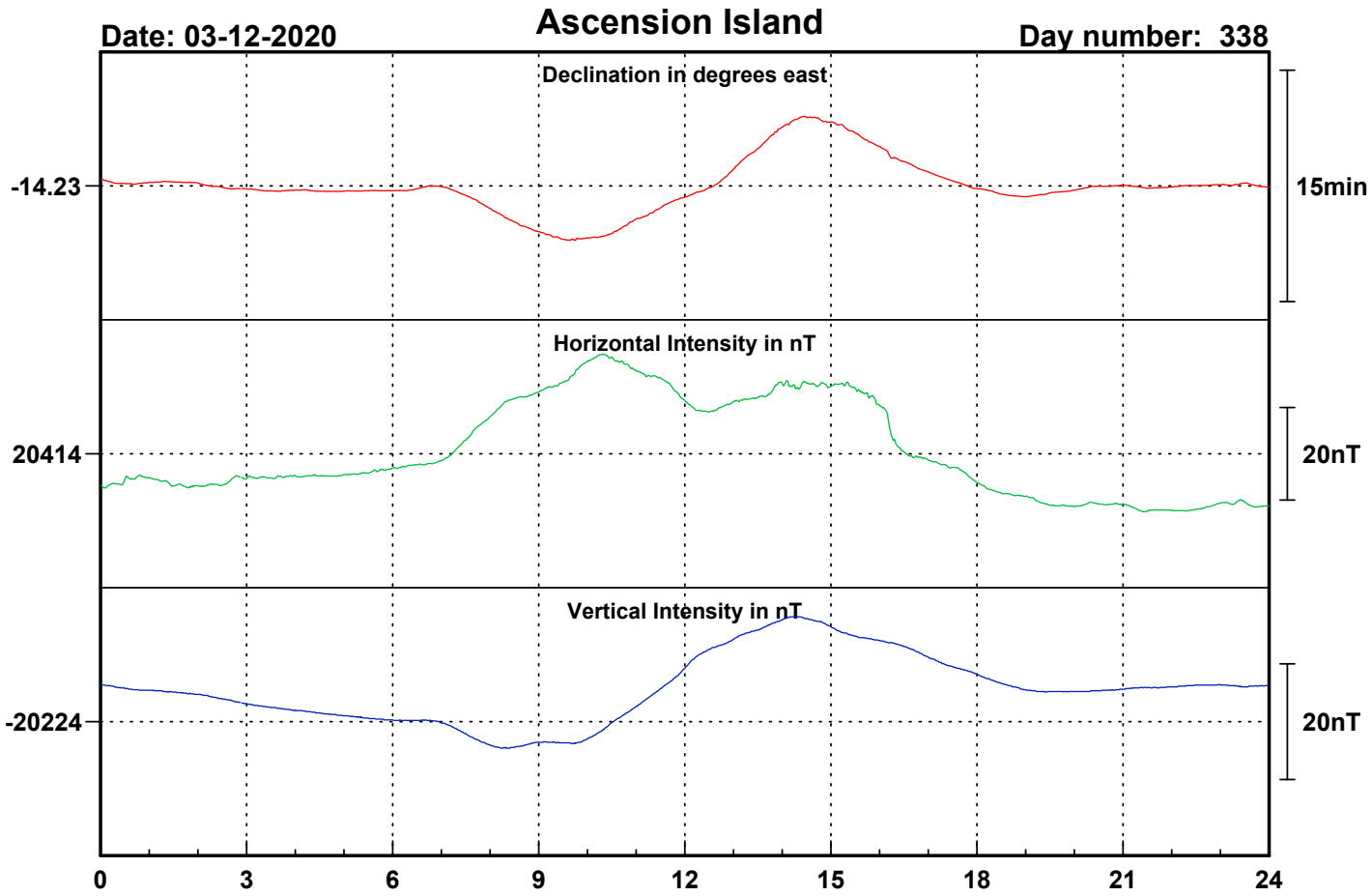
Hour (UT)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Day number: 338
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
20nT
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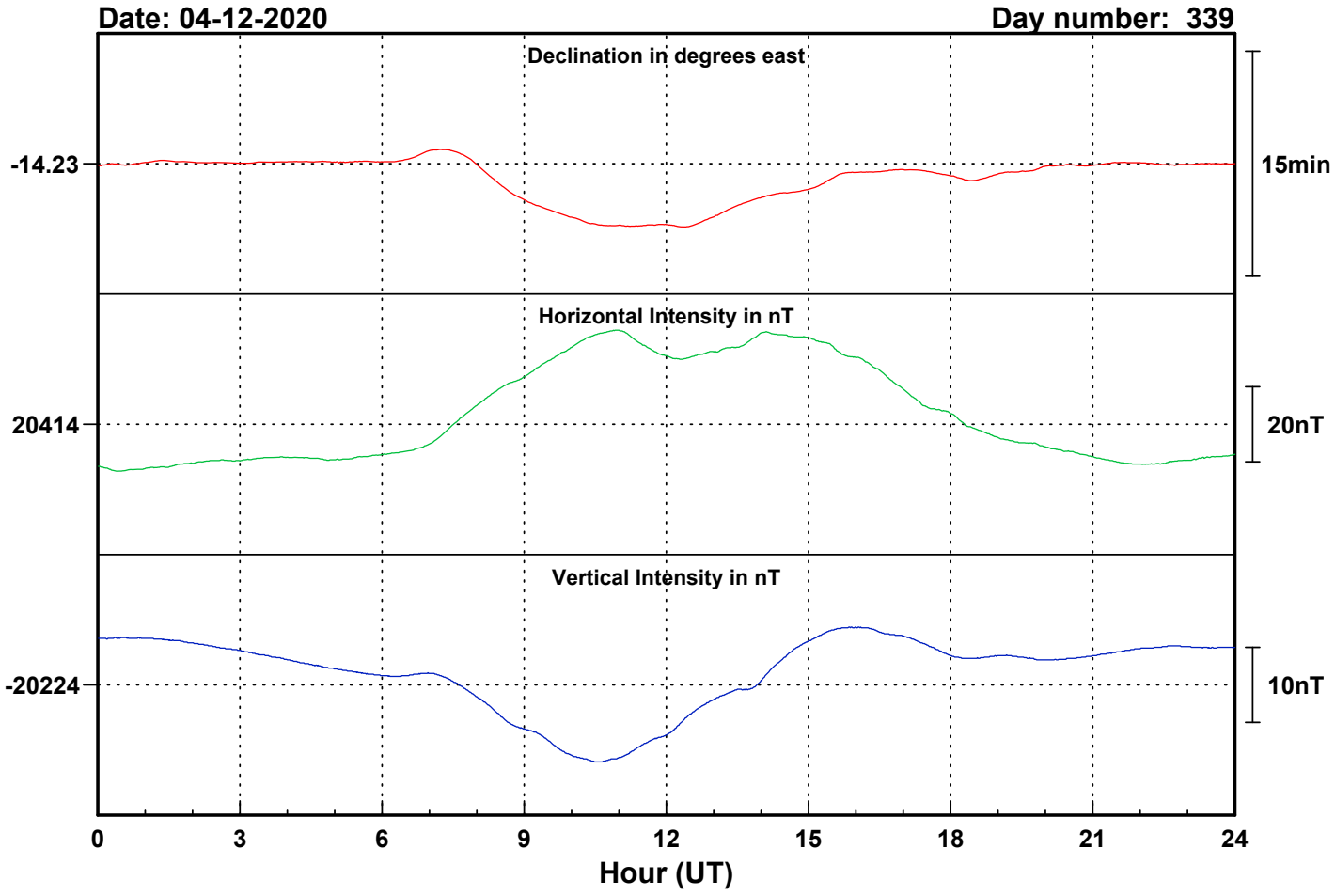
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Day number: 339
Declination in degrees east
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15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
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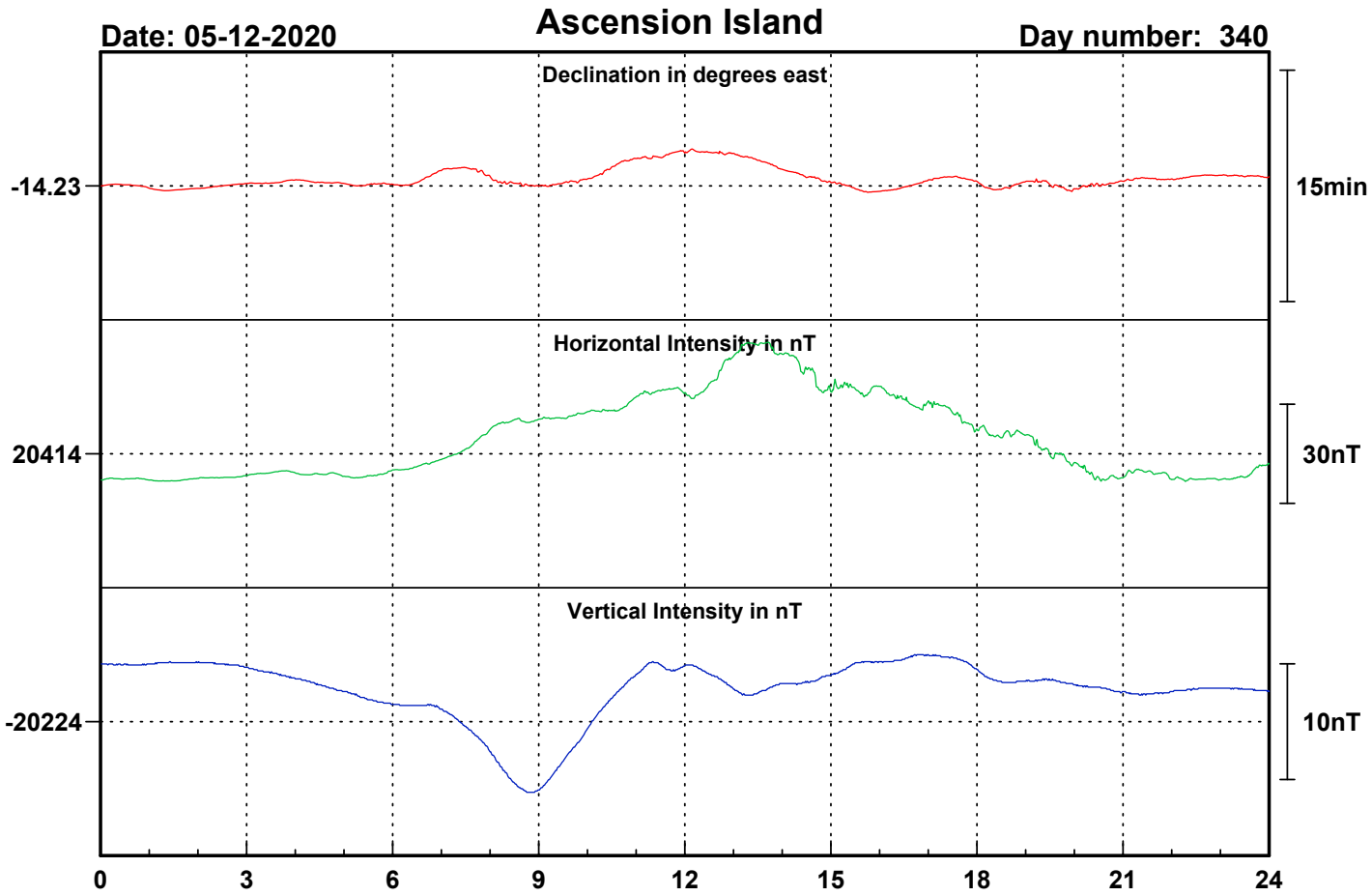
Hour (UT)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15min
Horizontal Intensity in nT
20414
30nT
Vertical Intensity in nT
-20224
10nT
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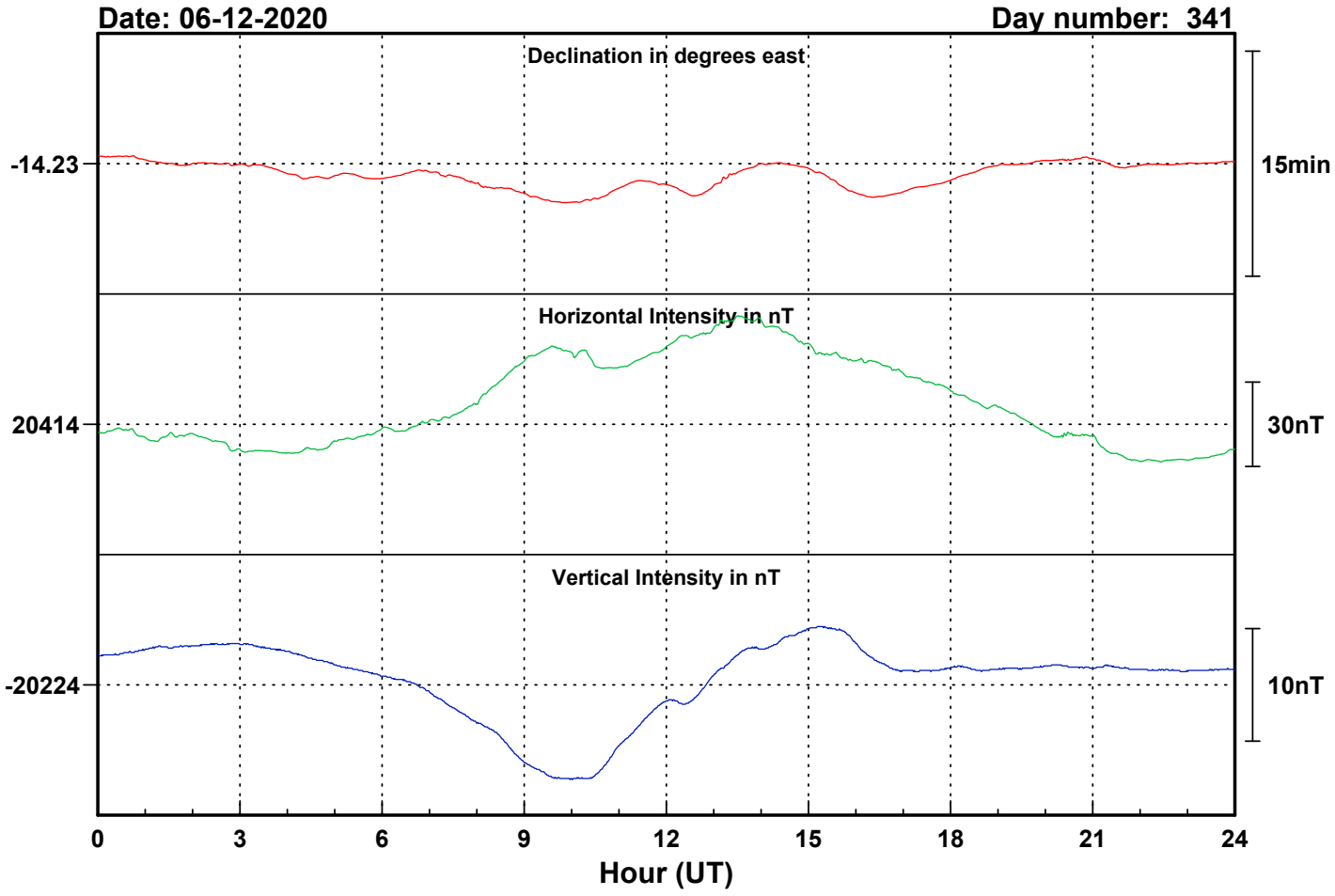
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15min
Horizontal Intensity in nT
20414
30nT
Vertical Intensity in nT
