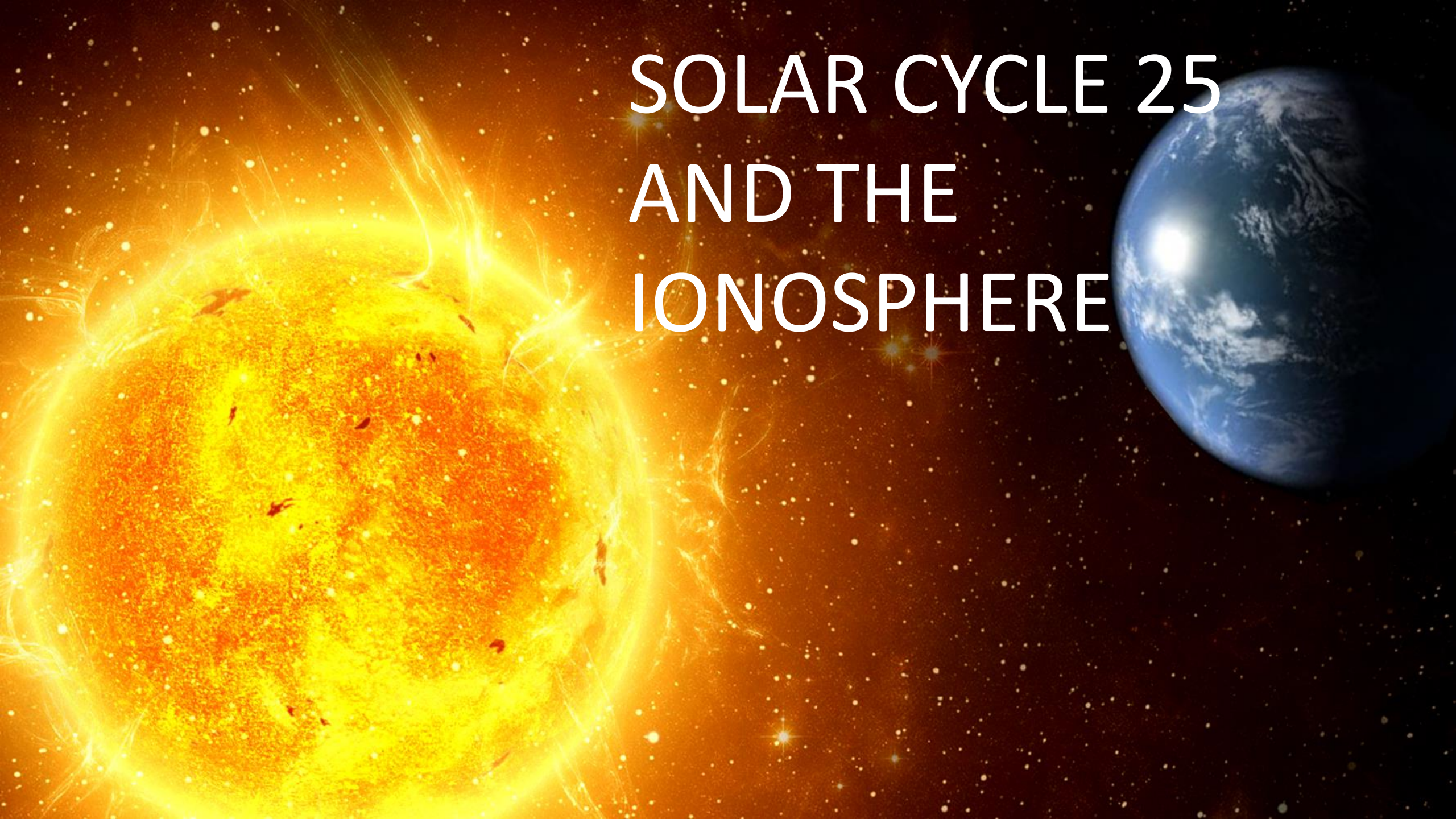
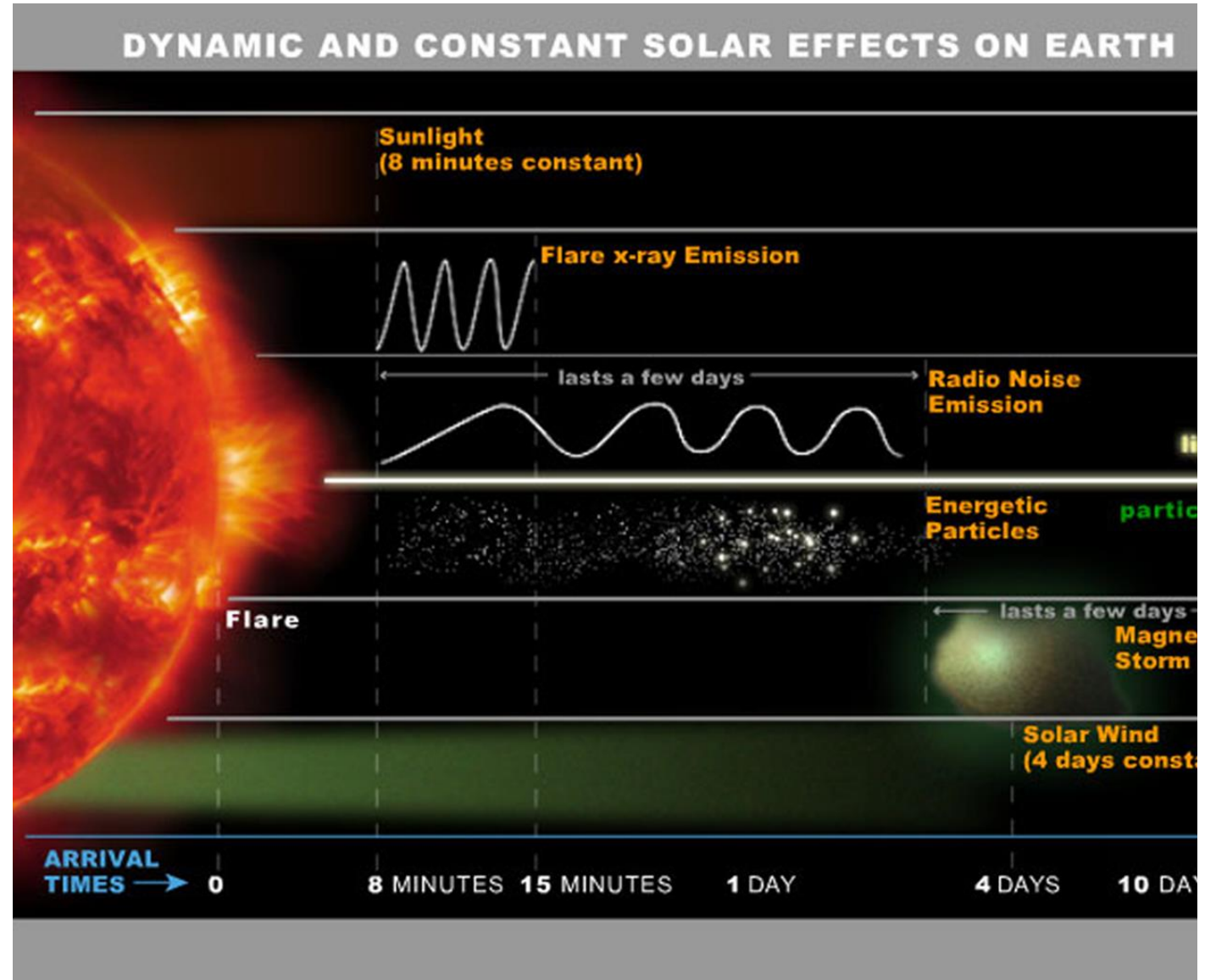
