SPACE WEATHER INTRODUCTORY COURSE



Collaboration of

Solar-Terrestrial Centre of Excellence

Koninklijke luchtmacht

Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu



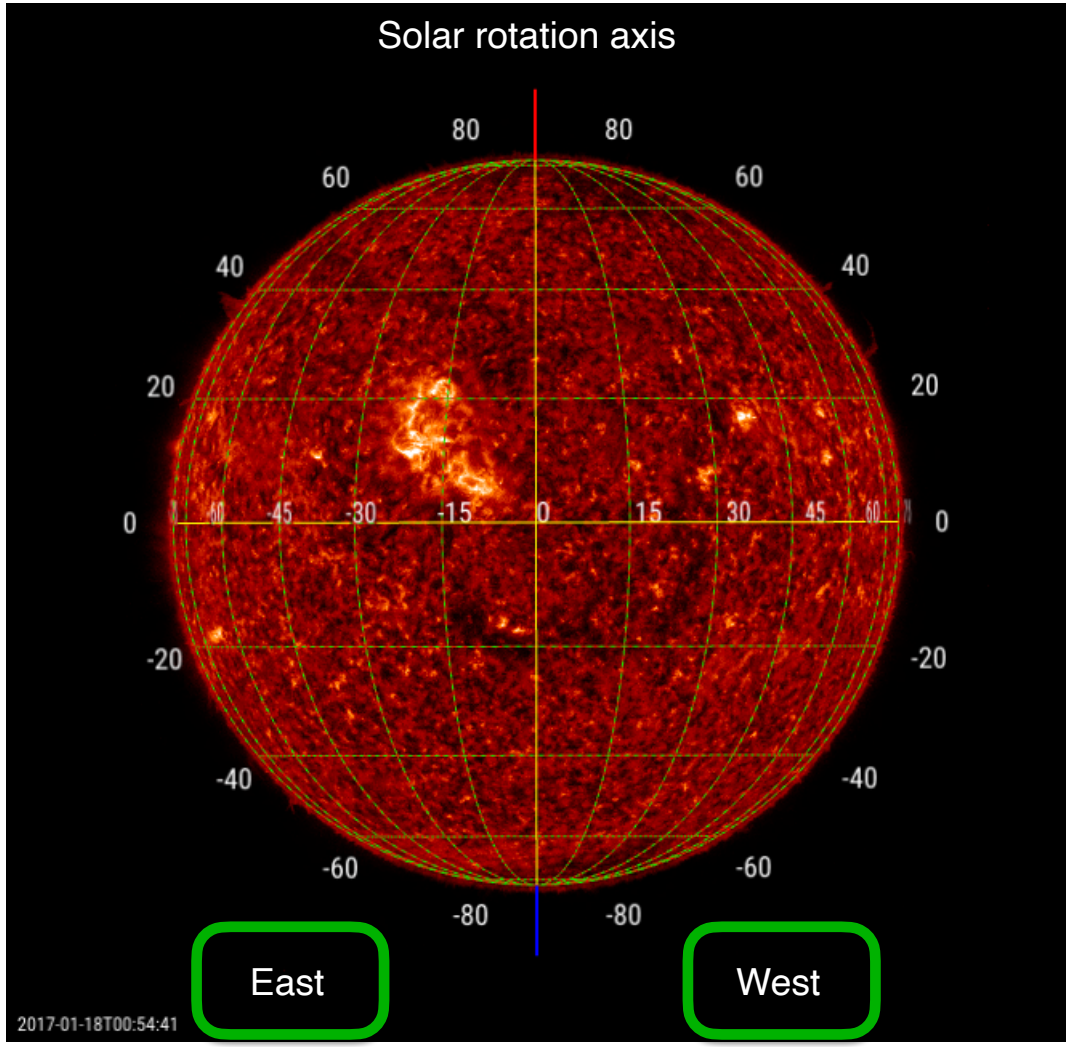
SPACE WEATHER

Basic Concepts

POSITIONING