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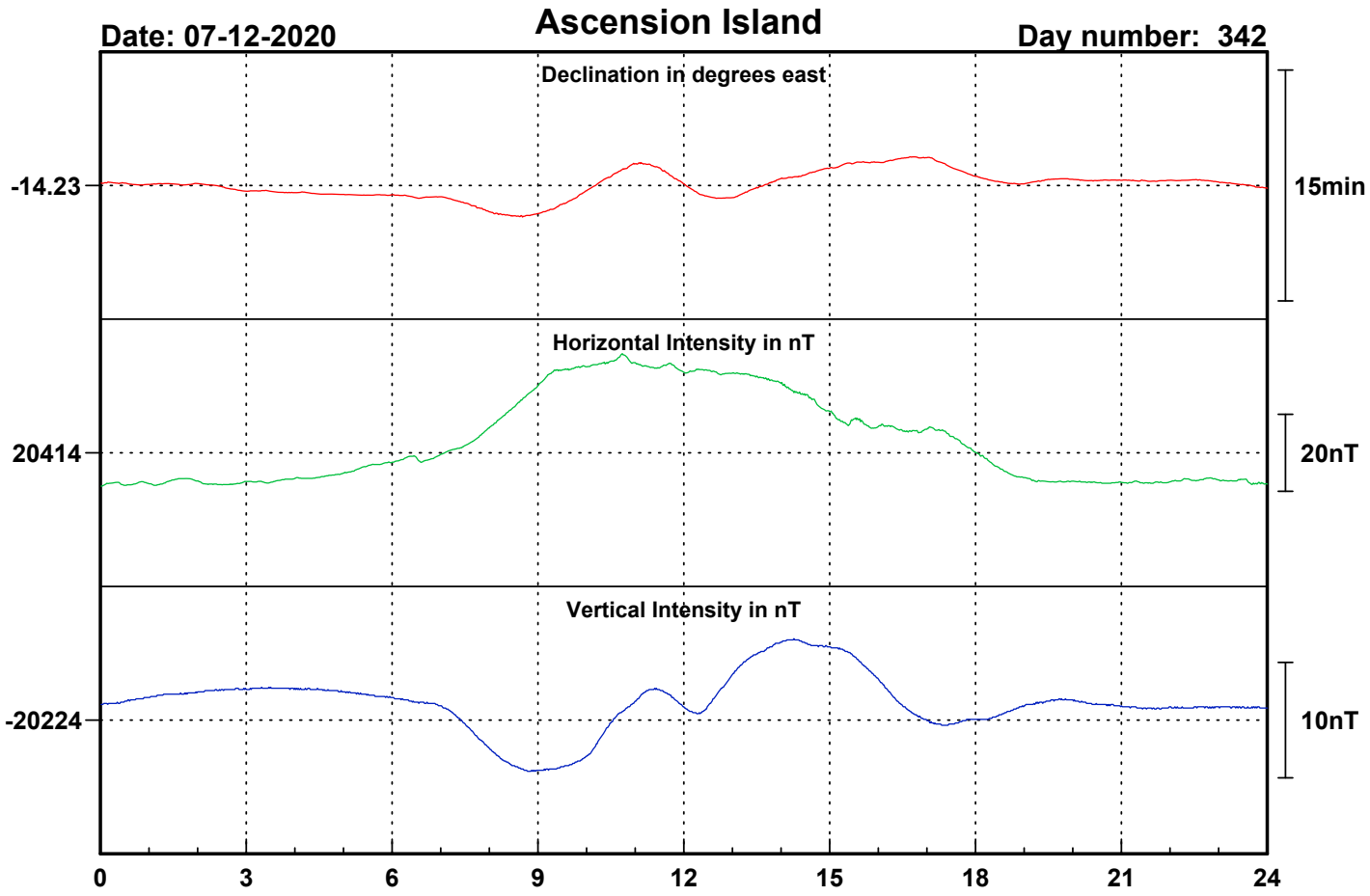
Hour (UT)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15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
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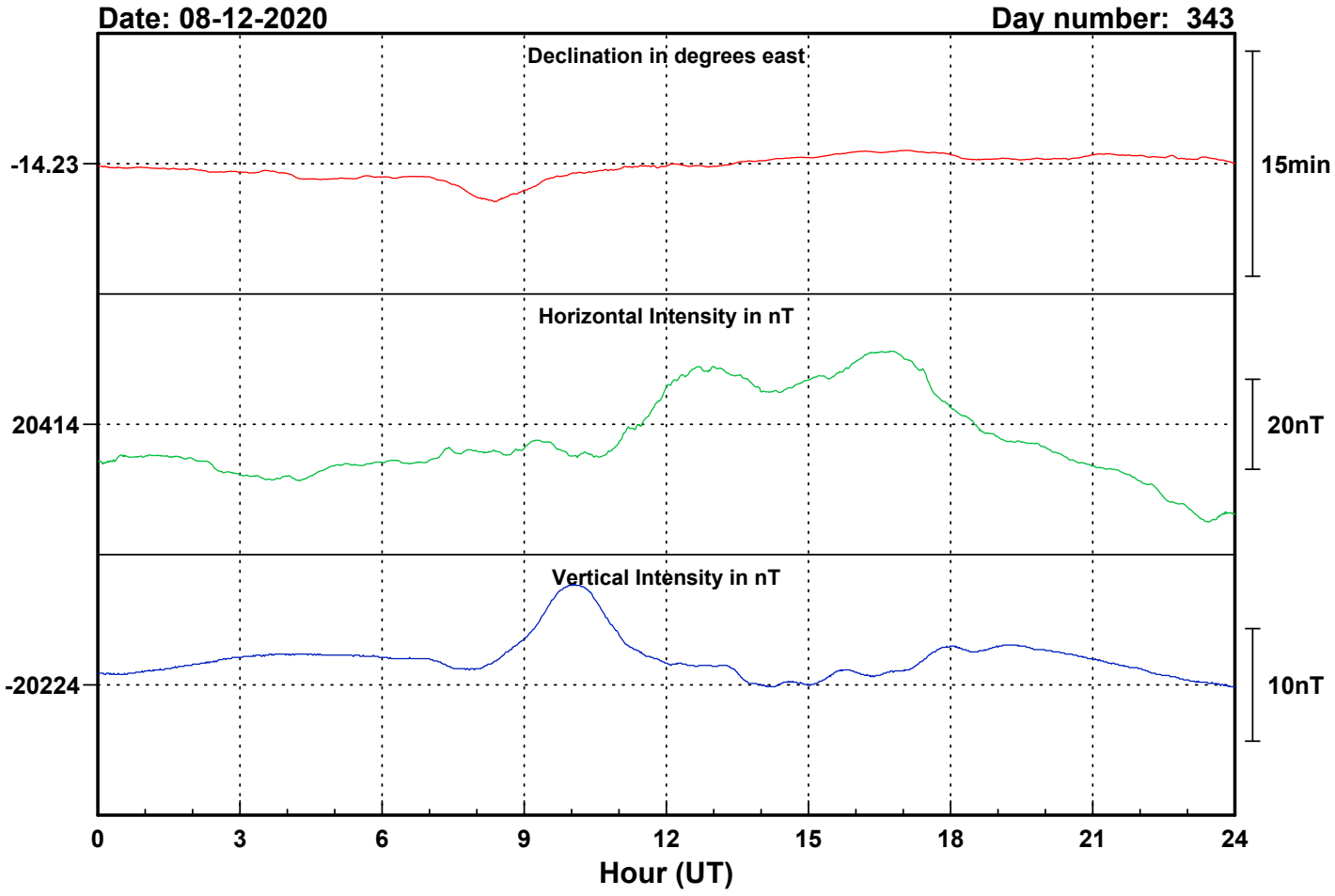
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Day number: 343
Declination in degrees east
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15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
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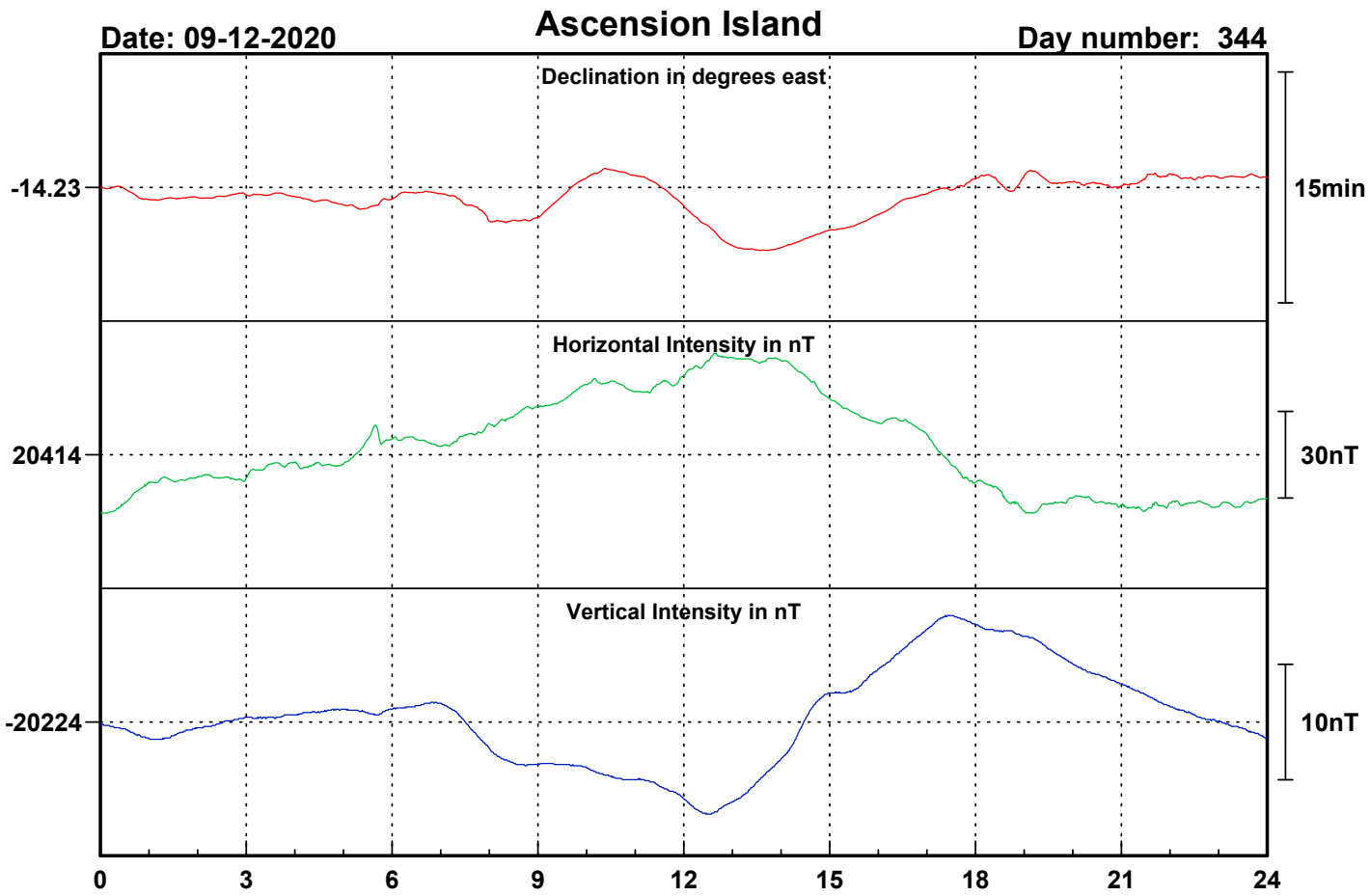
Hour (UT)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15min
Horizontal Intensity in nT
20414
30nT
Vertical Intensity in nT
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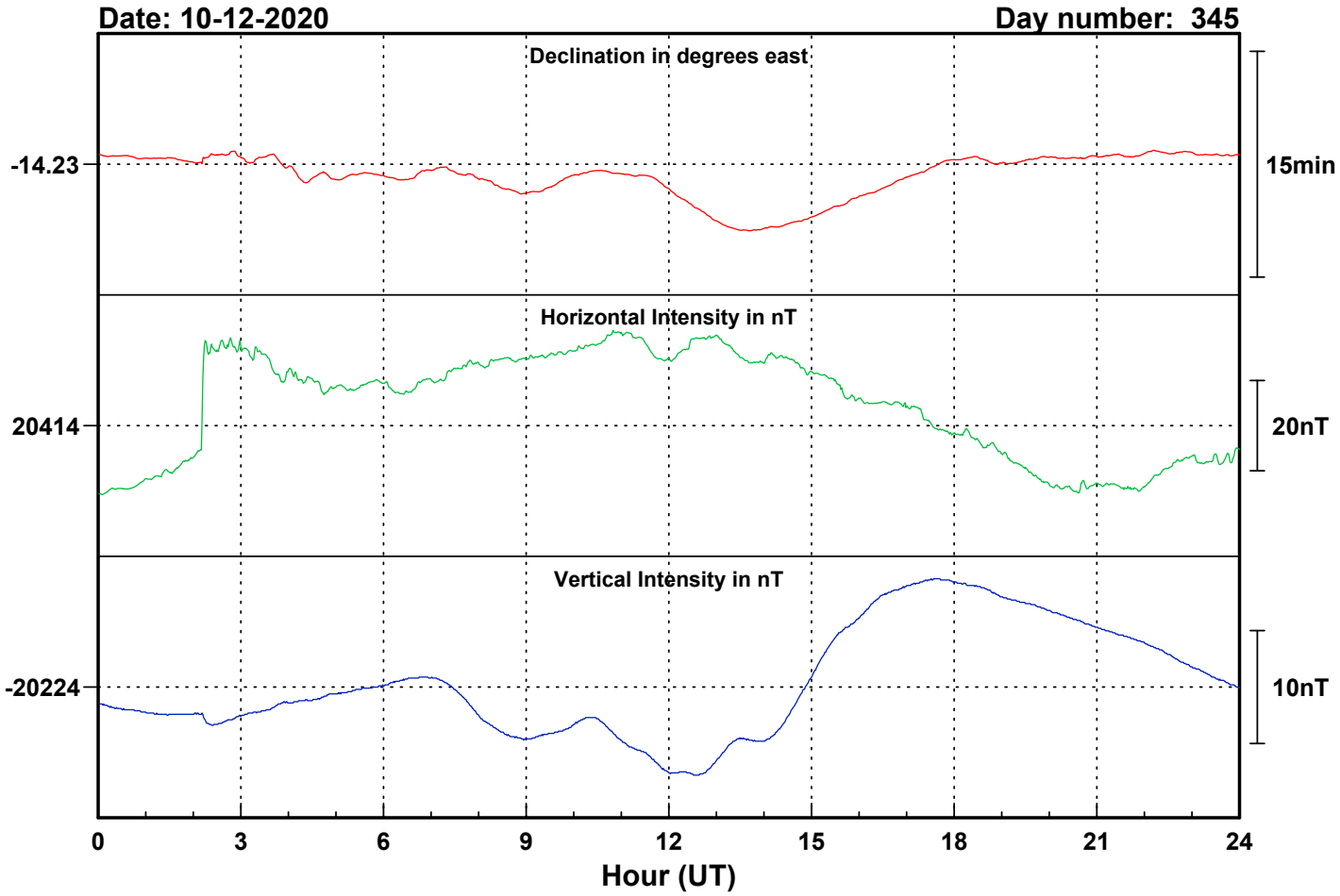
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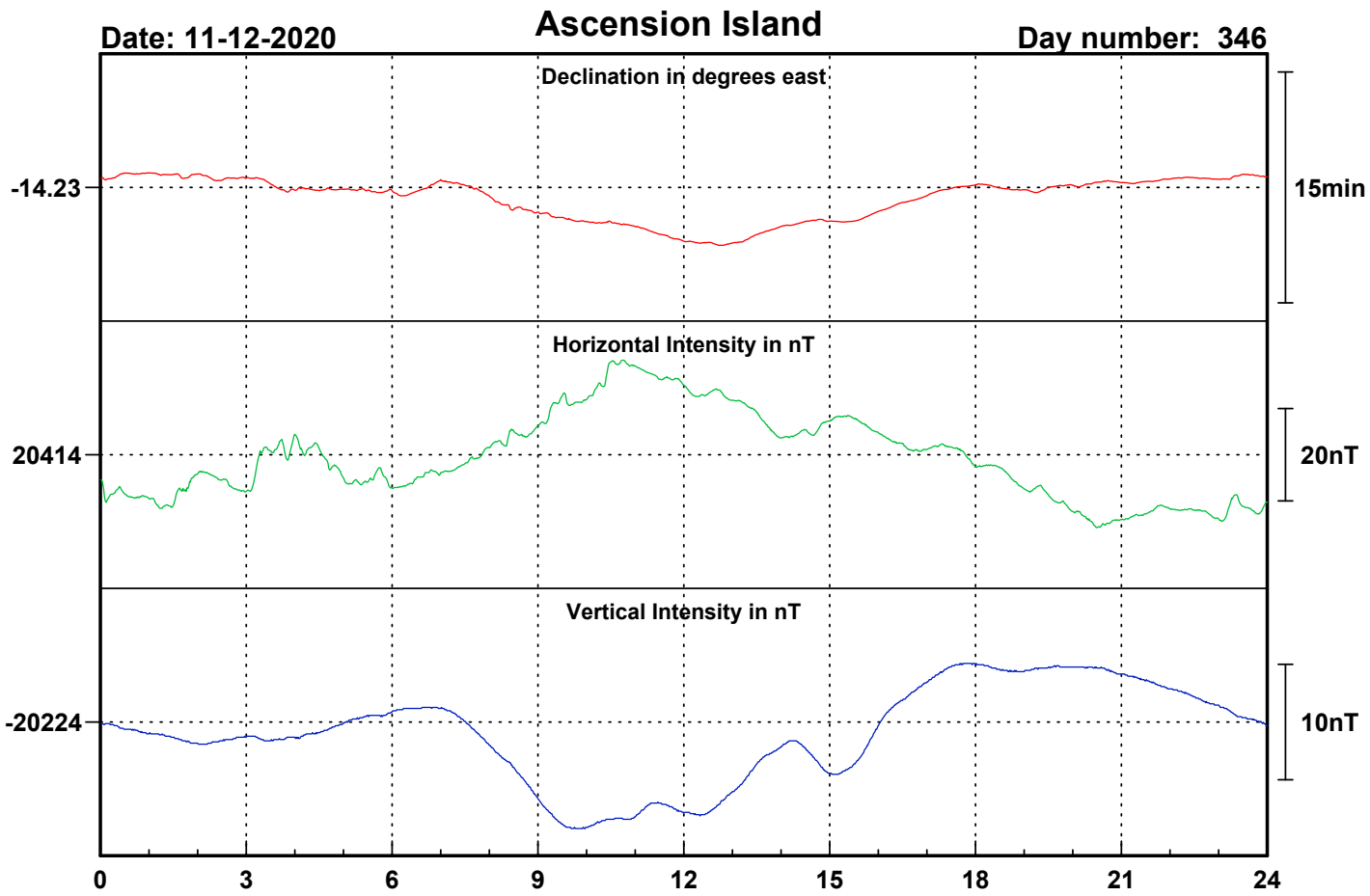