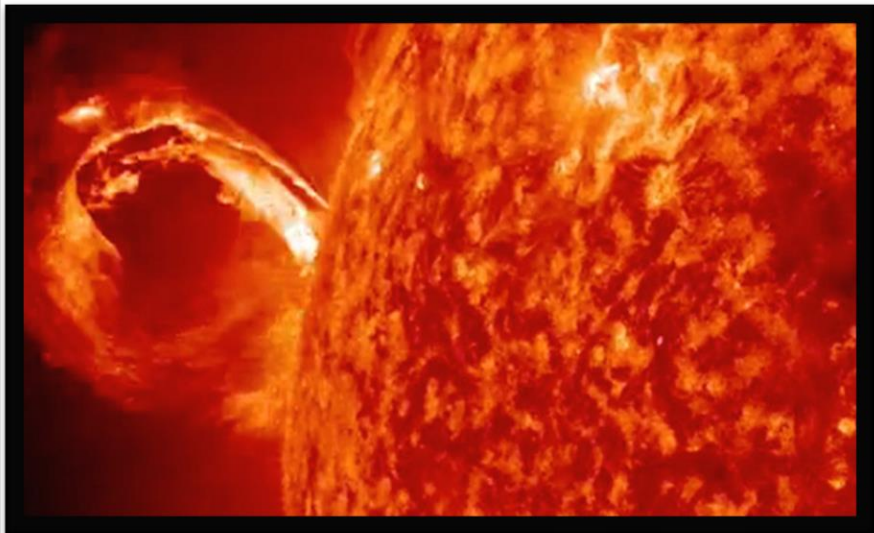
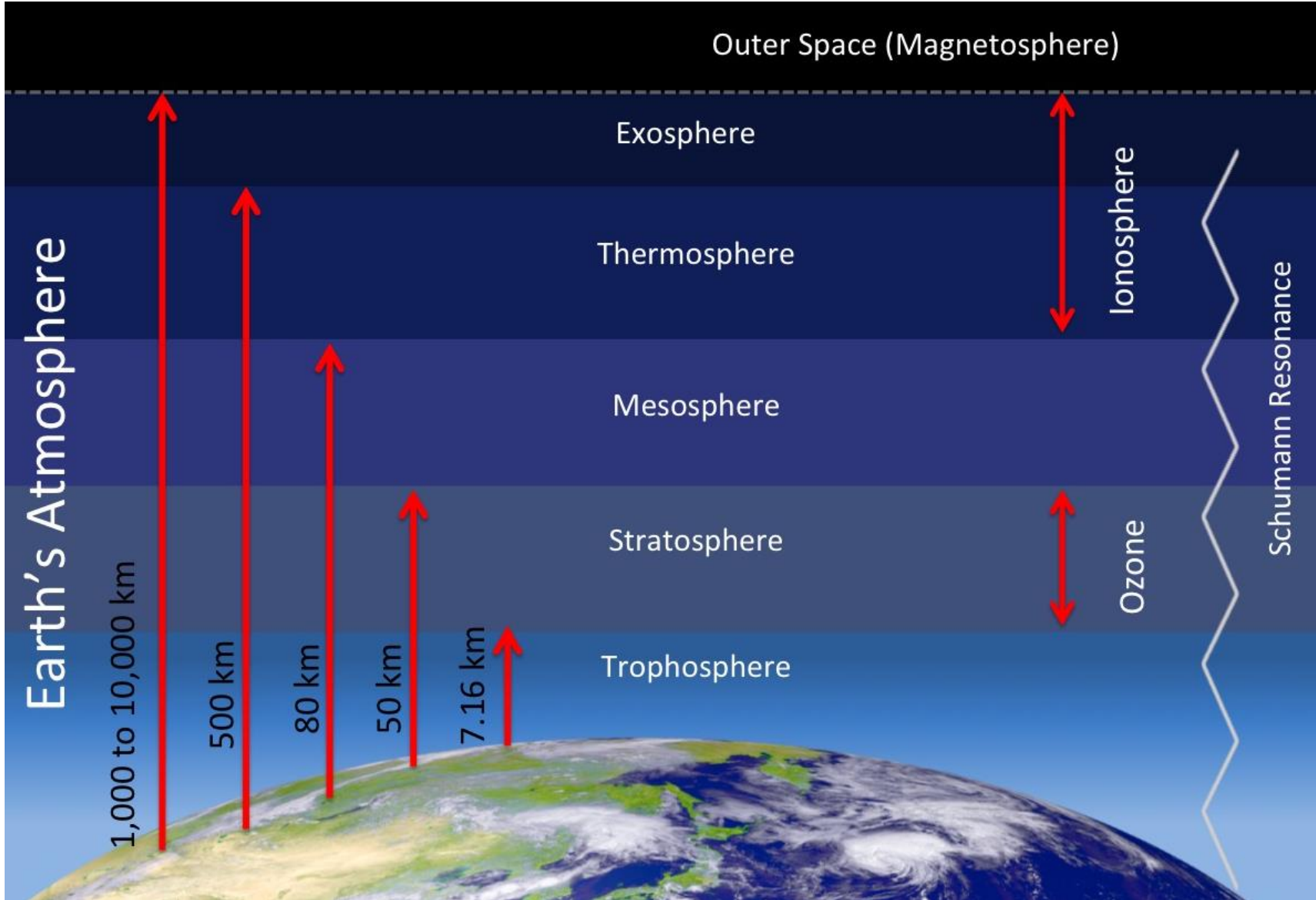