Solar North Pole

Magnetic North Pole
Negative/Inward



Central meridian

Northern hemisphere

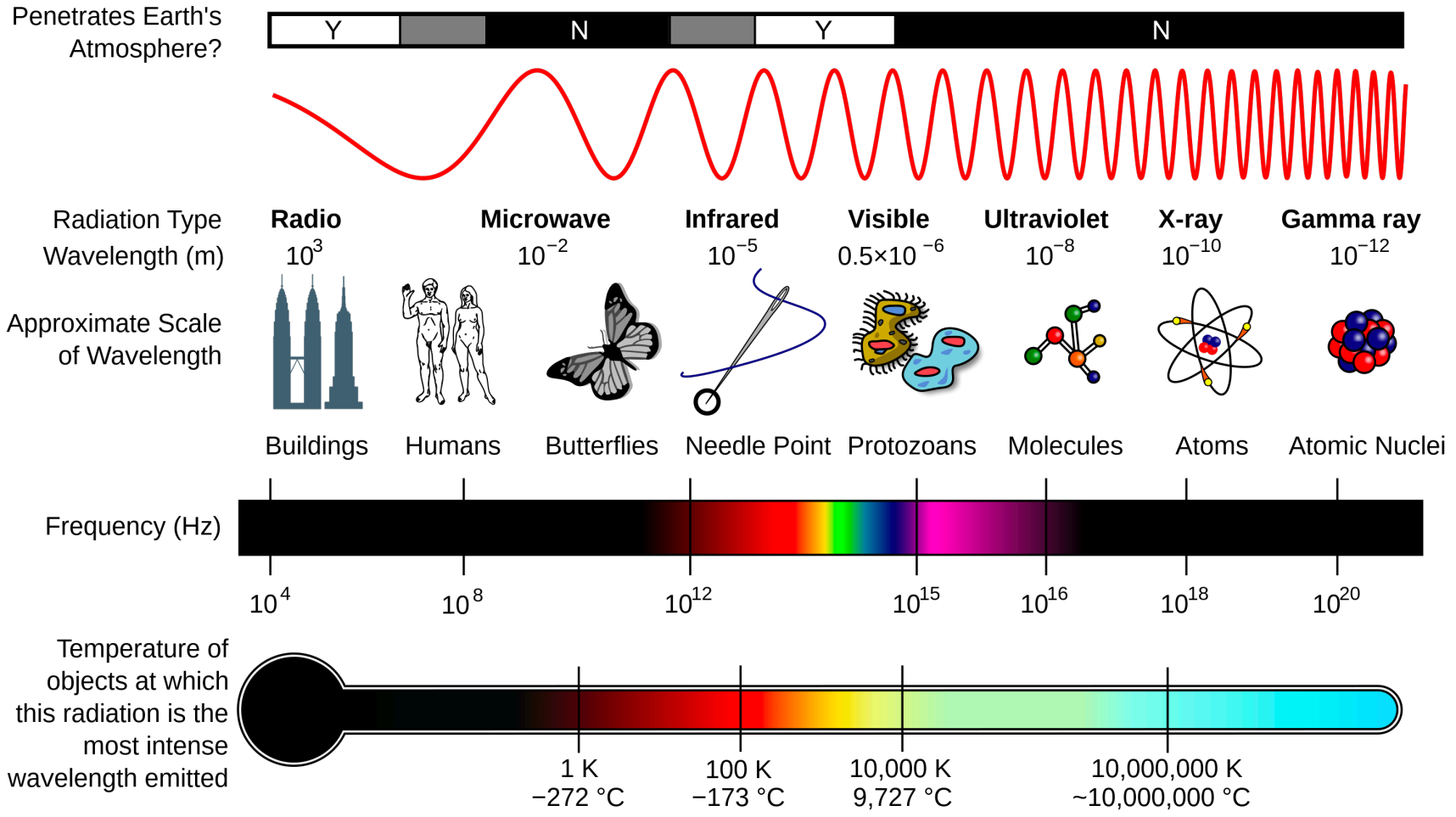