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15min
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20414
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Vertical Intensity in nT
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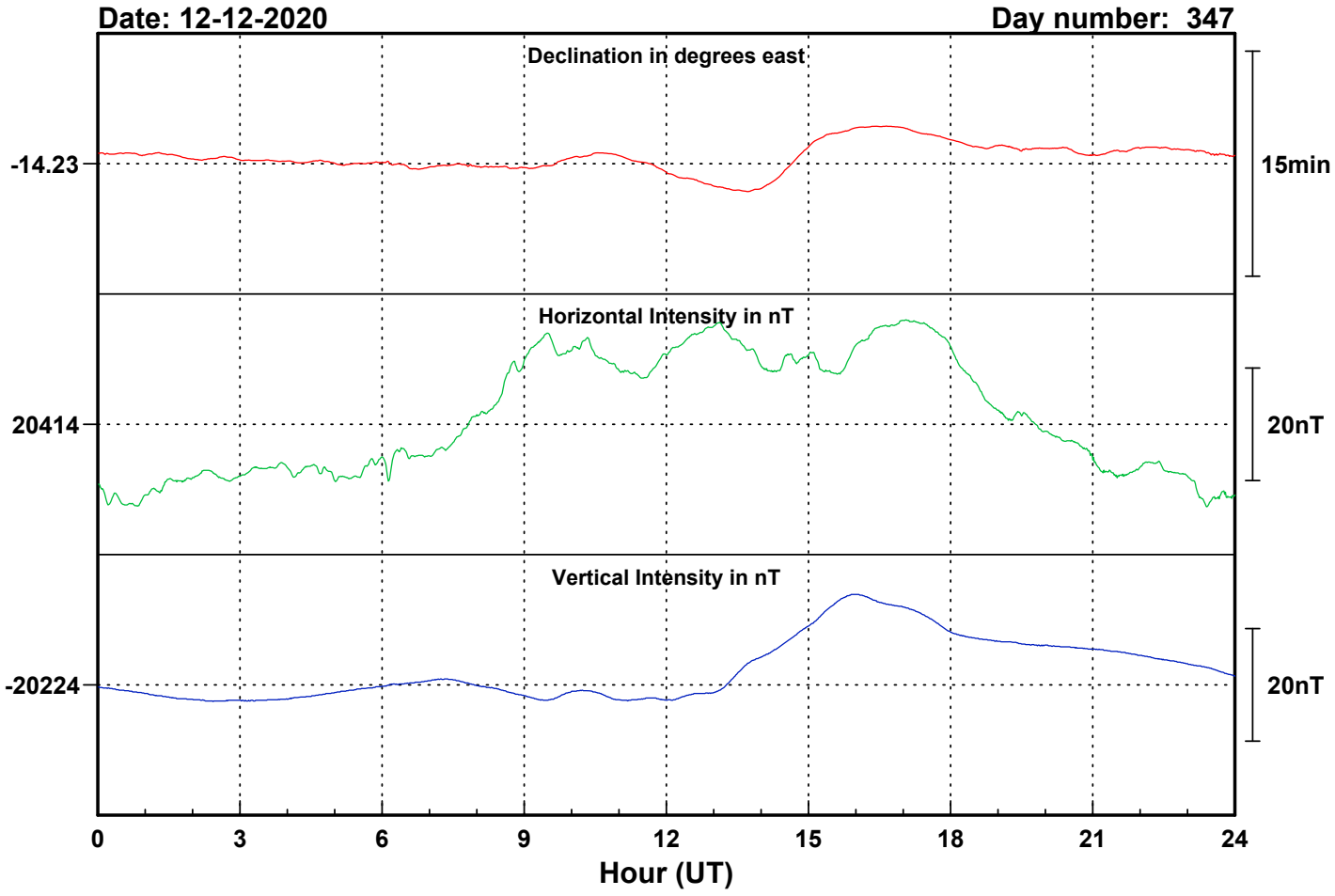
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15min
Horizontal Intensity in nT
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Vertical Intensity in nT
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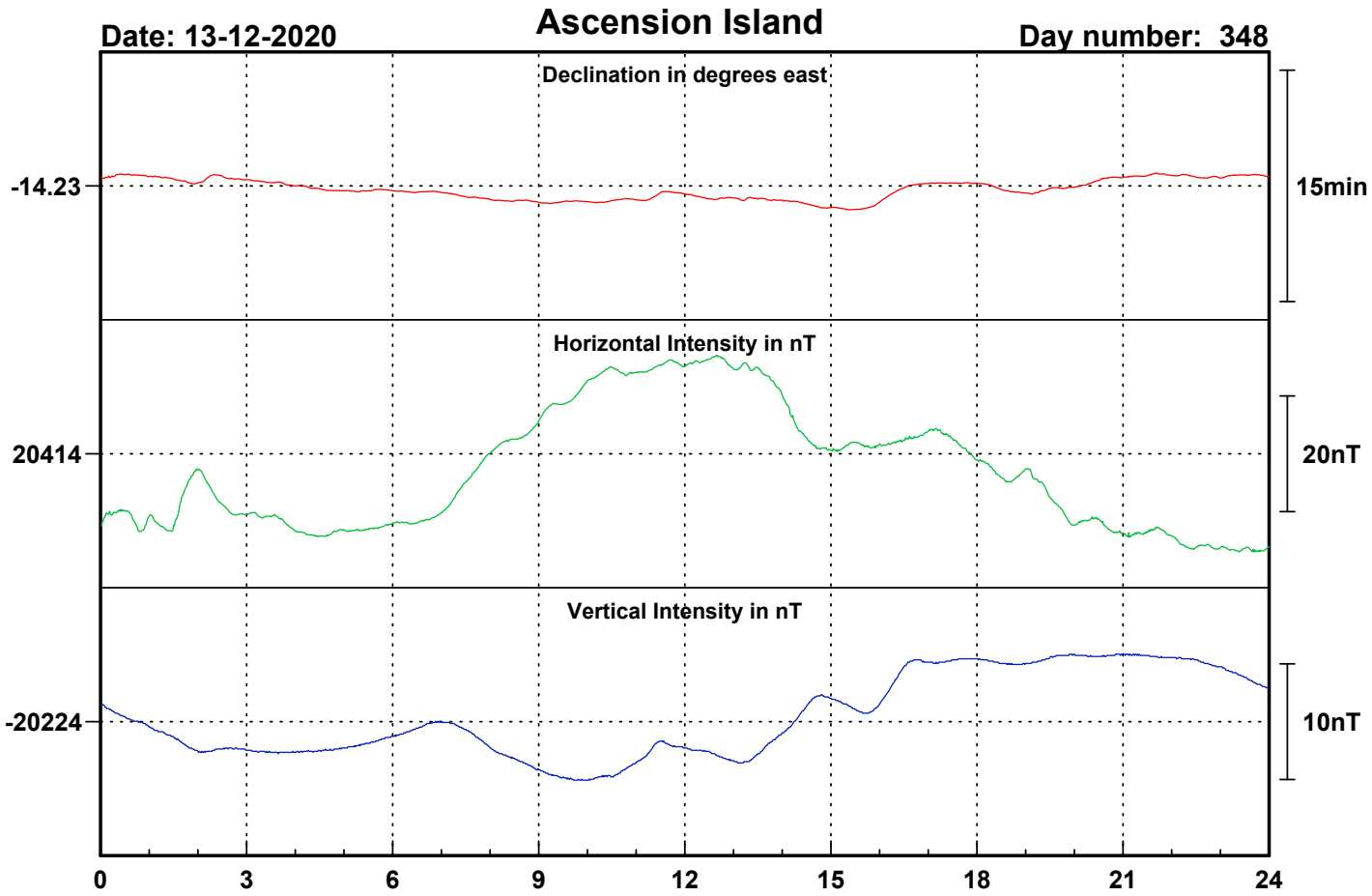
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15min
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Vertical Intensity in nT
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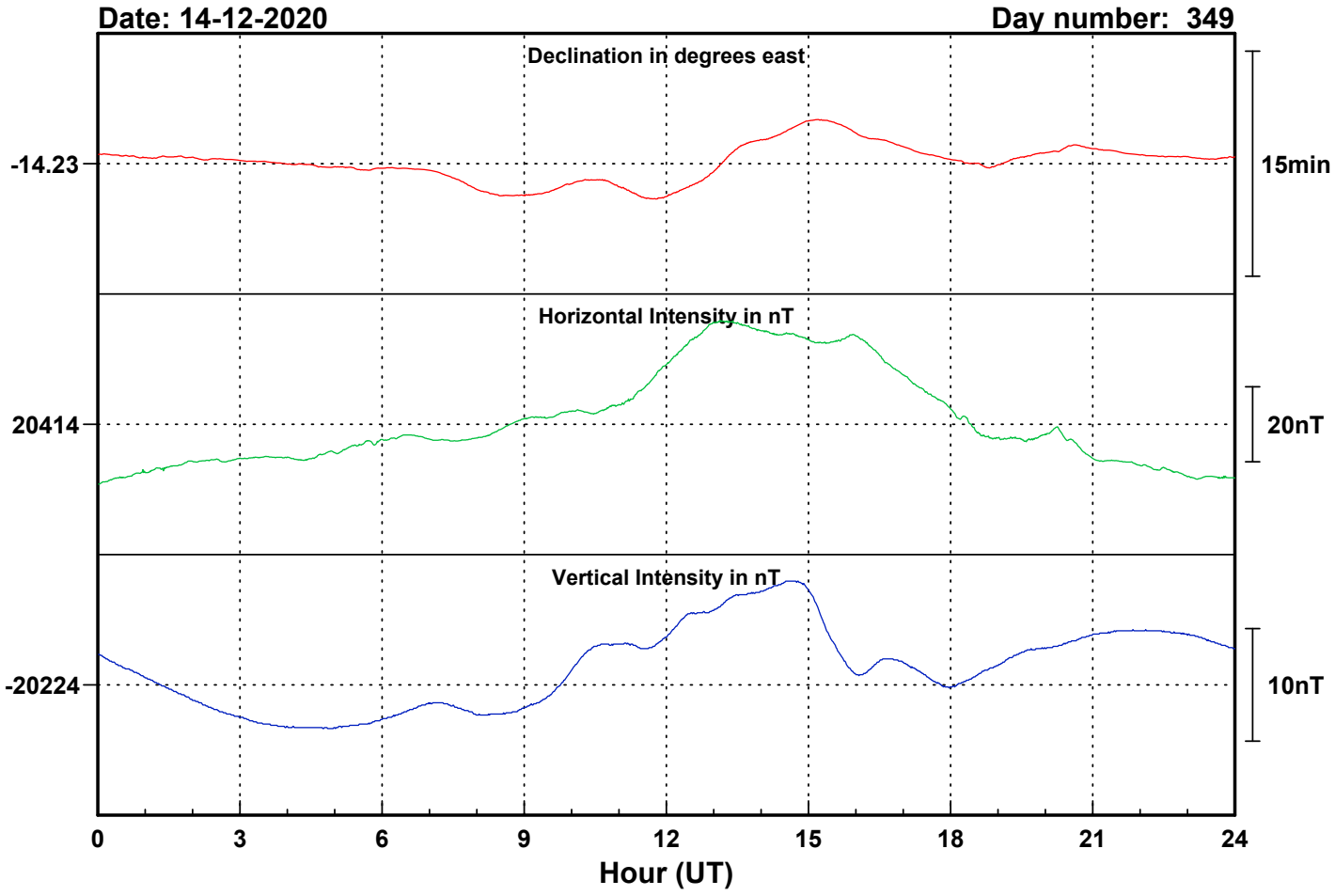
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20414
20nT
Vertical Intensity in nT