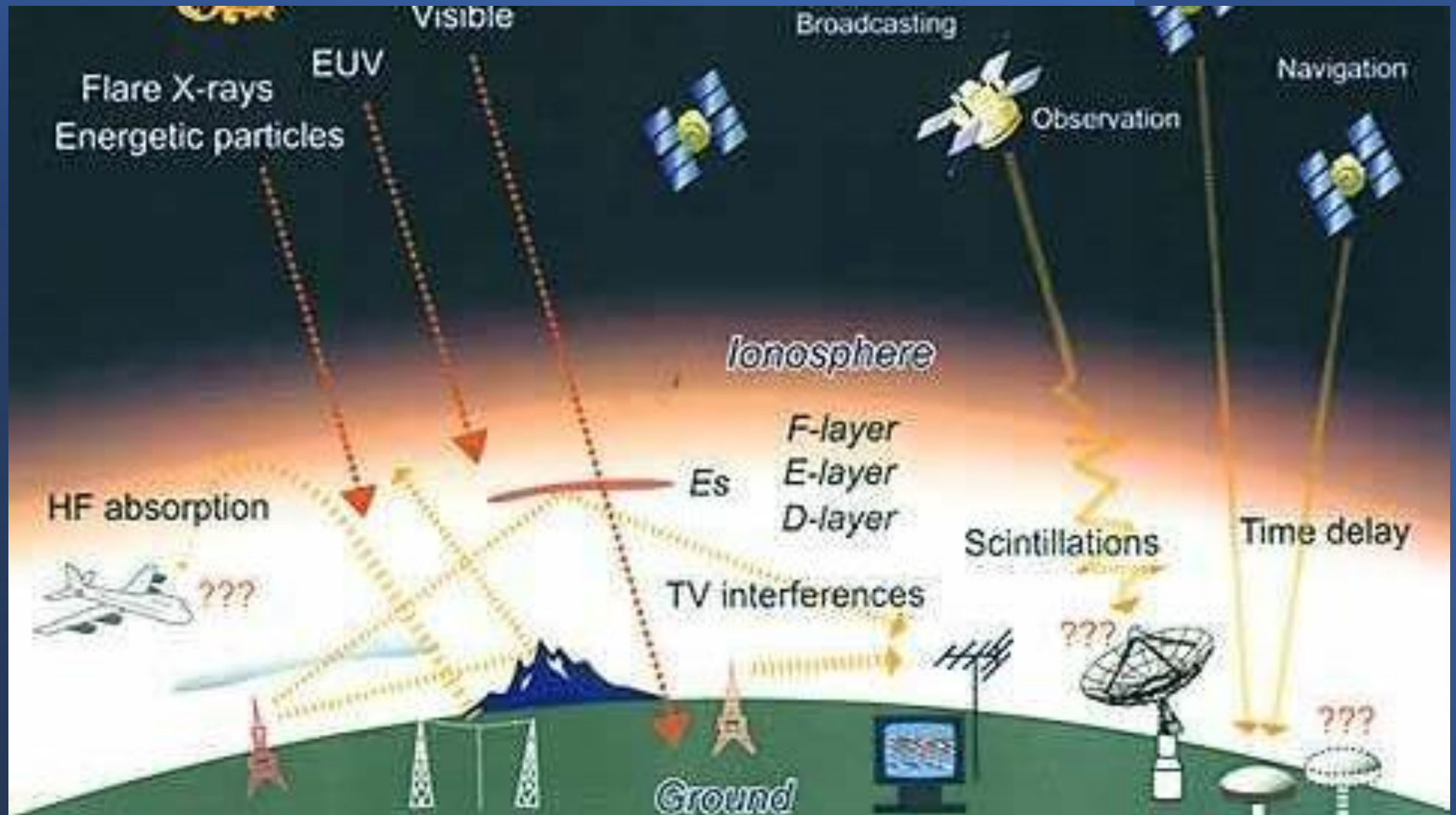
SOLAR CYCLE 25 AND THE IONOSPHERE



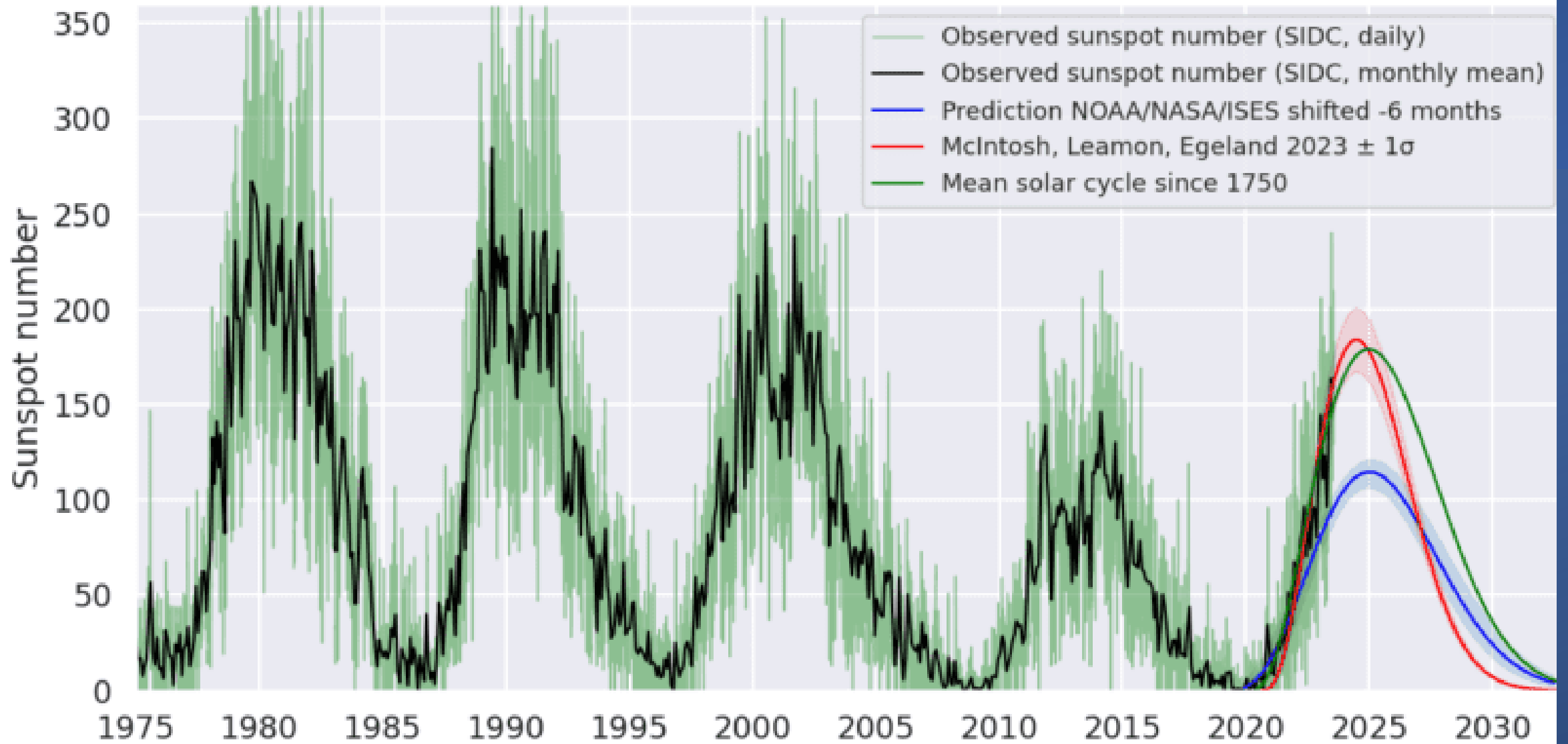
Solar Effects and CME's Impact the Ionosphere







What are⁺
ionospheric
disturbances
and how do they
affect GNSS?