Solar Equator

Southern hemisphere

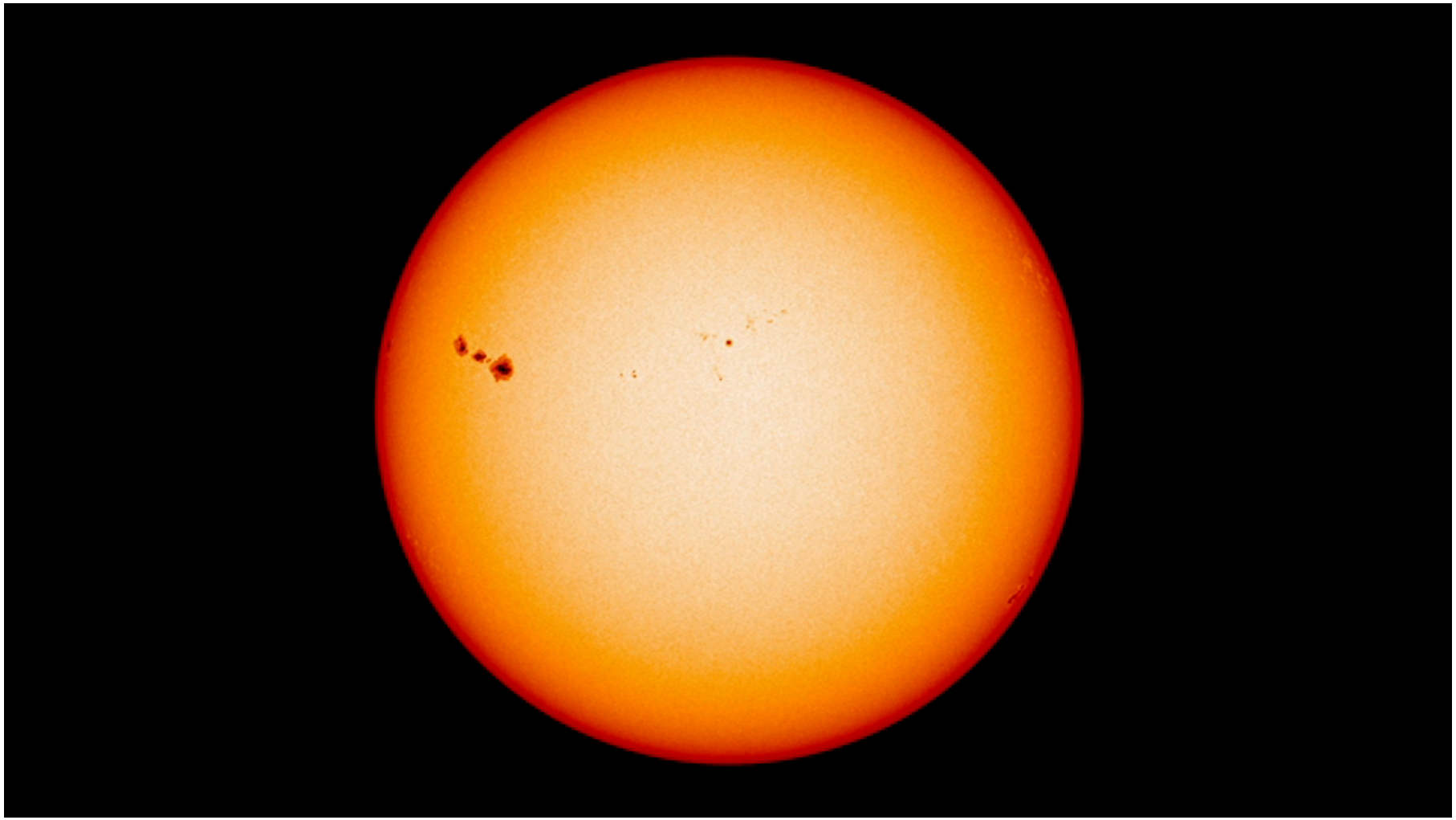
Solar South Pole

Magnetic South Pole
Positive/Outward