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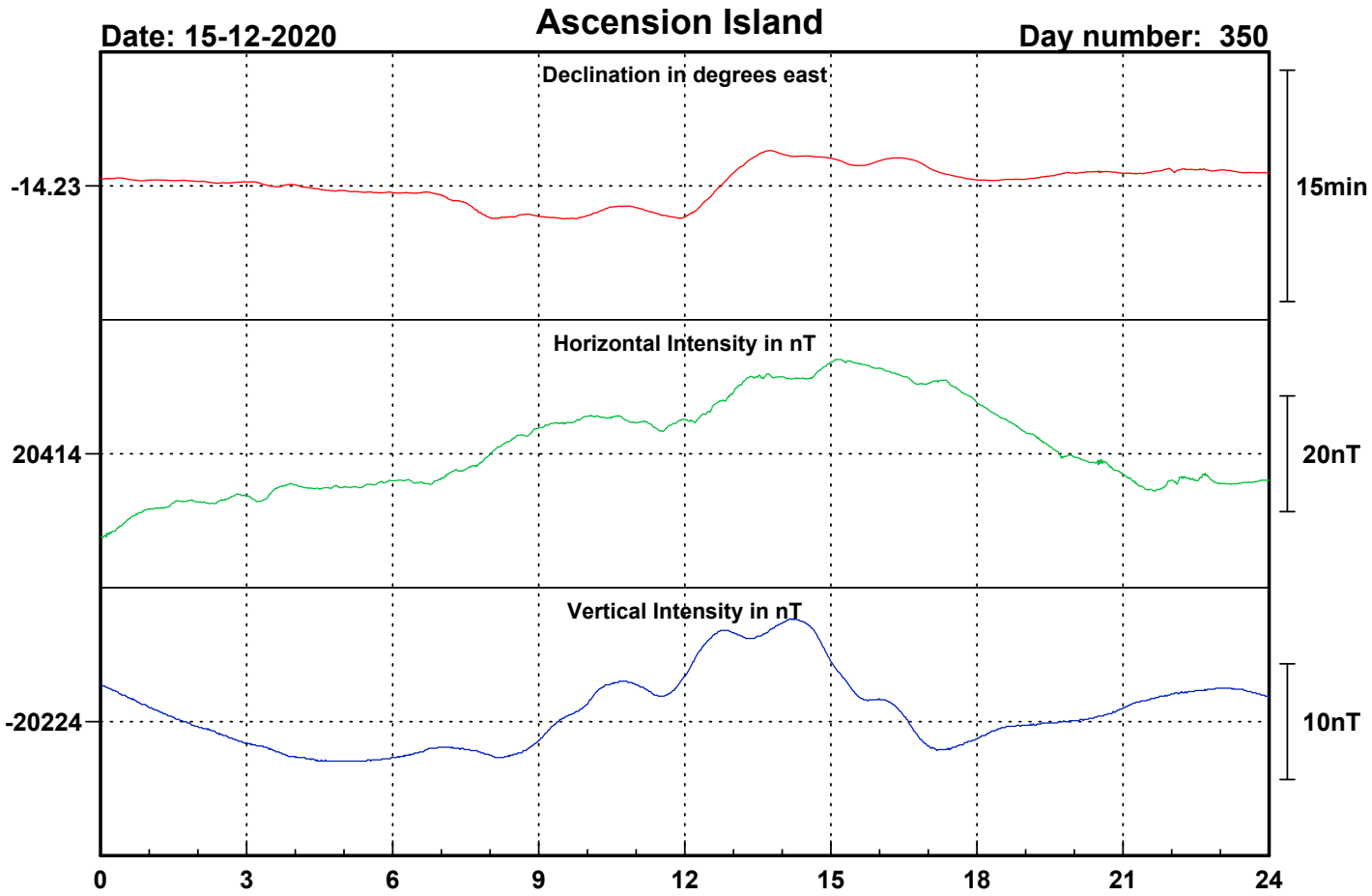
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Vertical Intensity in nT
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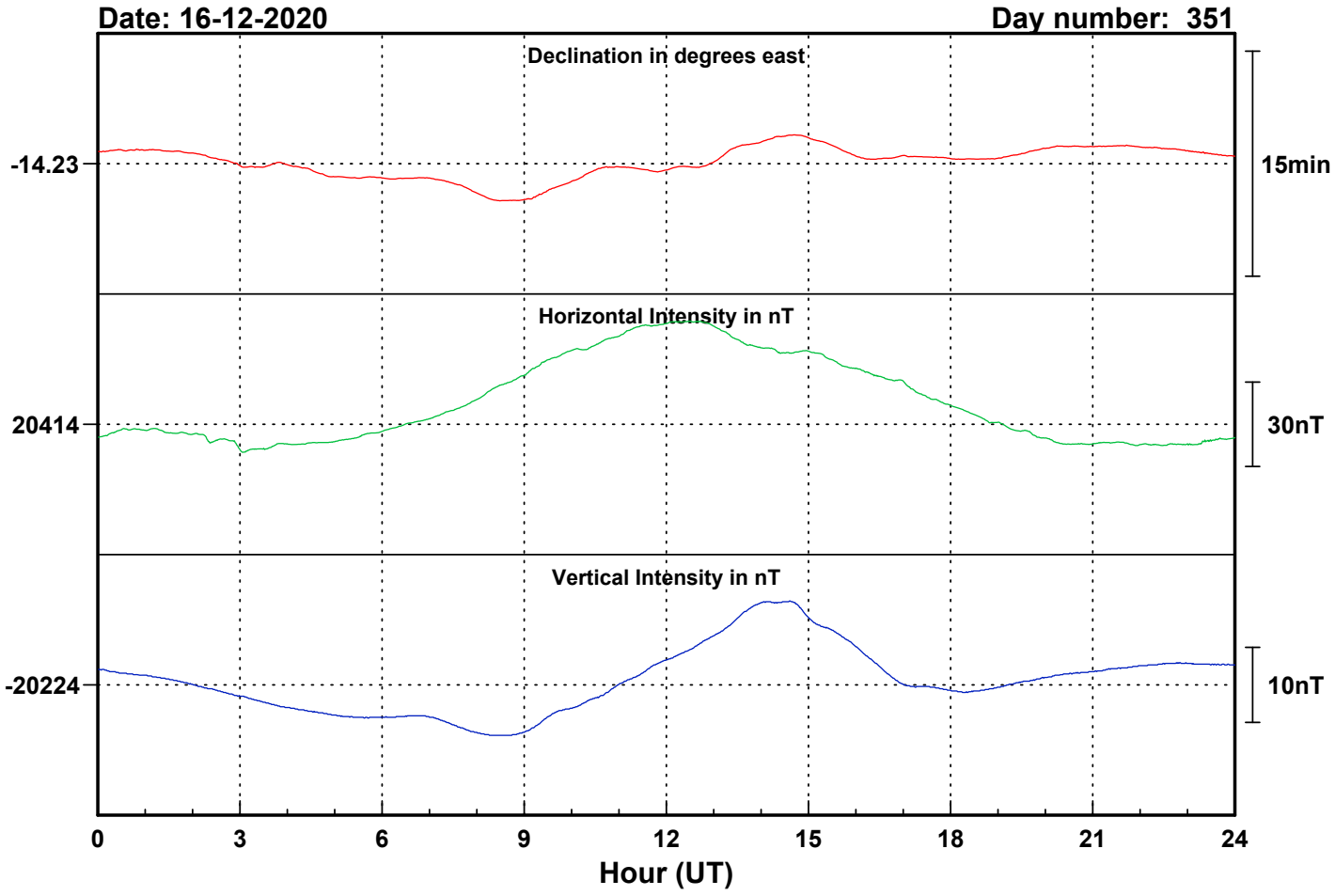
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20414
30nT
Vertical Intensity in nT
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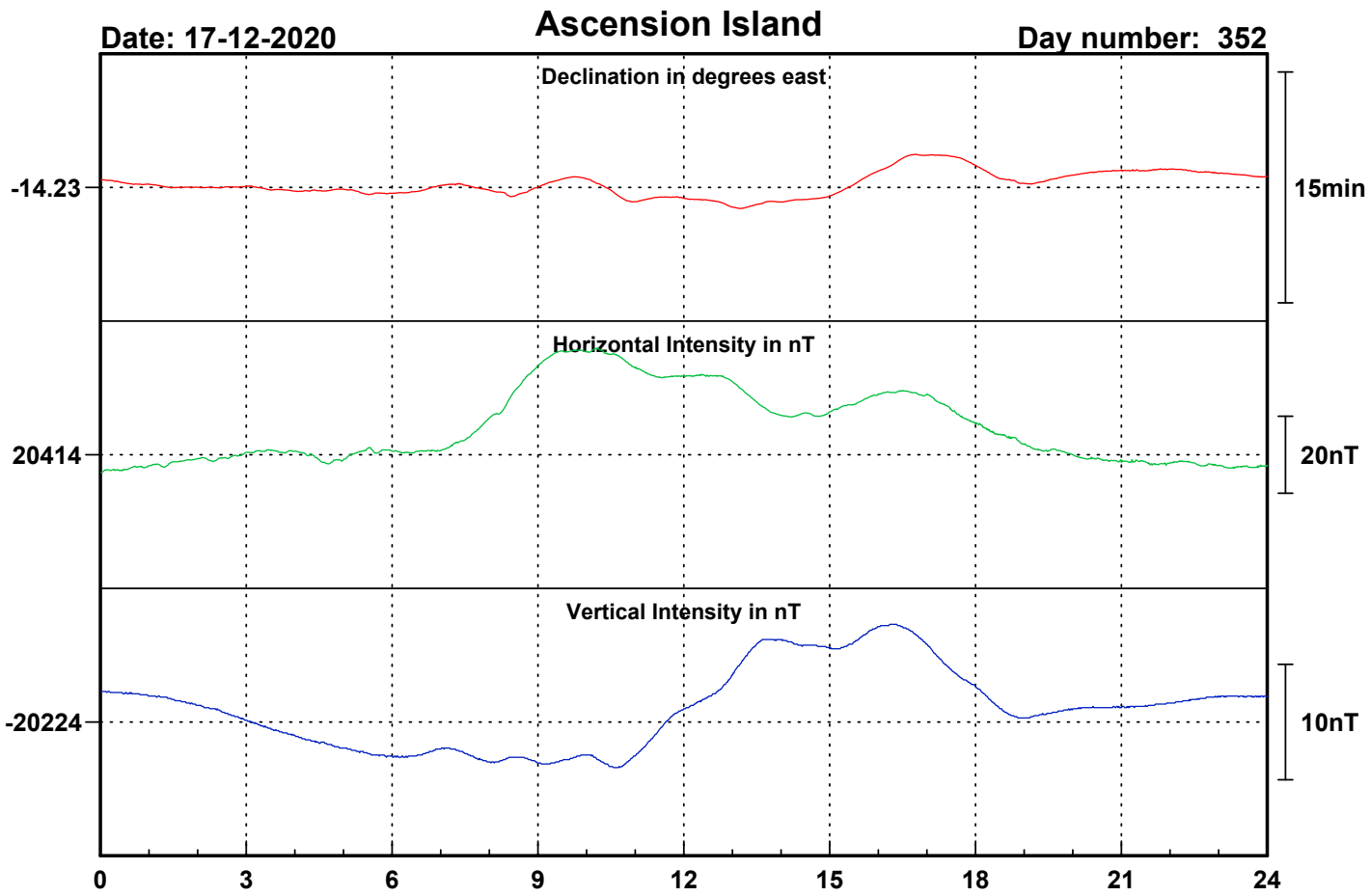
Hour (UT)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15min
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20414
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Vertical Intensity in nT
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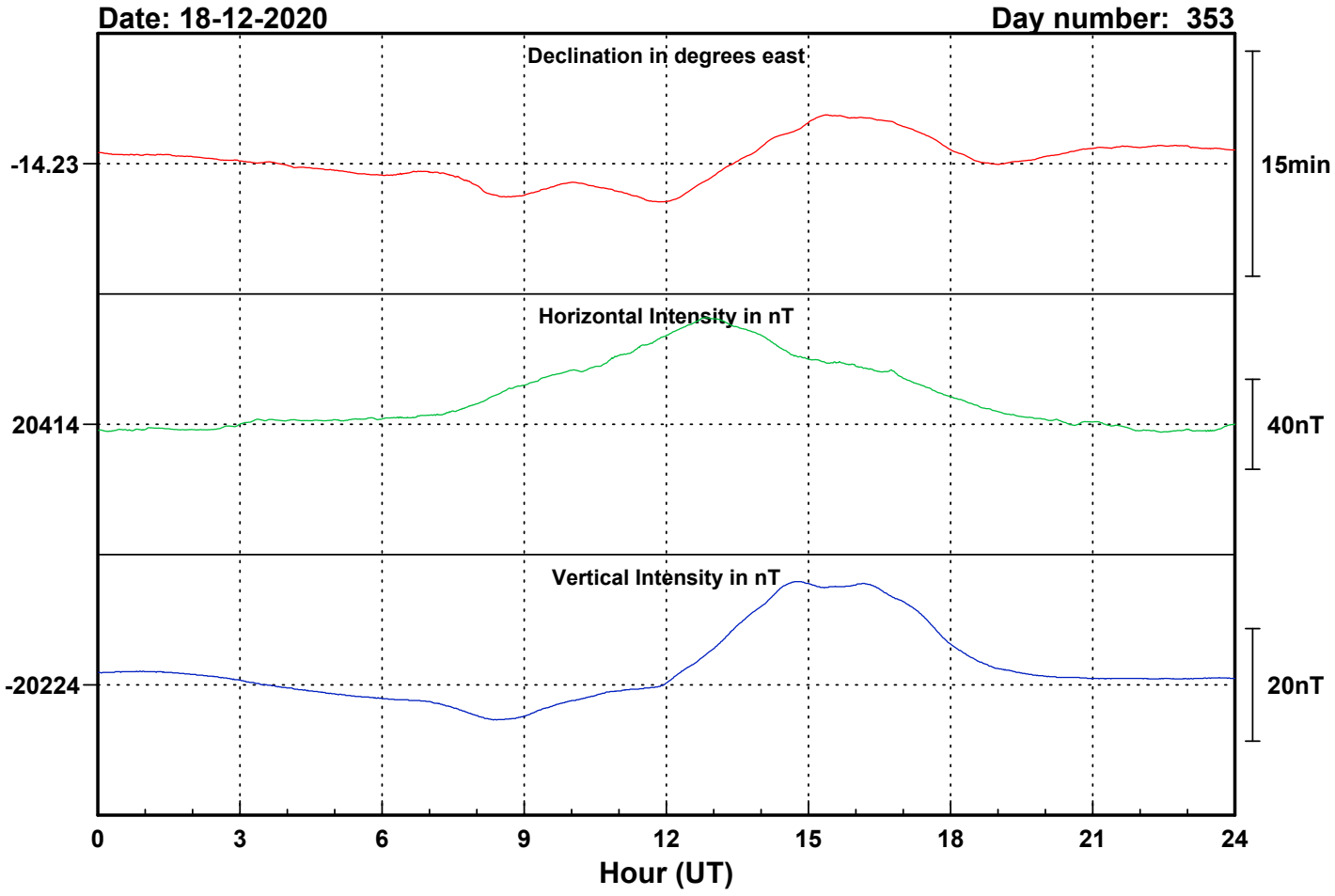
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15min
Horizontal Intensity in nT
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40nT
Vertical Intensity in nT