Receiver WebUI GPS Tracking

Receiver Status	
Satellites	
General	
Tracking (Table)	
Tracking (Graph)	
Tracking (SkyPlot)	
Enable/Disable	
Satellite Almanacs	
Predicted Elevation	
Predicted Constellation	
Current Constellation	
Ground Track	
Rise/Set (Table)	
Rise/Set (Graph)	
Data Logging	
Receiver Configuration	
I/O Configuration	
Bluetooth	
Radio	
GSM/GPRS Modem	
MSS Corrections	
Network Configuration	
Wi-Fi	
Security	
Firmware	
Help	

Satellites - Tracking Information ?

ALL	GPS	GLONASS	Galileo	BeiDou	QZSS	IRNSS	SBAS	MSS			
SV	Type	Elev. [Deg]	Azim. [Deg]	L1-C/No [dBHz]	L1	L2-C/No [dBHz]	L2	L5-C/No [dBHz]	L5	IOD	URA [m]
1	GPS	25.79	56.06	40.6	CA	43.2	CM+CL	47.1	I+Q	45	2
2	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
3	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
4	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
5	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
6	GPS	-45.00	0.00	21.9	CA	-	-	39.2	I+Q	-	-
7	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
8	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
9	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
10	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
11	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
12	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
13	GPS	35.29	223.03	44.5	CA	30.6	E	-	-	3	2
14	GPS	53.68	73.32	45.7	CA	37.8	E	-	-	68	2
15	GPS	28.73	261.94	44.3	CA	43.6	CM+CL	-	-	82	2
16	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
17	GPS	76.78	122.17	50.3	CA	50.5	CM+CL	-	-	50	2
18	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
19	GPS	60.24	189.93	46.4	CA	40.8	E	-	-	22	2
20	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
21	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
22	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
24	GPS	26.48	307.82	31.2	CA	40.3	CM+CL	41.2	I+Q	47	2
25	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
26	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
27	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
29	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
30	GPS	-45.00	0.00	29.4	CA	33.3	CM+CL	38.6	I+Q	-	-
31	GPS	-45.00	0.00	-	-	-	-	-	-	-	-
32	GPS	-45.00	0.00	-	-	-	-	-	-	-	-

Receiver WebUI GLONASS Tracking

Satellites - Tracking Information ?



- Receiver Status
- Satellites
 - General
 - Tracking (Table)
 - Tracking (Graph)
 - Tracking (SkyPlot)
 - Enable/Disable
 - Satellite Almanacs
 - Predicted Elevation
 - Predicted Constellation
 - Current Constellation
 - Ground Track
 - Rise/Set (Table)
 - Rise/Set (Graph)
- Data Logging
- Receiver Configuration
- I/O Configuration
- Bluetooth
- Radio
- GSM/GPRS Modem
- MSS Corrections

ALL	GPS	GLONASS	Galileo	BeiDou	QZSS	IRNSS	SBAS	MSS		
SV	Type	Elev. [Deg]	Azim. [Deg]	L1-C/No [dBHz]	L1	L2-C/No [dBHz]	L2	IODE	URA [m]	Type
10	GLONASS	34.77	107.54	49.0	CA	-	-	95	7	M
11	GLONASS	63.88	13.57	54.6	CA	47.2	CA	95	2	M
12	GLONASS	23.88	322.57	39.9	CA	38.9	CA	95	2	M
20	GLONASS	20.74	29.28	-	-	-	-	-	-	-
21	GLONASS	77.17	67.77	52.7	CA	47.6	CA	95	4	M
22	GLONASS	37.88	196.99	49.7	CA	44.3	CA	95	4	M

2020-04-05T20:44:06Z (UTC)

Satellites - Tracking Information ?



- Receiver Status
- Satellites
 - General
 - Tracking (Table)
 - Tracking (Graph)
 - Tracking (SkyPlot)
 - Enable/Disable
 - Satellite Almanacs
 - Predicted Elevation
 - Predicted Constellation
 - Current Constellation
 - Ground Track
 - Rise/Set (Table)
 - Rise/Set (Graph)
- Data Logging
- Receiver Configuration
- I/O Configuration
- Bluetooth
- Radio
- GSM/GPRS Modem
- MSS Corrections
- Network Configuration

ALL	GPS	GLONASS	Galileo	BeiDou	QZSS	IRNSS	SBAS	MSS	
SV	Type	Elev. [Deg]	Azim. [Deg]	L1-C/No [dBHz]	L1	L5-C/No [dBHz]	L5	IODE	URA [m]
2	Galileo	33.05	309.27	44.6	CBOC	49.4	Alt	122	3.12
3	Galileo	14.18	240.02	39.4	CBOC	50.6	Alt	120	3.12
8	Galileo	12.03	290.29	-	-	-	-	-	-
11	Galileo	61.06	91.25	46.6	CBOC	48.7	Alt	123	3.12
12	Galileo	20.04	40.49	30.9	CBOC	39.4	Alt	123	3.12
24	Galileo	30.50	96.71	46.4	CBOC	49.6	Alt	123	3.12
25	Galileo	68.48	25.43	50.1	CBOC	53.8	Alt	119	3.12
36	Galileo	40.71	180.02	44.8	CBOC	51.7	Alt	123	3.12

2020-04-05T20:46:03Z (UTC)

Galileo Satellite Tracking in R10-2 WebUI



GNSS Mission Planning Tool

Settings - Mission planning x +

Not secure gnsmissionplanning.com/App/Settings

Bookmarks Zoho One

Settings Charts

GNSS Mission Planning

Settings

Satellite library

Help

Apply

Settings Obstructions

Search Address

Search Results

Latitude

Longitude

Height

Cutoff

Date

From / For

Time zone

gnsmissionplanning.com/App/Settings#map

Type here to search

76%

37°F Rain showers

2:41 PM 1/18/2024

30

Online Planning Tool for Today/Salem, Oregon

gnsplanning.com/#/settings

Bookmarks Zoho One

Trimble GNSS Planning Online Settings Satellite Library Charts Sky Plot World View EN

Satellite Selection

Change selection

Satellites: 129/130

System: active	Satellites	
	Selected	Healthy
GPS <input checked="" type="checkbox"/>	30	30
GLONASS <input checked="" type="checkbox"/>	24	24
Galileo <input checked="" type="checkbox"/>	25	25
BeiDou <input checked="" type="checkbox"/>	46	46
QZSS <input checked="" type="checkbox"/>	4	4