ELECTROMAGNETIC SPECTRUM

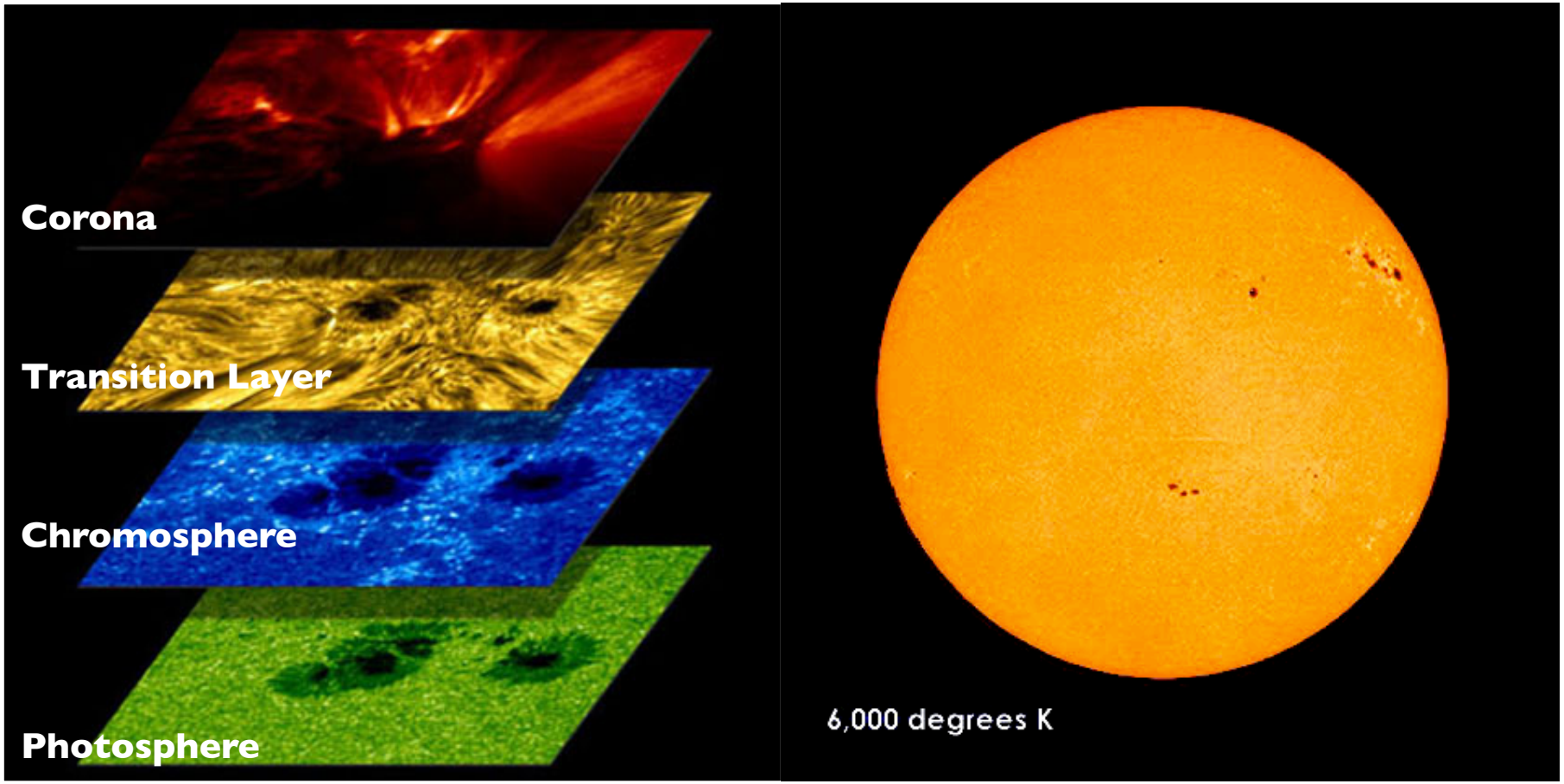


ELECTROMAGNETIC SPECTRUM

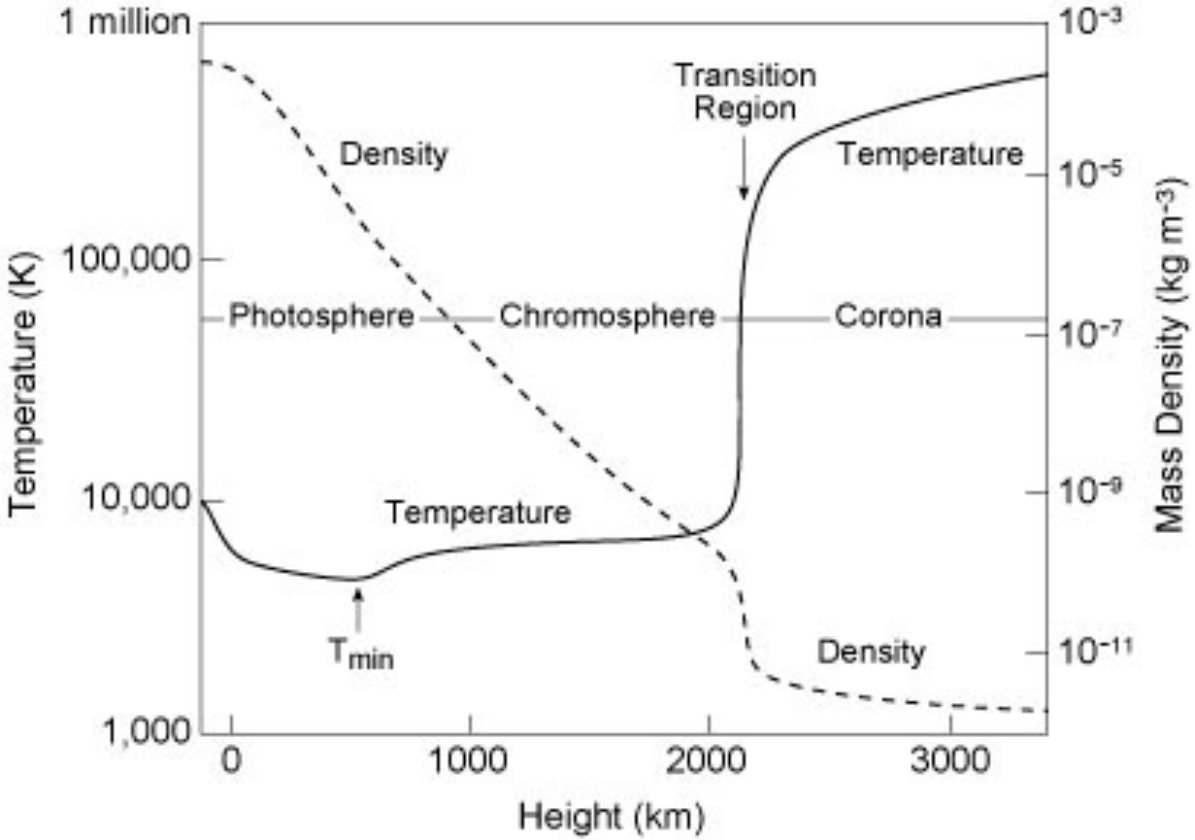