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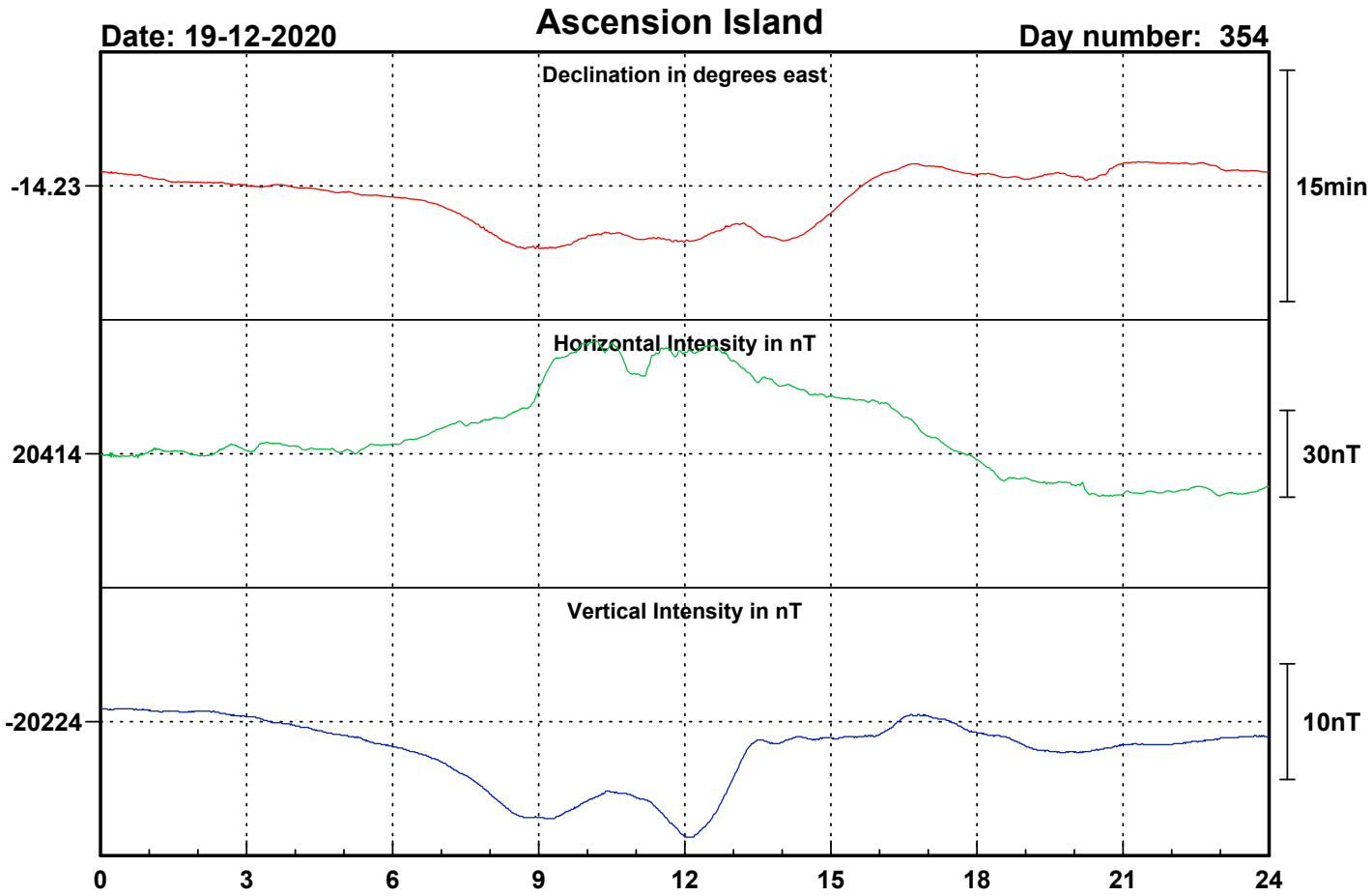
Hour (UT)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Day number: 354
Declination in degrees east
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15min
Horizontal Intensity in nT
20414
30nT
Vertical Intensity in nT
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10nT
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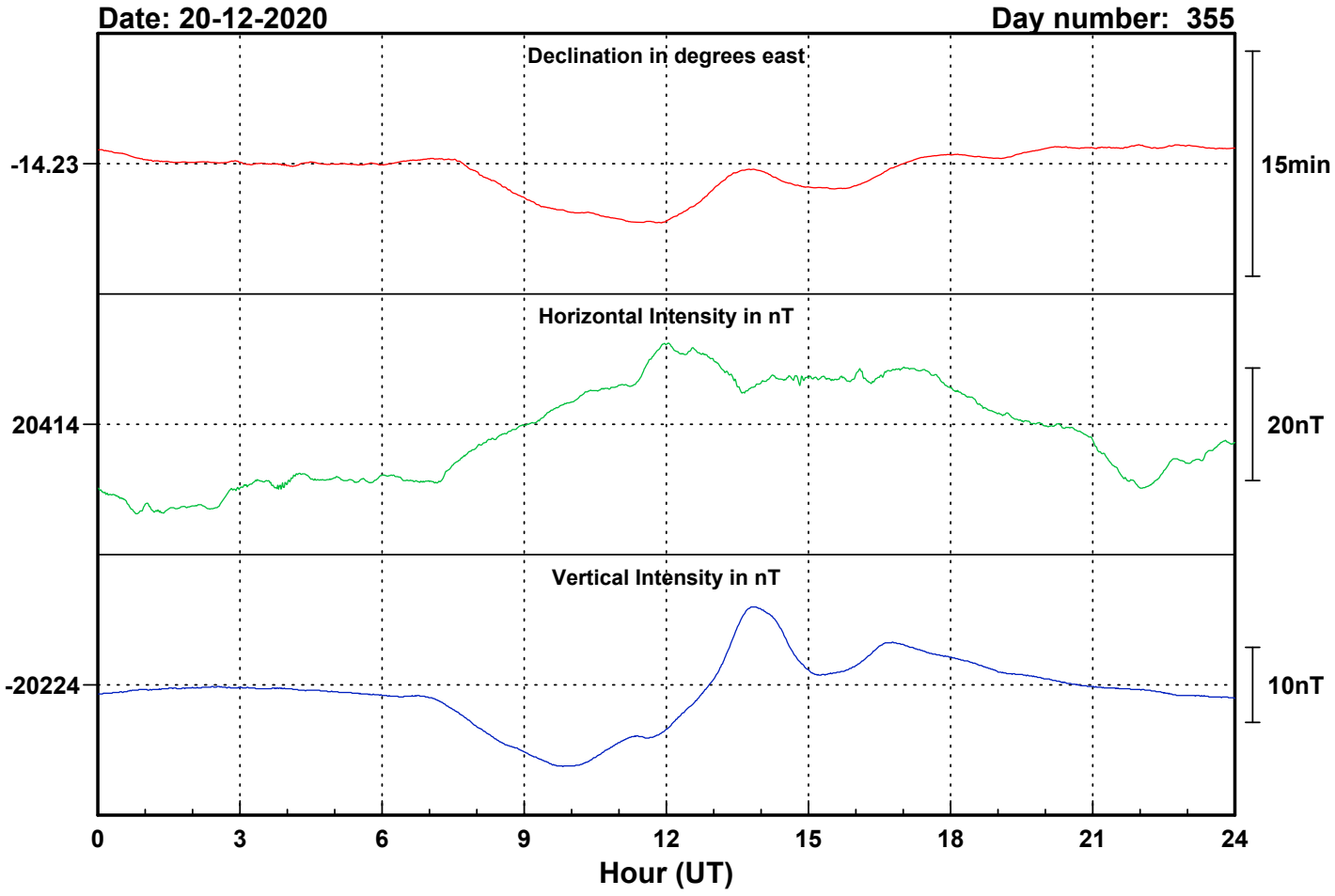
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15min
Horizontal Intensity in nT
20414
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Vertical Intensity in nT
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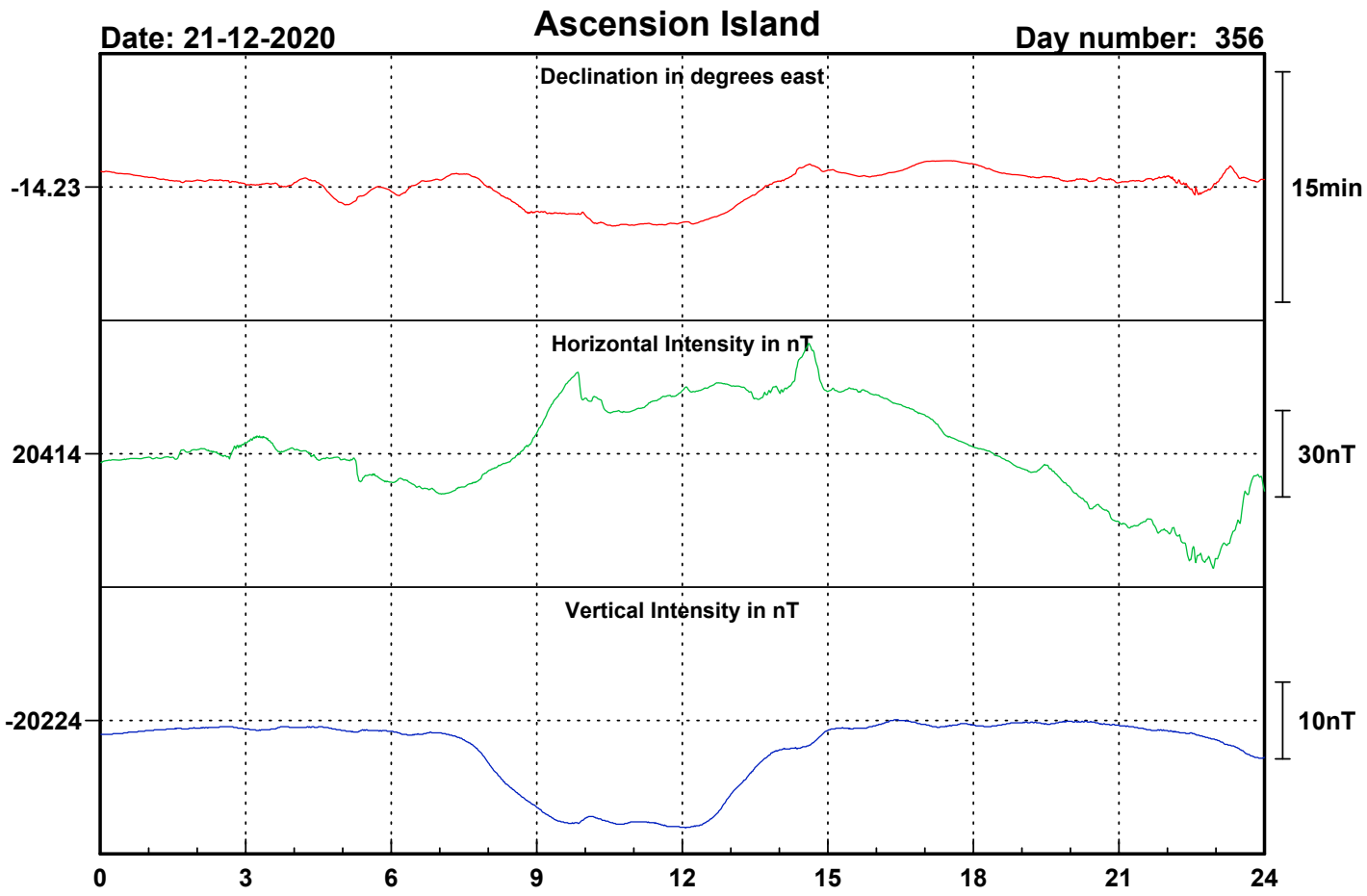
Hour (UT)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Day number: 356
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15min
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20414
30nT
Vertical Intensity in nT