My Settings

Time of almanac: 2024-01-19

Time zone: UTC -8:00

Visible period:
2024-01-19 00:00 - 2024-01-20 00:00

Latitude: N 44° 56' 20.6624"

Longitude: W 123° 2' 25.7892"

Height: 100 m

Elevation cutoff: 10 °

GNSS Planning Online, © 2017-2018, Trimble Inc.
Version: 1.6.1.0

Settings

Latitude: N 44° 56' 20.6624" °

Longitude: W 123° 2' 25.7892" °

Height: 100 m

Elevation cutoff: 10 °

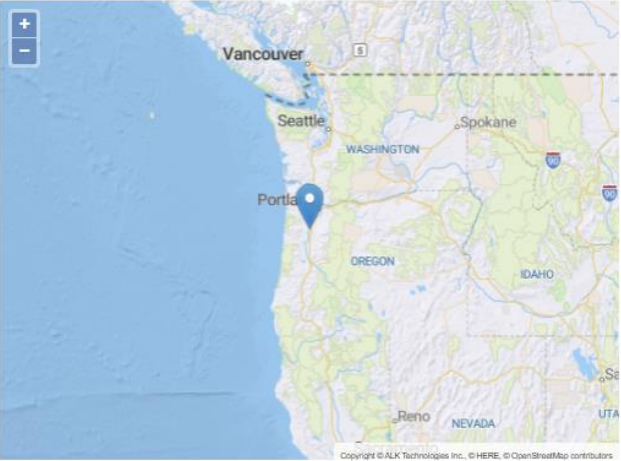
Day: 01/19/2024 Today

Start time: 00:00 UTC -8:00

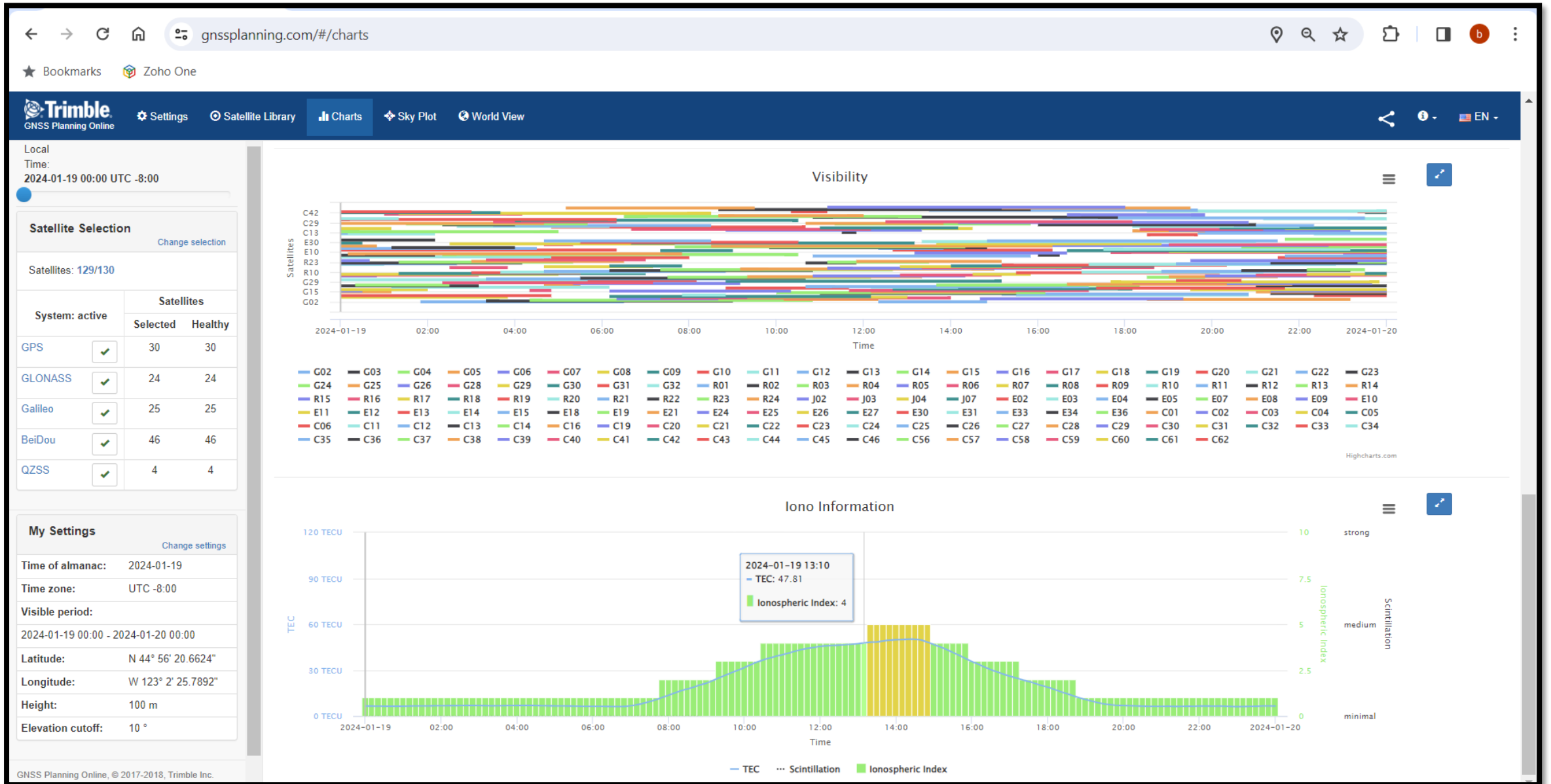
Period [hours]: 24

Time zone: (UTC-08:00) Pacific Time (US & Canada)