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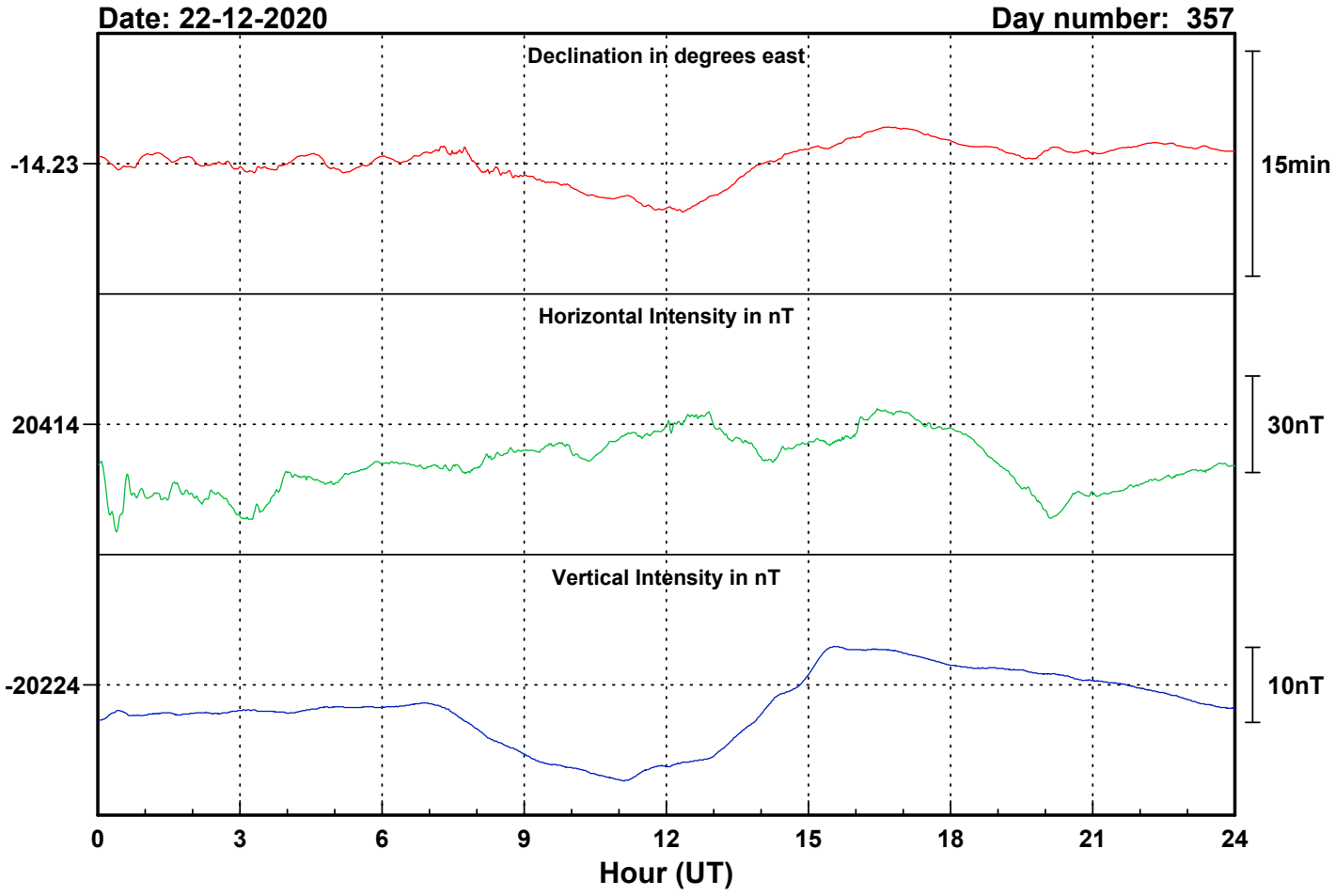
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15min
Horizontal Intensity in nT
20414
30nT
Vertical Intensity in nT
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0
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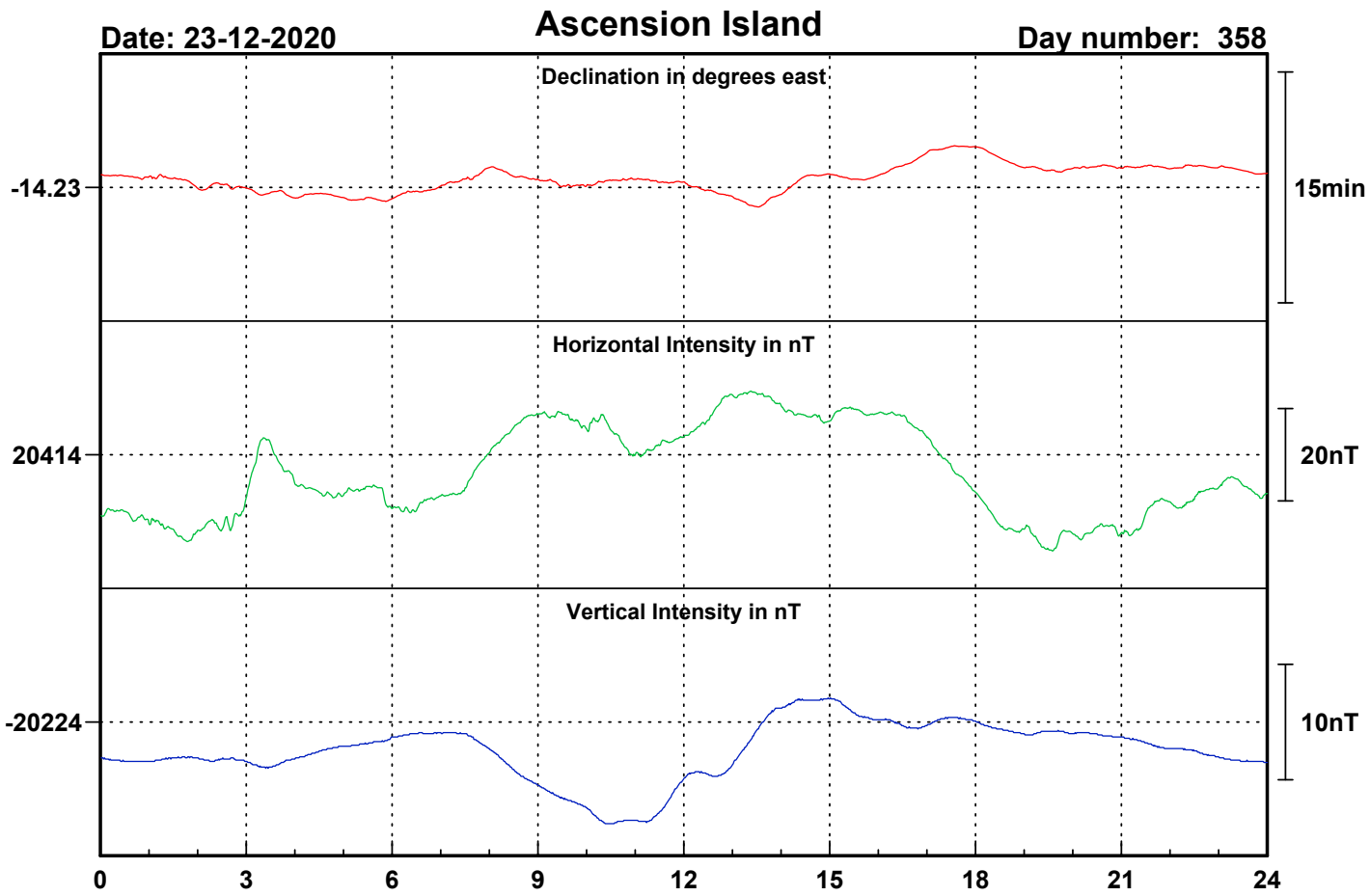
24
Hour (UT)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Day number: 358
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
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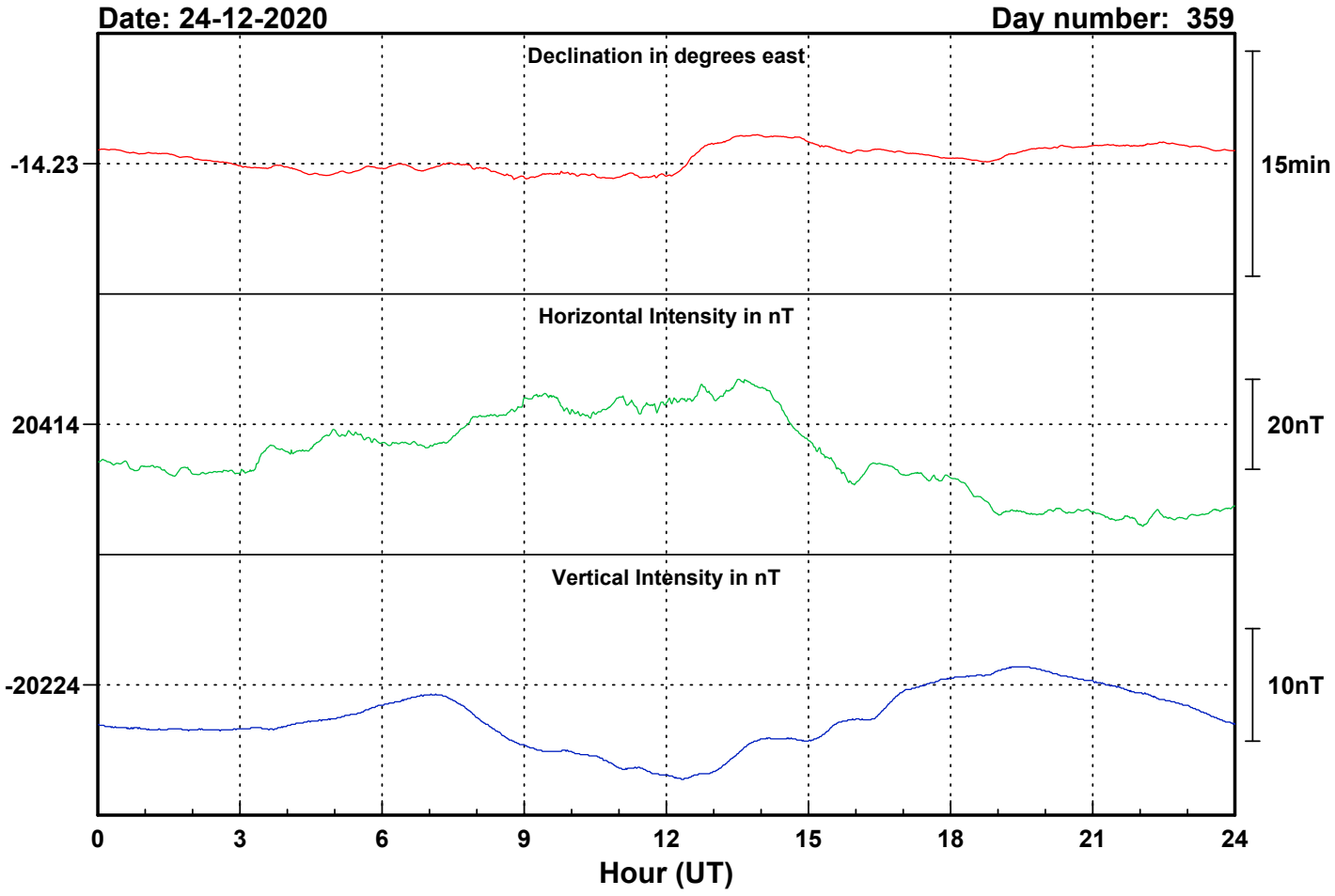
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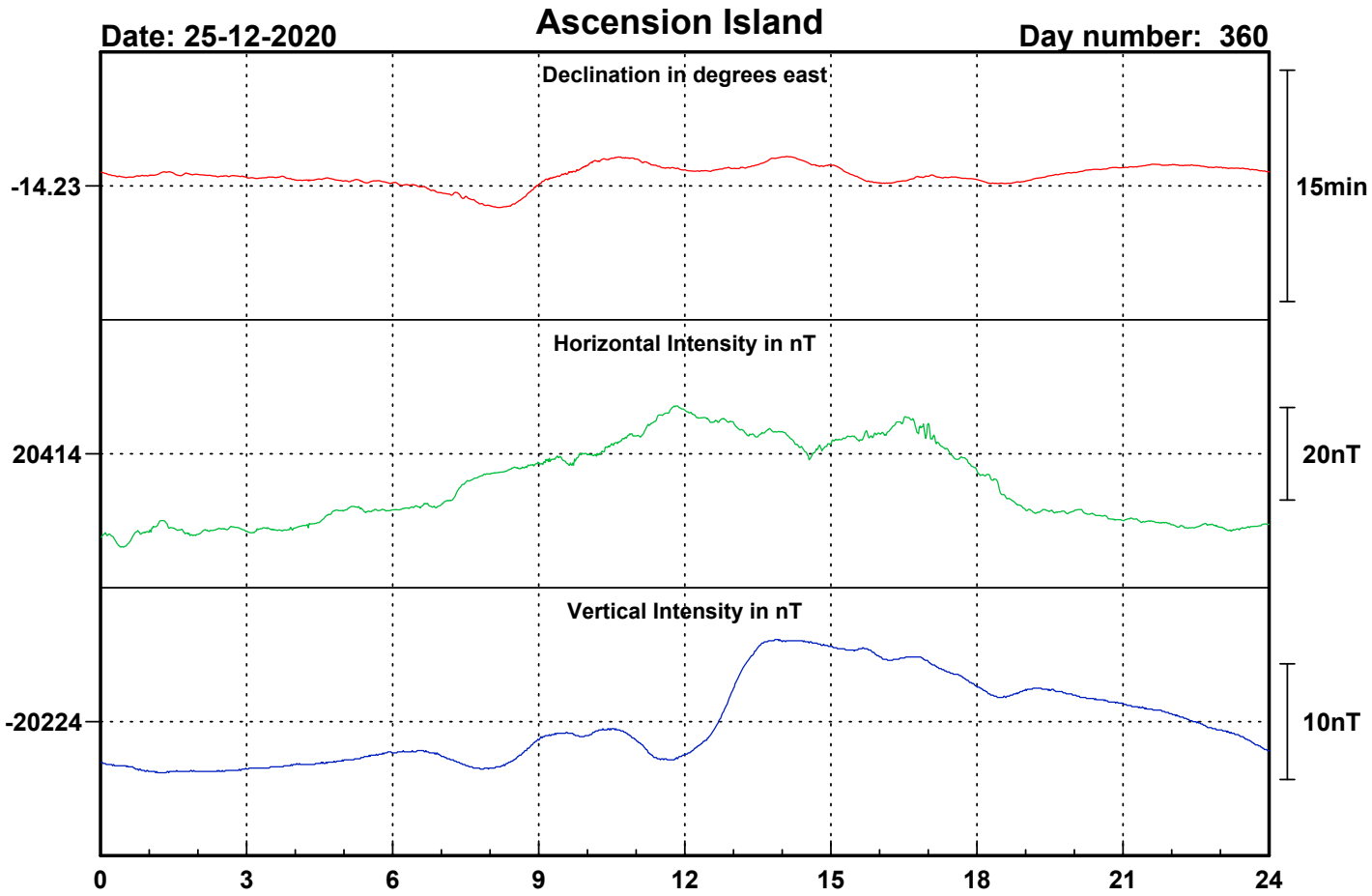
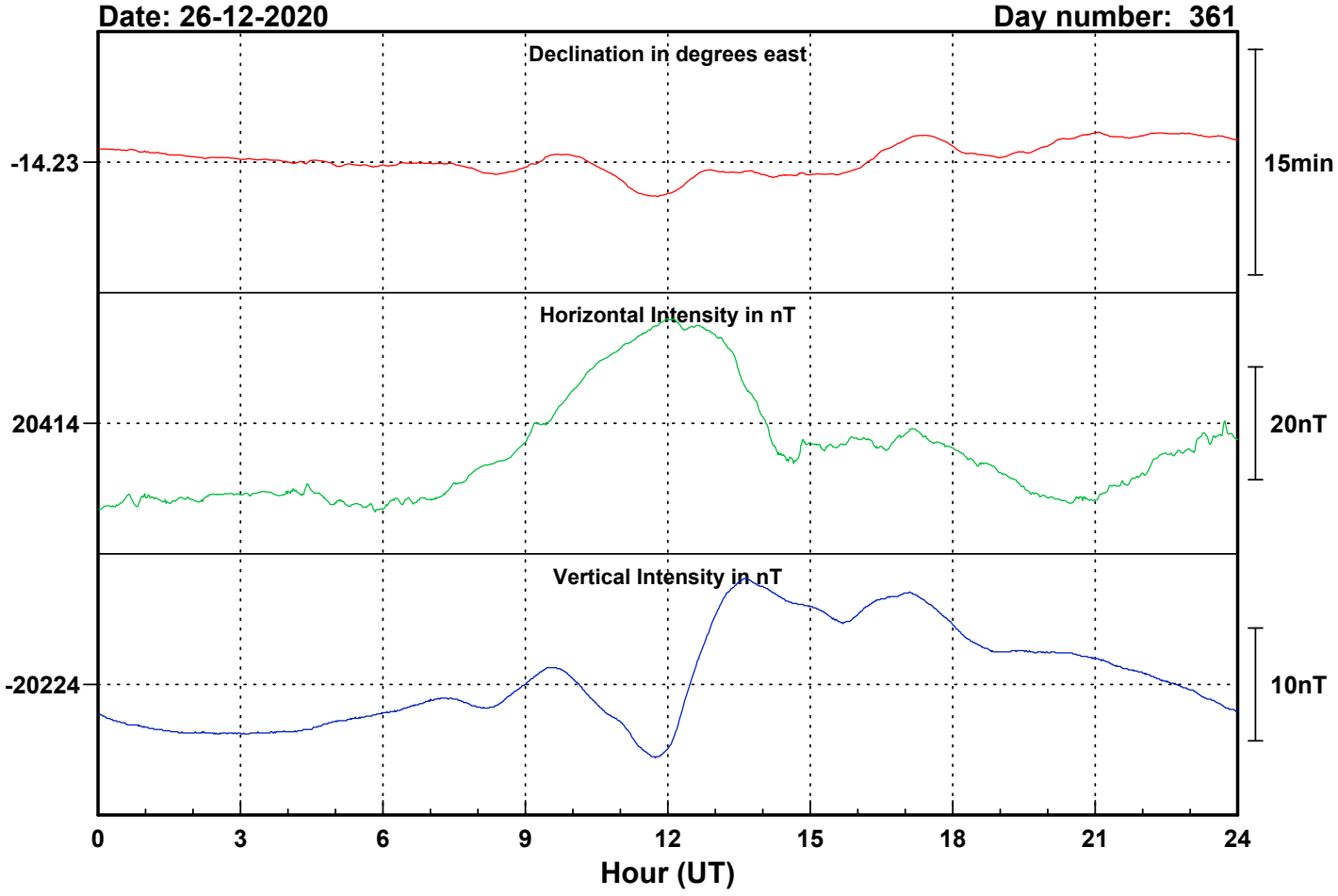
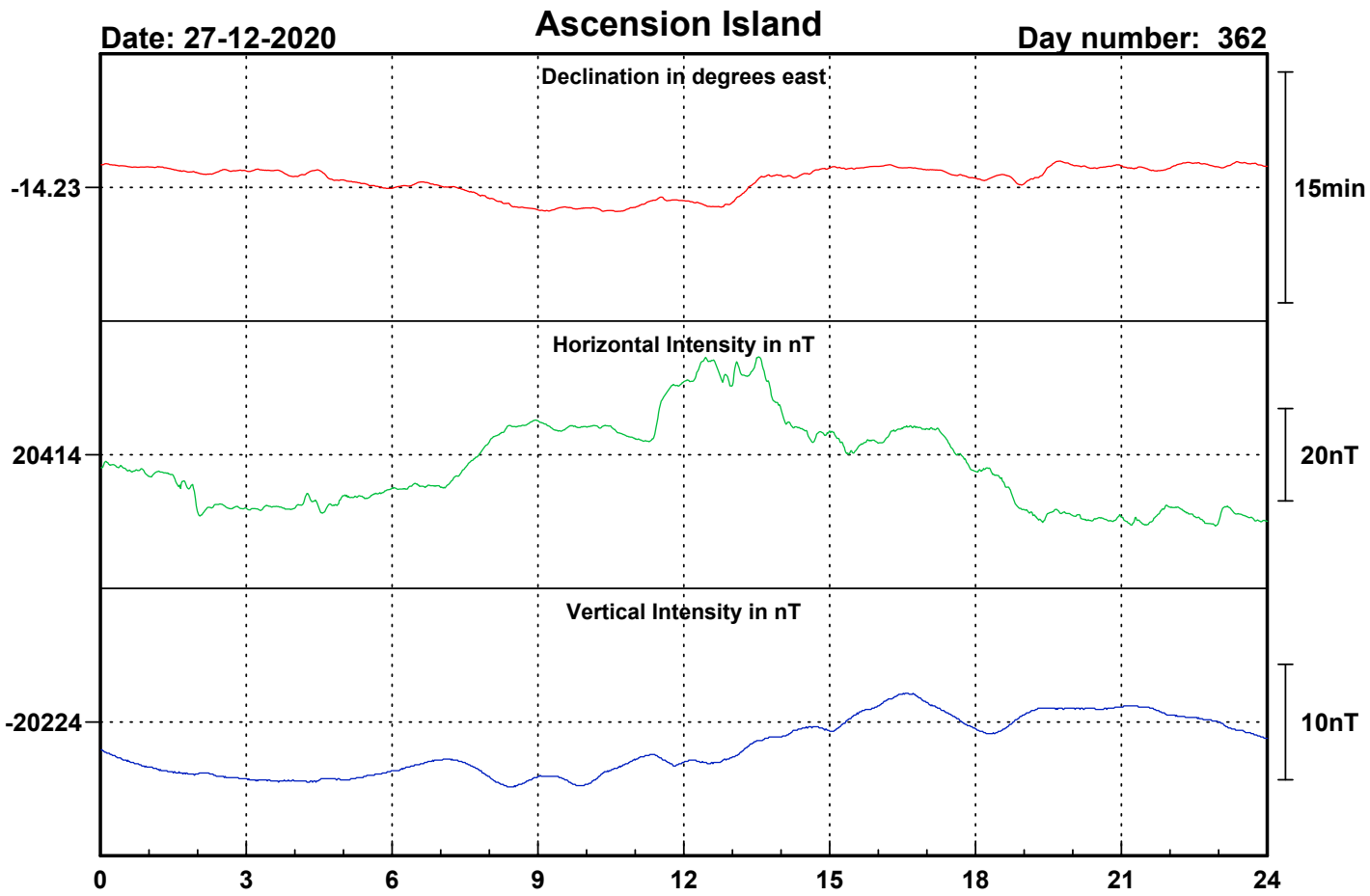
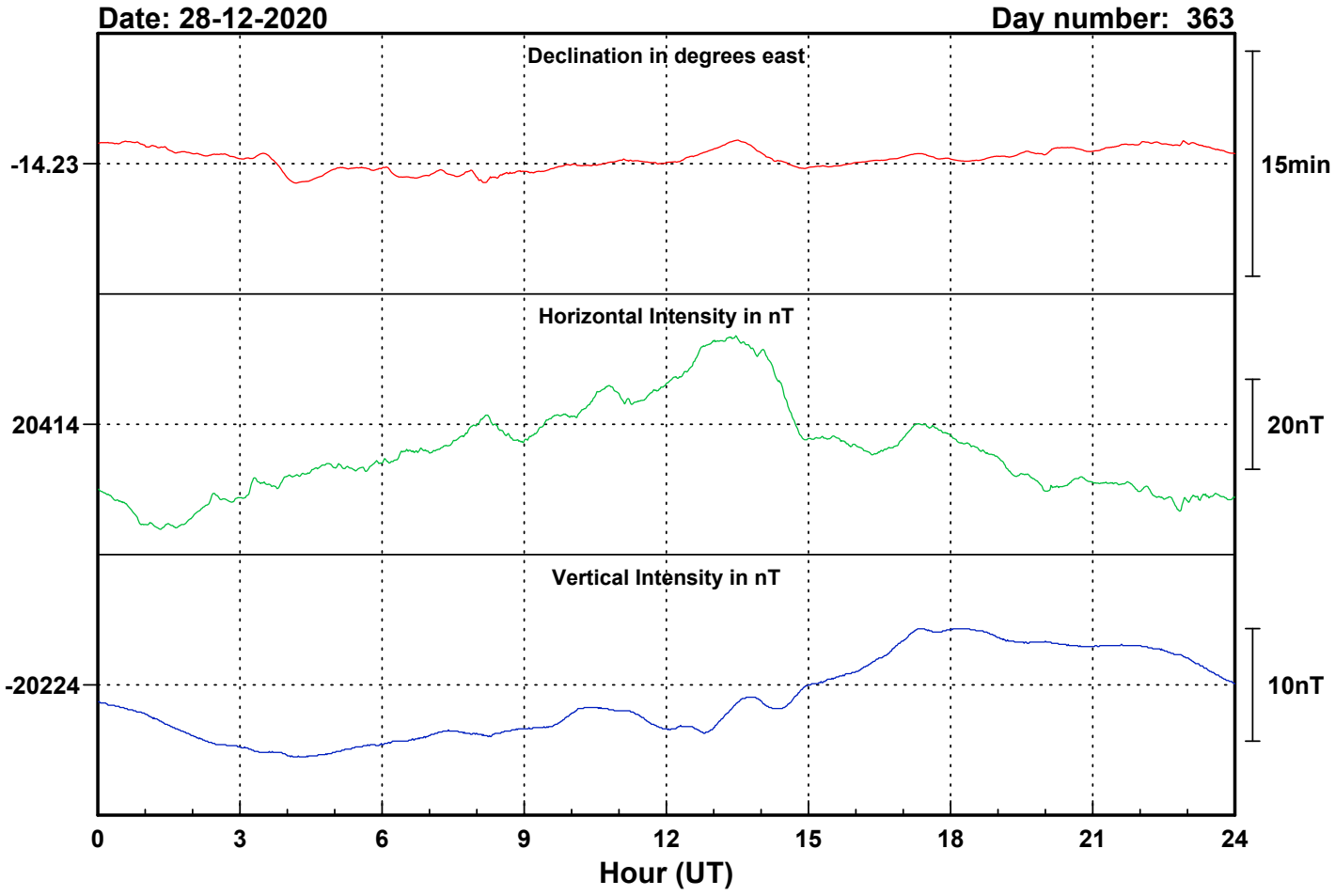
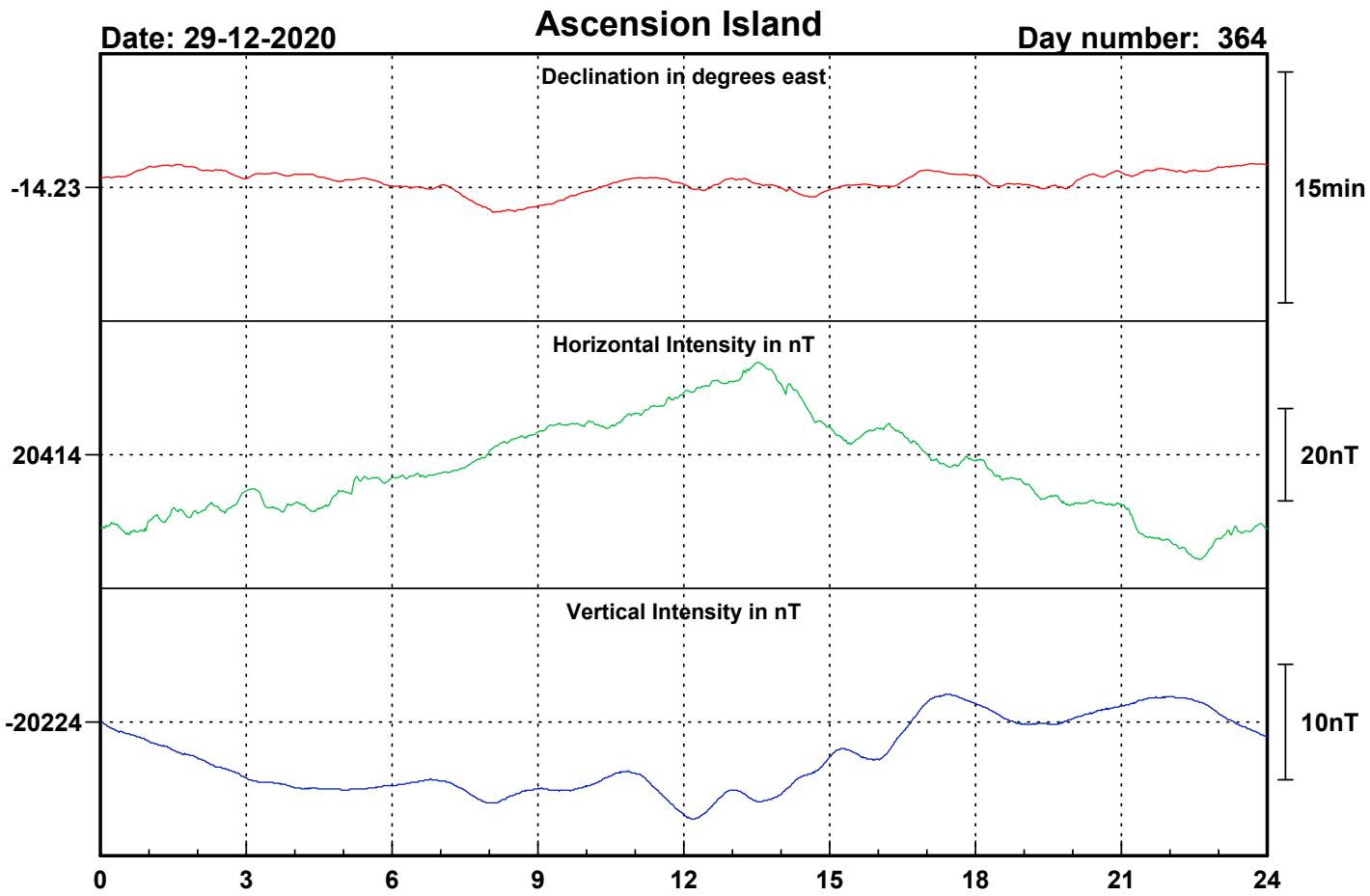
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)