Apply

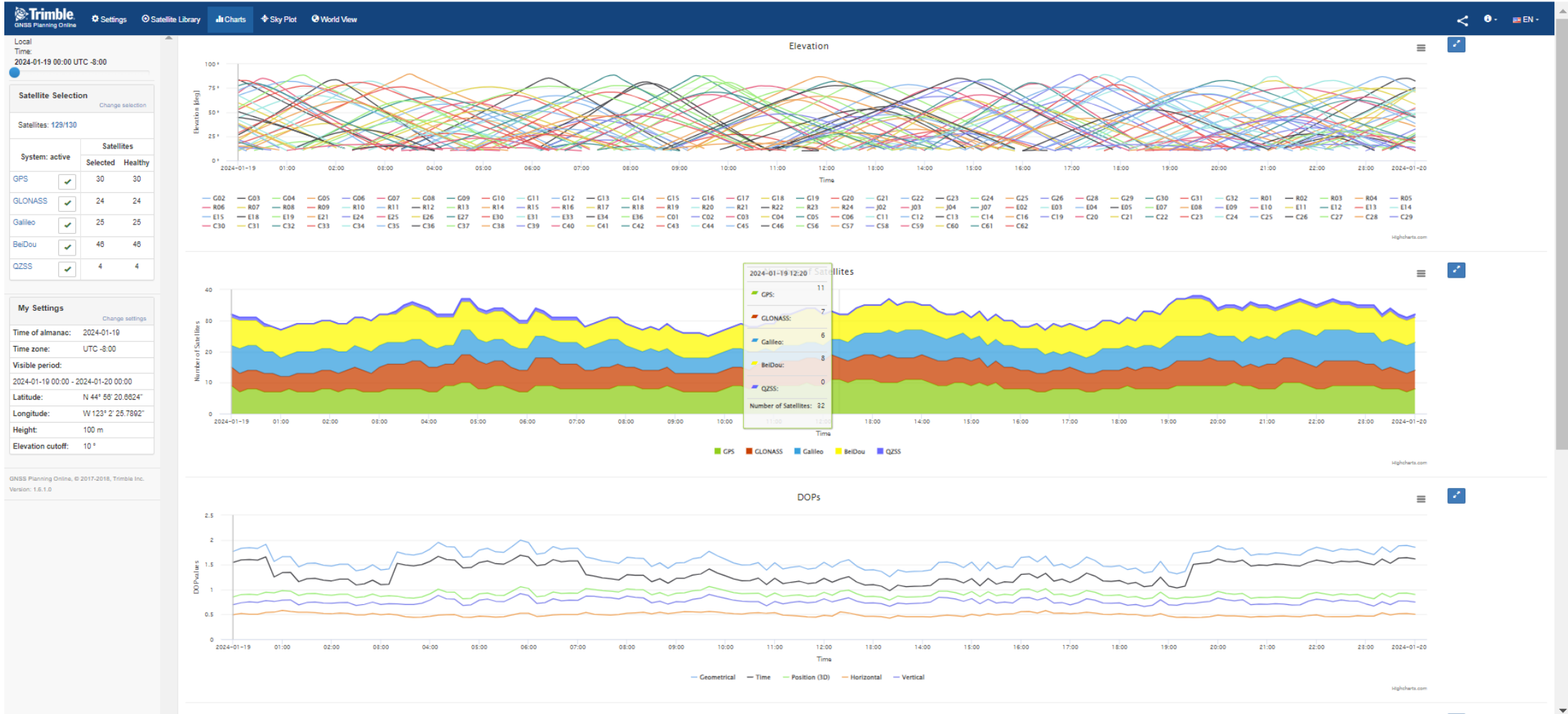


Online Planning Tool Iono Graph

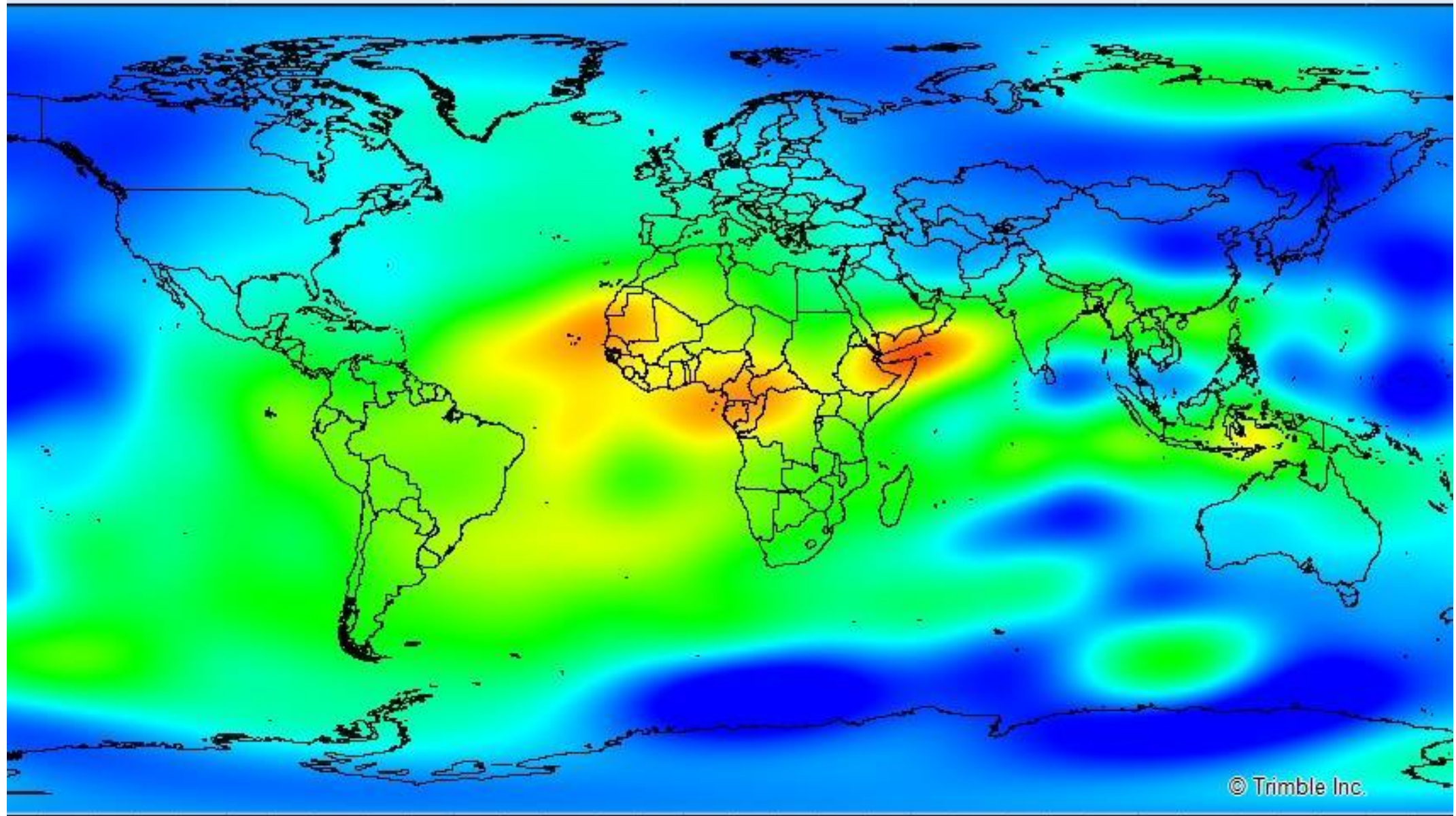


Online Planning Tool Graphs

★ Bookmarks Zoho One



Ionosphere Map
(11/03/2023 14:40:00 UTC)



© Trimble Inc.

0 -100 -50 0 50 100 150

Longitude

Trimble Online Planning Tool



An ionospheric index value for a given location and time is also provided. This is a value on a scale of zero to 10 indicating ionospheric level derived from measured TEC and scintillation.