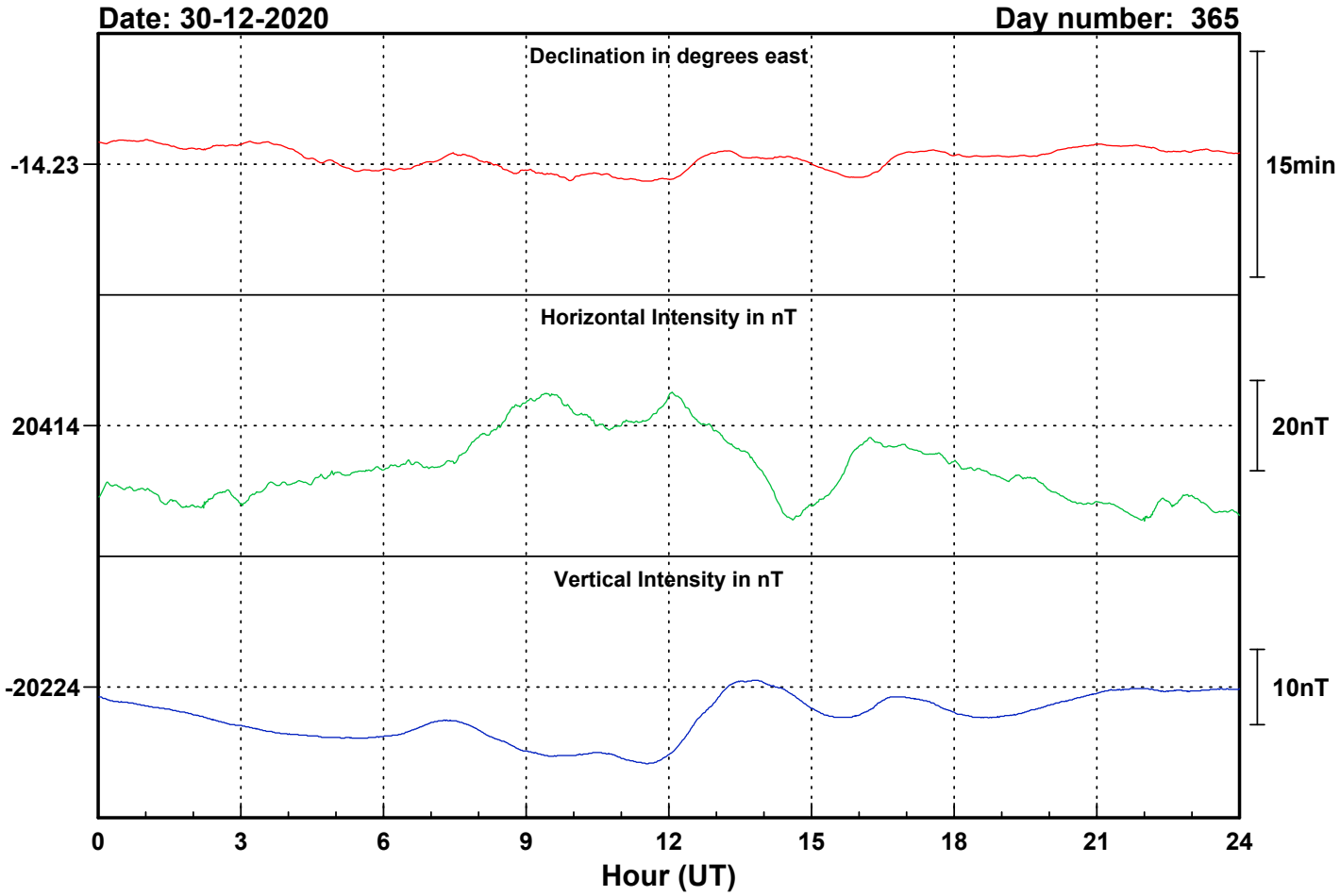

Ascension Island
Date: 25-12-2020
Day number: 360
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24

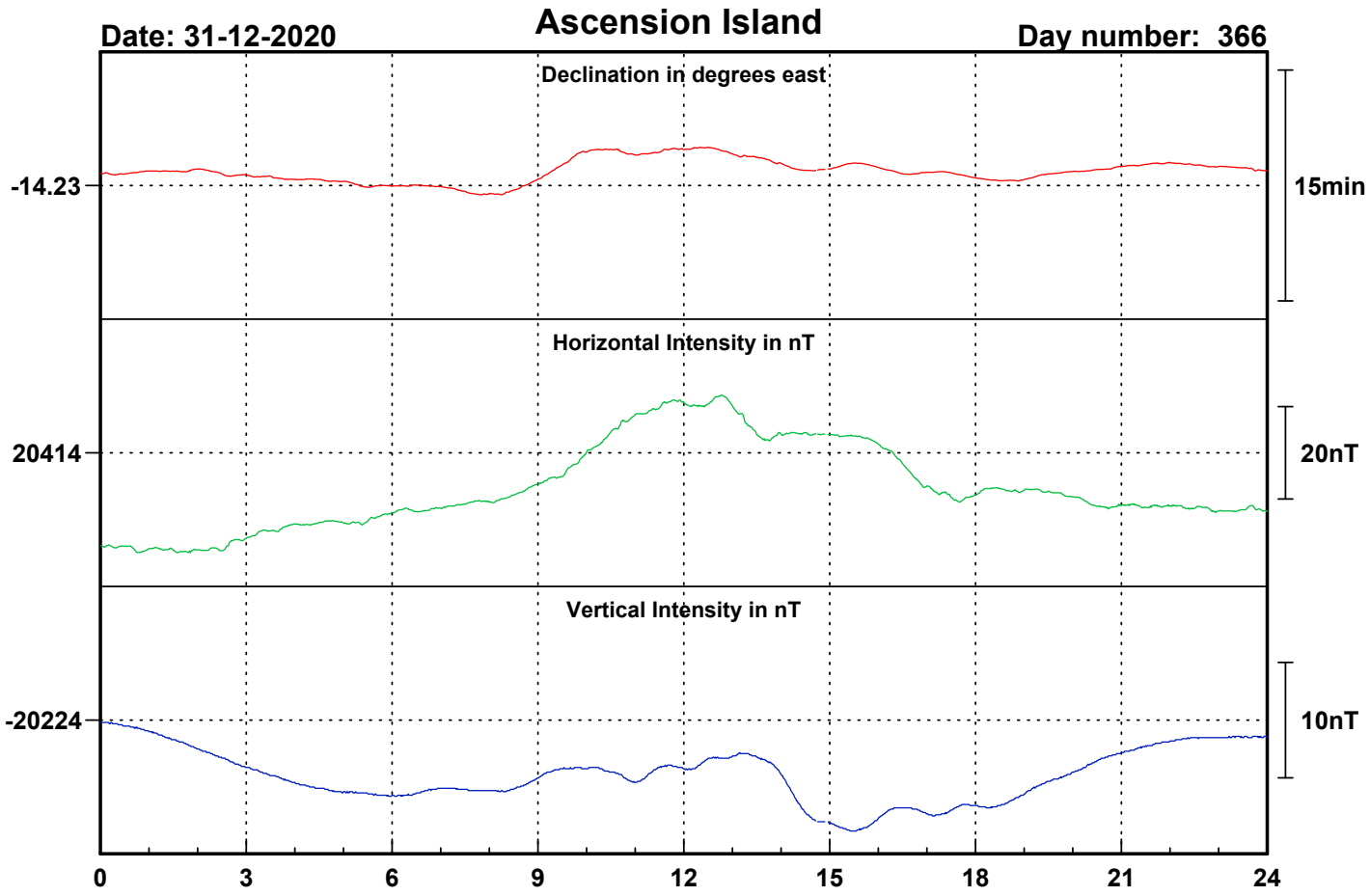

Date: 26-12-2020
Day number: 361
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)


Ascension Island
Date: 27-12-2020
Day number: 362
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24