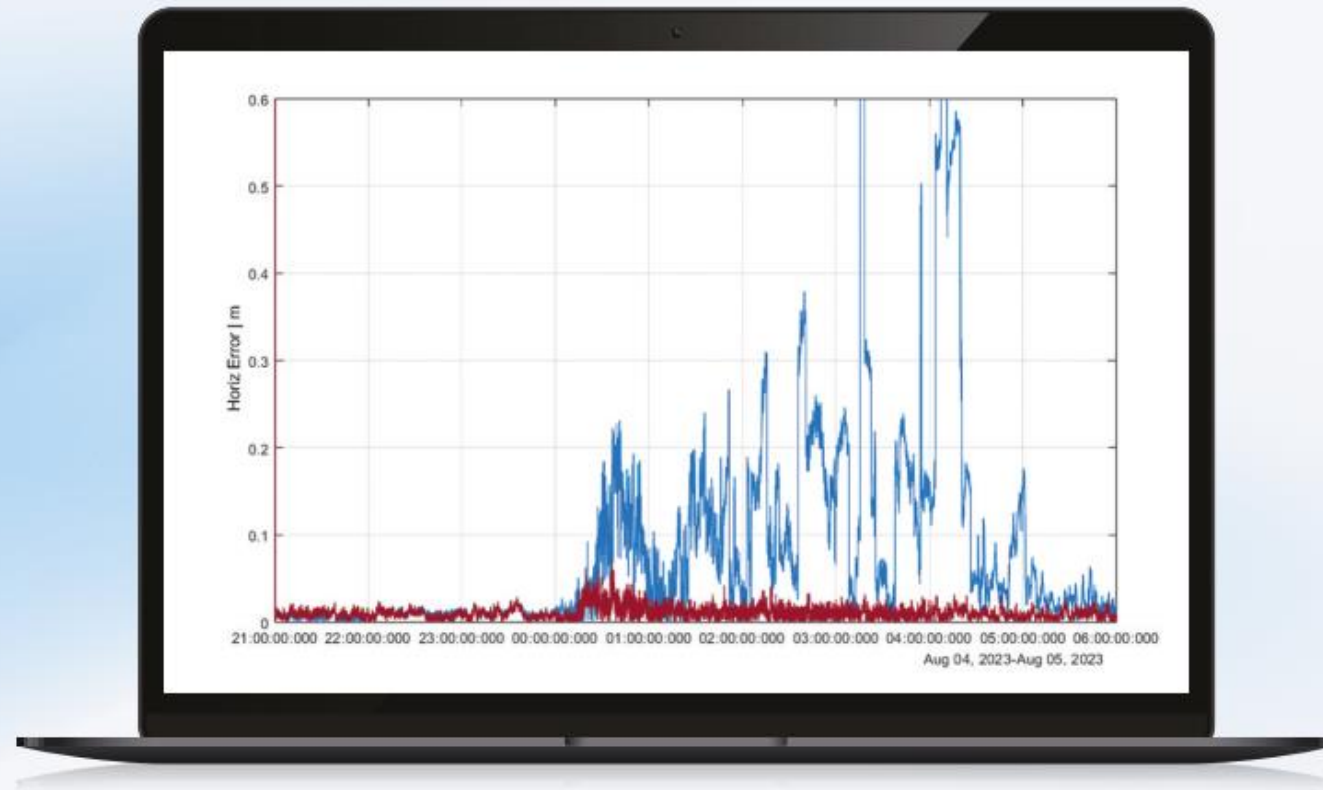
Trimble IonoGuard

Protecting RTK GNSS from
ionospheric disturbances

Minimum Receiver Firmware
Version 6.23/ProPoint

IONOGUARD Positional Error

Peru data



-  Horizontal position error with IonoGuard enabled
-  IonoGuard disabled

Rover Receiver WebUI

New IONO Tech

ALL	GPS	GLONASS	Galileo	BeiDou	QZSS	NavIC	SBAS	MSS					
SV	Type	Elev. [°]	Azim. [°]	L1-C/No [dBHz]	L1	L2-C/No [dBHz]	L2	L5-C/No [dBHz]	L5	Iono	IDDE	URA [m]	Type
3	GPS	86.46	258.86	51.2	CA	51.2	CM+CL	54.3	I+Q		34	2	IIF
4	GPS	53.38	307.68	47.2/49.3	CA/BOC	49.3	CM+CL	51.3	I+Q		112	2	III
6	GPS	13.12	318.35	39.4	CA	42.4	CM+CL	46.5	I+Q		126	2	IIF
9	GPS	26.53	288.58	44.1	CA	44.4	CM+CL	49.1	I+Q		107	2	IIF
16	GPS	31.73	130.18	43.5	CA	30.7	E	-	-		116	2	IIR
26	GPS	40.05	90.11	44.6	CA	47.2	CM+CL	51.4	I+Q		120	2	IIF
31	GPS	42.66	46.71	48.2	CA	43.2	CM+CL	-	-		190	2	IIR-M

Satellite Subsets

How to use satellite subsets in Trimble Access

9/28 80% 54% 21 6.562 RTK+IMU H:0.04sft V:0.03sft

Satellites

The diagram shows a circular arrangement of satellite identifiers. A green inner circle encloses a subset of satellites, while a black outer circle encloses all visible satellites. The satellites are labeled as follows:

- Outer Circle (Black):** G16, G26, E25, G23, R7, G29, G15, R20, E33, G20, R5, G5, E19, E12, G13, G2, E4, R21, E10, R5.
- Inner Circle (Green):** G16, G26, E25, G23, R7, G29, G15, R20, E33, G20, R5, G5, E19, E12, G13, G2, E4, R21, E10, R5.
- Other Labels:** E18, R6, RTX.

Esc Sun SV set A Reset Options 3:52 / 8:39 Scroll for details

Satellite Subsets

How to use satellite subsets in Trimble Access

9/28 8:08 80% 54% 12 [A] 6.562 Auton H:? V:? X

Satellites

A diagram illustrating satellite subsets. It features two concentric circles: an outer black circle and an inner green circle. A red arrow points from the '12 [A]' status icon in the top bar to the green inner circle. Various satellite identifiers are placed within the diagram: G16, G26, and G20 are positioned near the outer circle; E11, R21, E10, E12, G2, R6, G29, R20, and E4 are scattered in the center; and RTX is located at the bottom center.

Esc Sun SV set B Reset Options

4:08 / 8:39

Scroll for details

Satellite Subsets

How to use satellite subsets in Trimble Access

9/28 79% 54% 8 [B] 6.562 RTK+IMU H:? V:? X

Satellites

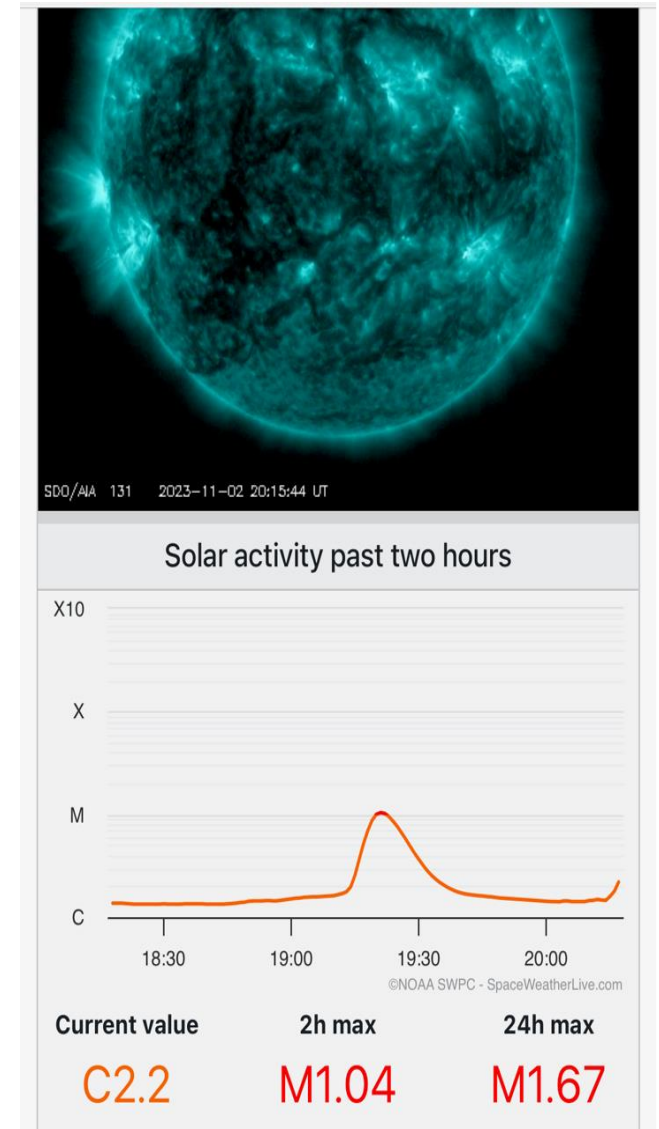
The diagram illustrates a satellite subset. It features a large outer circle and a smaller inner green circle. A red arrow points from the top of the green circle to the text 'How to use satellite subsets in Trimble Access'. Inside the circles, several satellite identifiers are listed: R5, G5, E19, G13, G18, G15, E33, G23, RTX, R7, and E25. The labels E25, RTX, and E33 are highlighted in blue. A north arrow is located to the left of the diagram.

Esc Sun All Reset Options List

5:30 / 8:39 Scroll for details

Solar Activity App

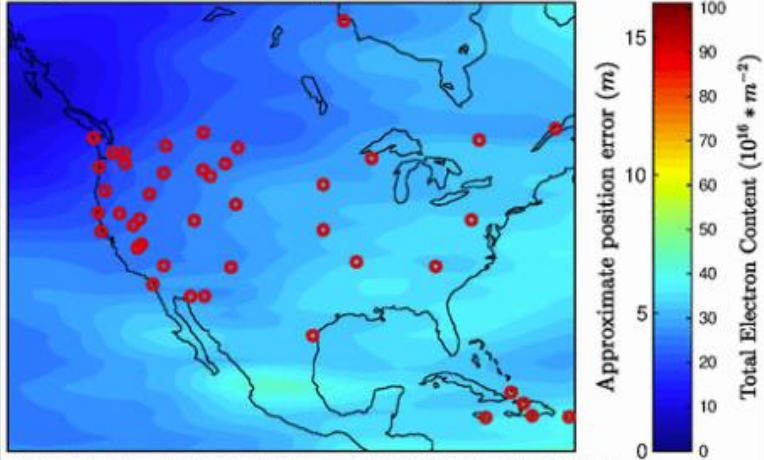
CME	Onset time i	Duration i	Angle i	Angular width	Median i
33	2023/11/02 11:36	1	72°	6°	308
32	2023/11/02 06:36	2	127°	20°	243
31	2023/11/02 06:36	1	10°	14°	427
30	2023/11/02 05:36	1	248°	14°	280
29	2023/11/02 03:36	8	34°	214°	370
28	2023/11/02 02:24	1	190°	10°	473
27	2023/11/01 21:24	3	91°	20°	385
26	2023/11/01 20:24	3	81°	16°	466



NOAA Space Weather

US REGION TOTAL ELECTRON CONTENT

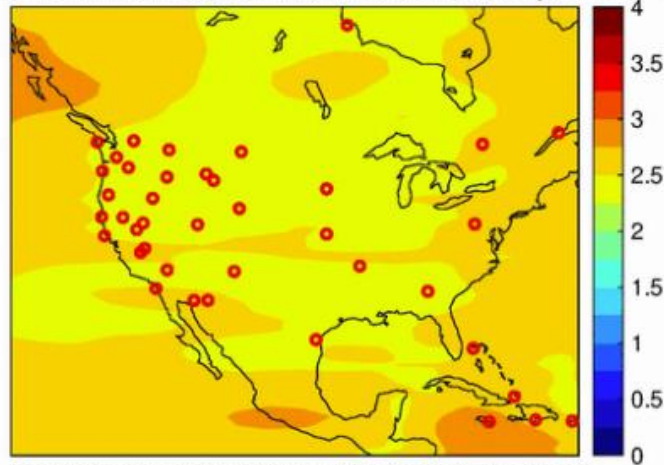
Approximate L1 Position Error (m) and TECu ($10^{16} * m^{-2}$)



02-Nov-2023 from 15:45 to 16:00 UT NOAA/SWPC Boulder, CO USA

STANDARD DEVIATION

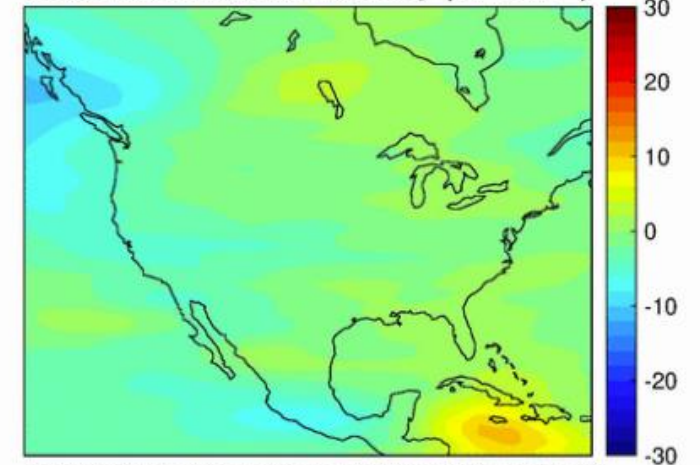
Total Electron Content Standard Deviation ($10^{16} * m^{-2}$)



03-Nov-2023 from 14:45 to 15:00 UT NOAA/SWPC Boulder, CO USA

ANOMALY

Total Electron Content Anomaly ($10^{16} * m^{-2}$)



03-Nov-2023 from 14:45 to 15:00 UT NOAA/SWPC Boulder, CO USA

December 31, 2023_X5 Solar Flare