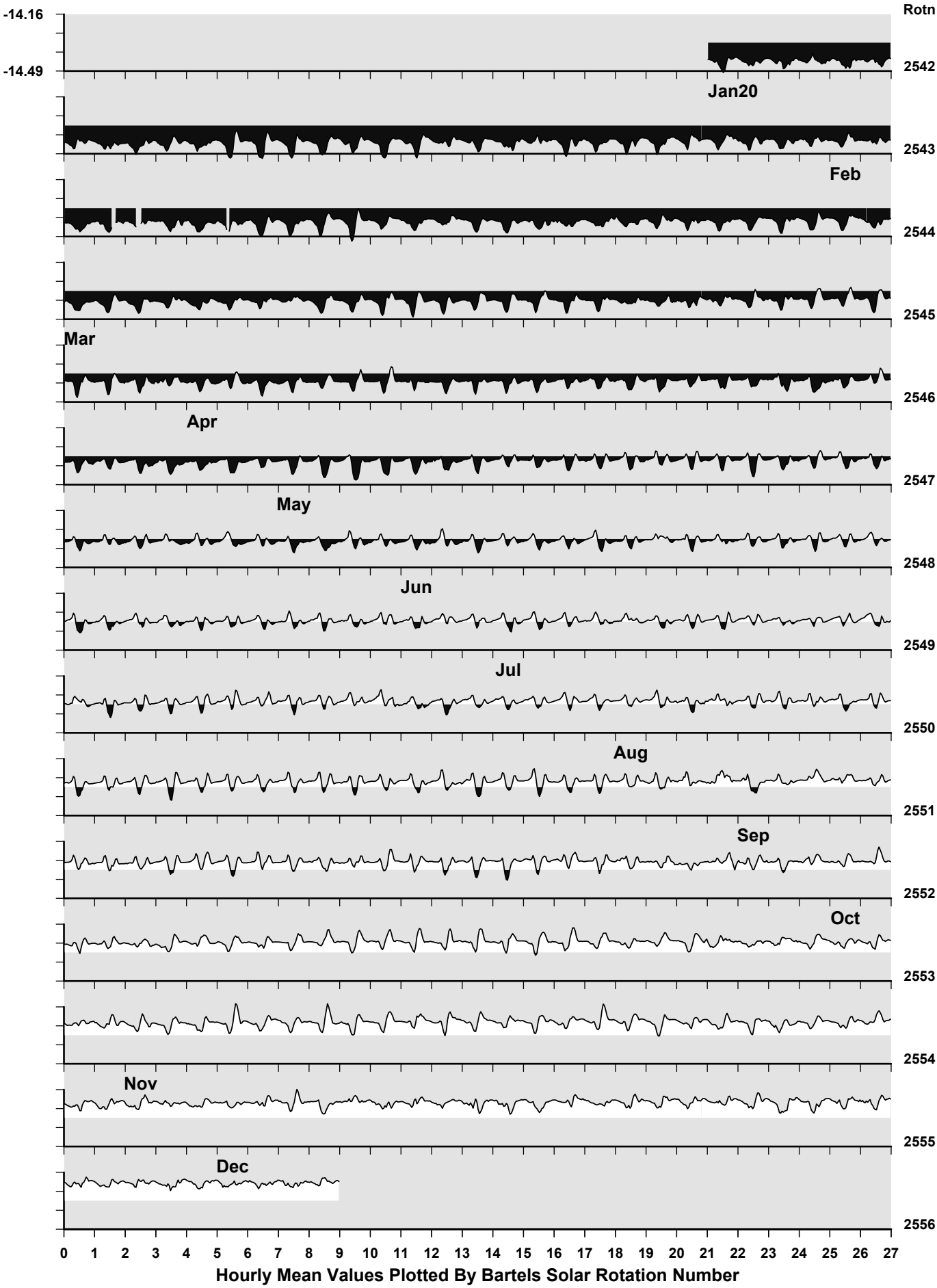

Date: 28-12-2020
Day number: 363
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)


Ascension Island
Date: 29-12-2020
Day number: 364
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24

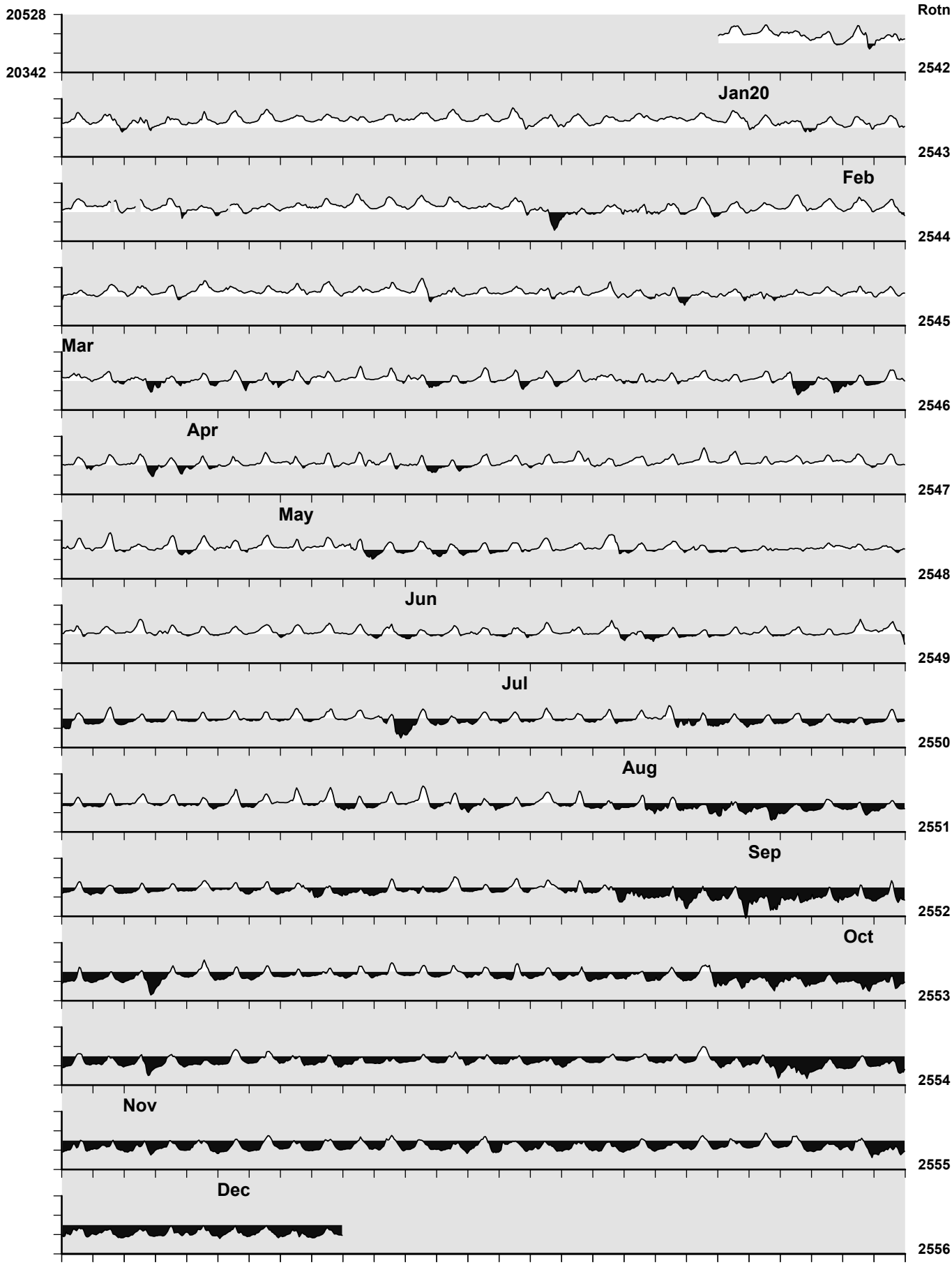

Date: 30-12-2020
Day number: 365
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24
Hour (UT)


Ascension Island
Date: 31-12-2020
Day number: 366
Declination in degrees east
-14.23
15min
Horizontal Intensity in nT
20414
20nT
Vertical Intensity in nT
-20224
10nT
0
3
6
9
12
15
18
21
24

Ascension Island Observatory: Declination (degrees)

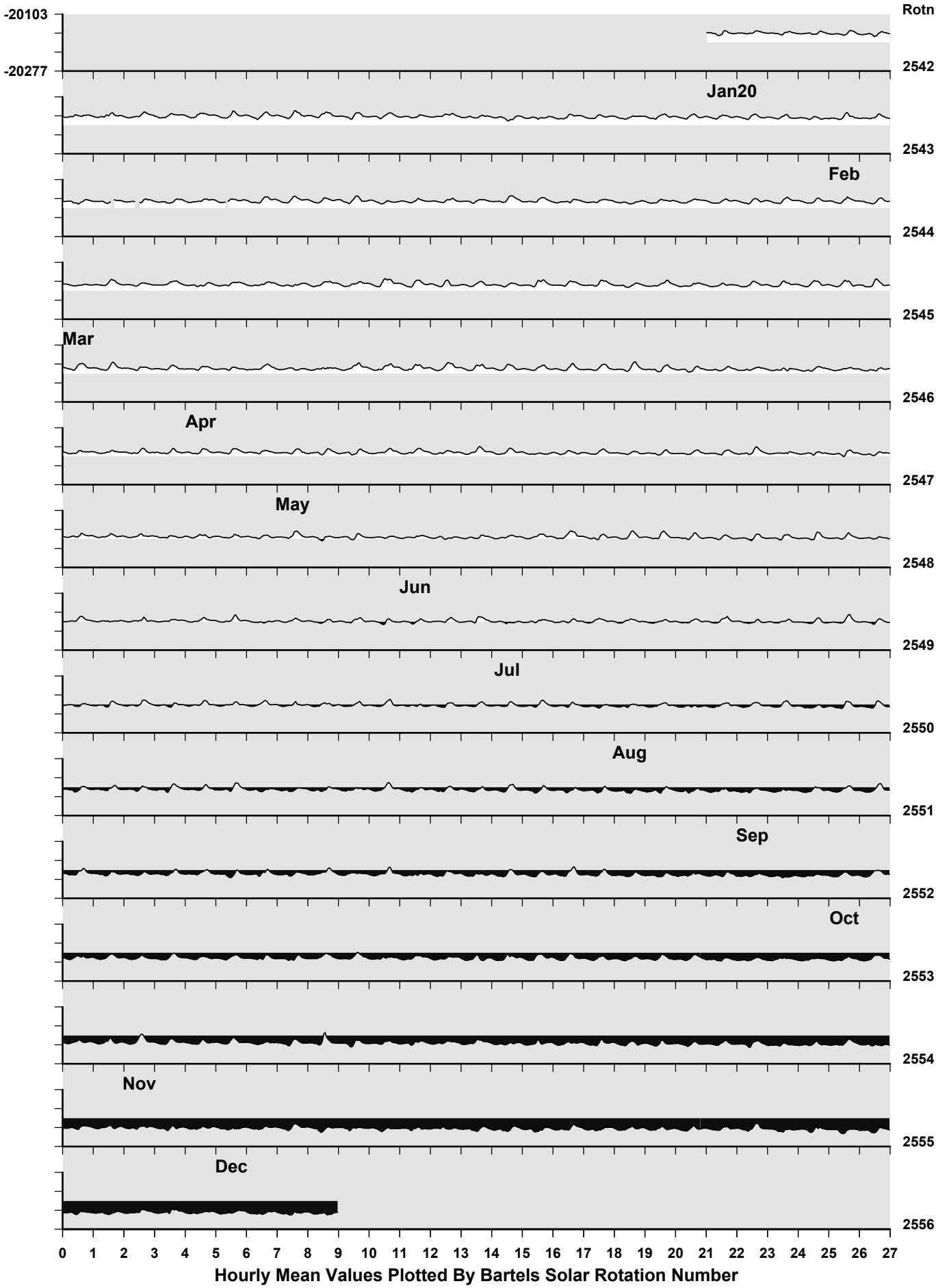


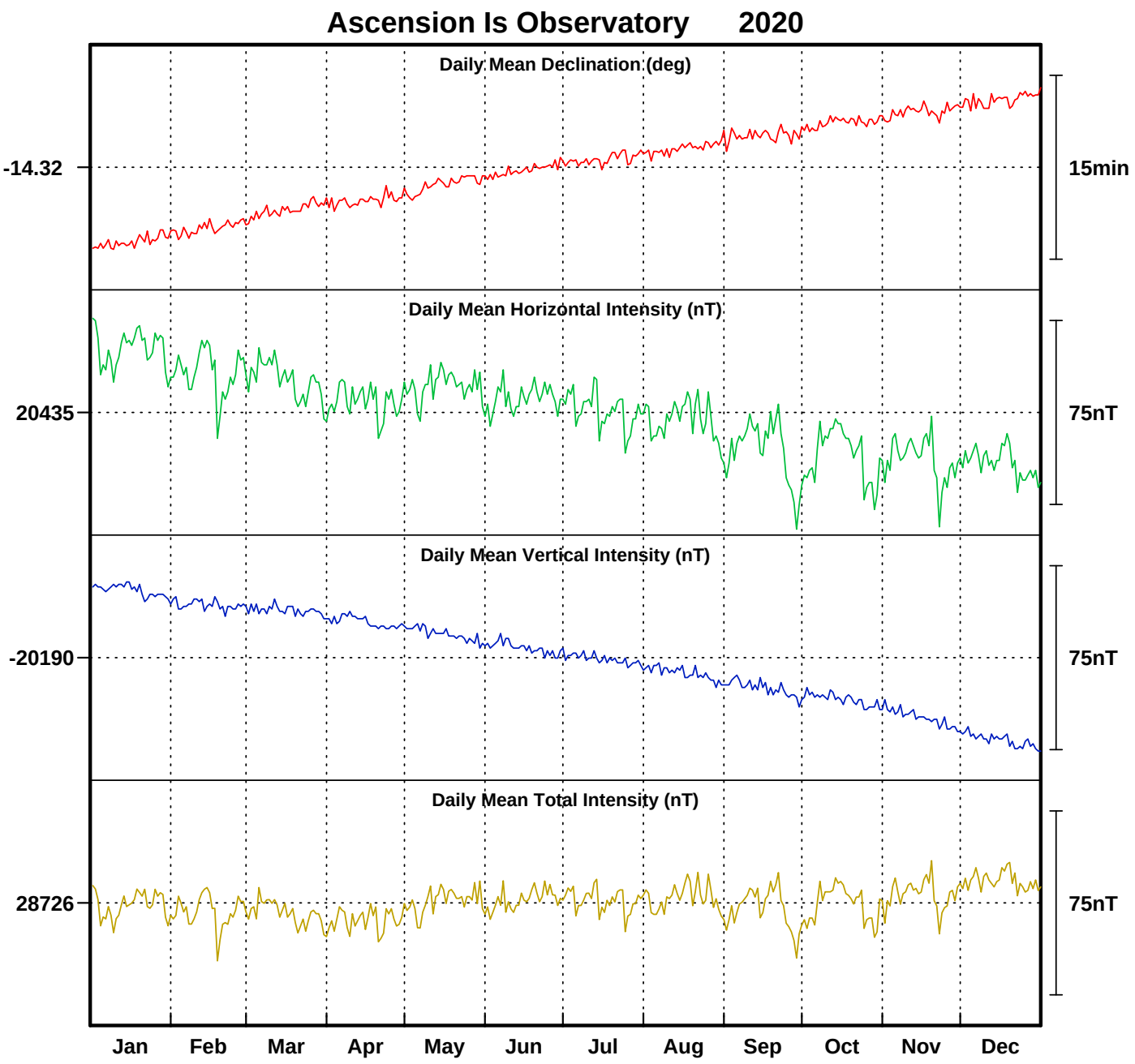
Ascension Island Observatory: Horizontal Intensity (nT)



Hourly Mean Values Plotted By Bartels Solar Rotation Number

Ascension Island Observatory: Vertical Intensity (nT)




Ascension Is Observatory 2020
Daily Mean Declination (deg)
-14.32
15min
Daily Mean Horizontal Intensity (nT)
20435
75nT
Daily Mean Vertical Intensity (nT)
-20190
75nT
Daily Mean Total Intensity (nT)
28726
75nT
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Monthly Mean Values for Ascension Island Observatory 2020

Month	*D*	*H*	*I*	*X*	*Y*	*Z*	*F*
January	-14° 25.5′	20460 nT	-44° 34.8′	19815 nT	-5097 nT	-20163 nT	28725 nT
February	-14° 24.5′	20451 nT	-44° 36.1′	19808 nT	-5089 nT	-20168 nT	28723 nT
March	-14° 23.0′	20447 nT	-44° 36.6′	19807 nT	-5079 nT	-20171 nT	28722 nT
April	-14° 22.2′	20439 nT	-44° 37.6′	19800 nT	-5073 nT	-20175 nT	28720 nT
May	-14° 20.9′	20445 nT	-44° 37.6′	19807 nT	-5067 nT	-20180 nT	28727 nT
June	-14° 19.7′	20440 nT	-44° 38.5′	19805 nT	-5059 nT	-20186 nT	28728 nT
July	-14° 18.8′	20435 nT	-44° 39.3′	19801 nT	-5052 nT	-20191 nT	28727 nT
August	-14° 17.9′	20431 nT	-44° 40.1′	19798 nT	-5046 nT	-20196 nT	28729 nT
September	-14° 16.9′	20419 nT	-44° 41.7′	19788 nT	-5037 nT	-20202 nT	28724 nT
October	-14° 15.8′	20417 nT	-44° 42.2′	19788 nT	-5031 nT	-20207 nT	28726 nT
November	-14° 15.0′	20415 nT	-44° 43.0′	19787 nT	-5025 nT	-20215 nT	28730 nT
December	-14° 14.0′	20414 nT	-44° 43.9′	19787 nT	-5019 nT	-20224 nT	28735 nT

Note

i. The values shown here are provisional.