SDO/AIA

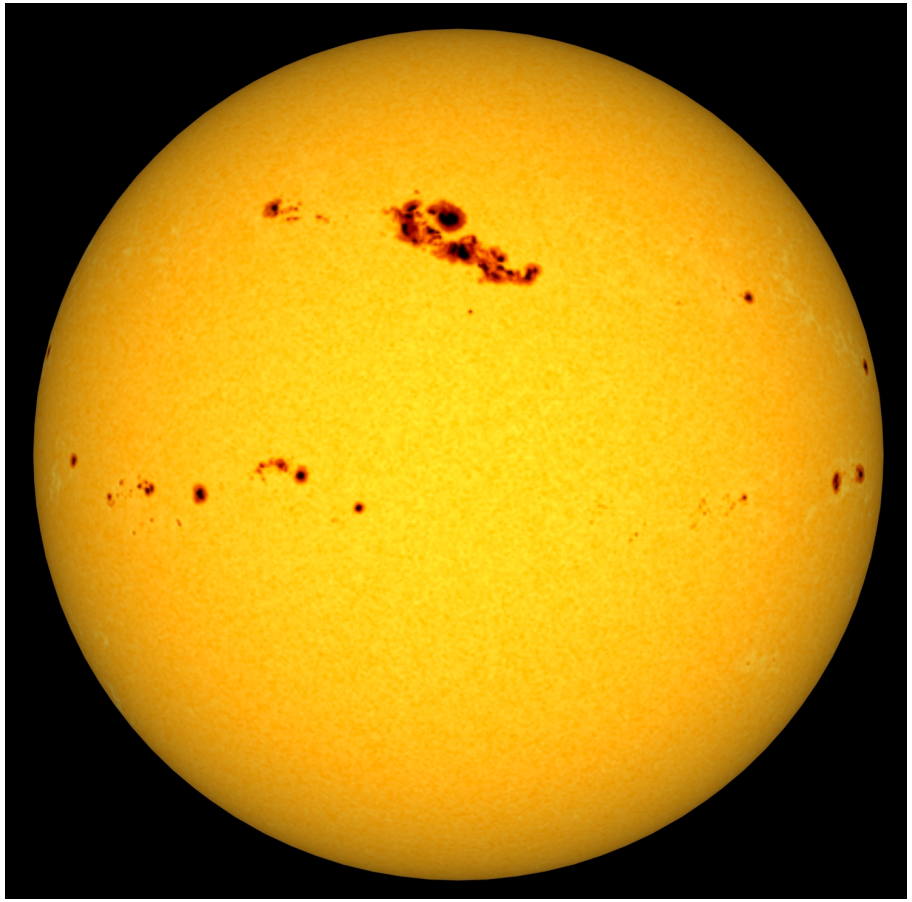
LAYERS OF THE SUN

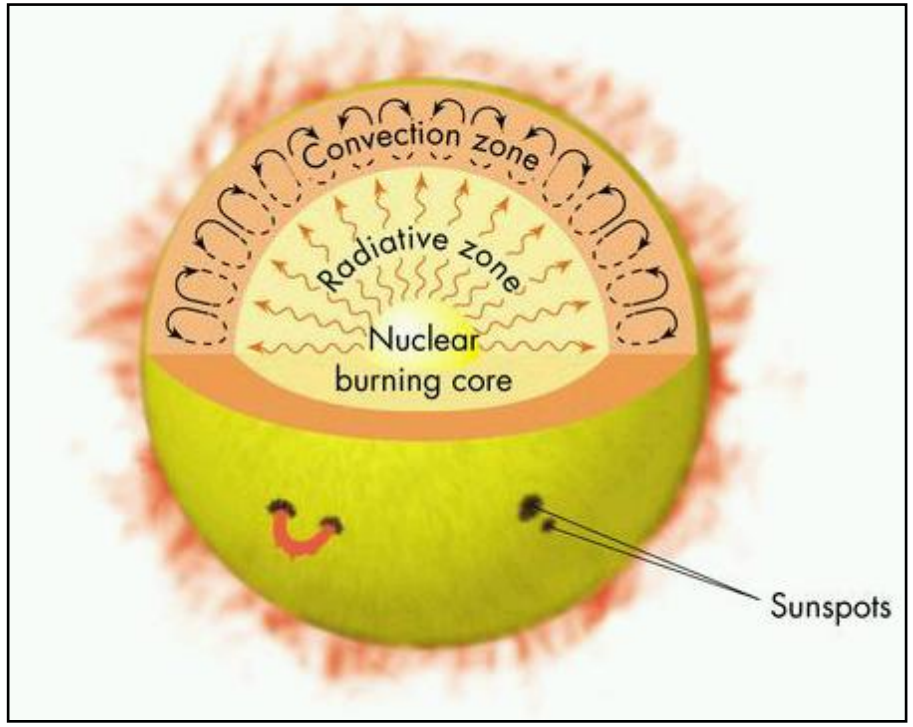


LAYERS OF THE SUN



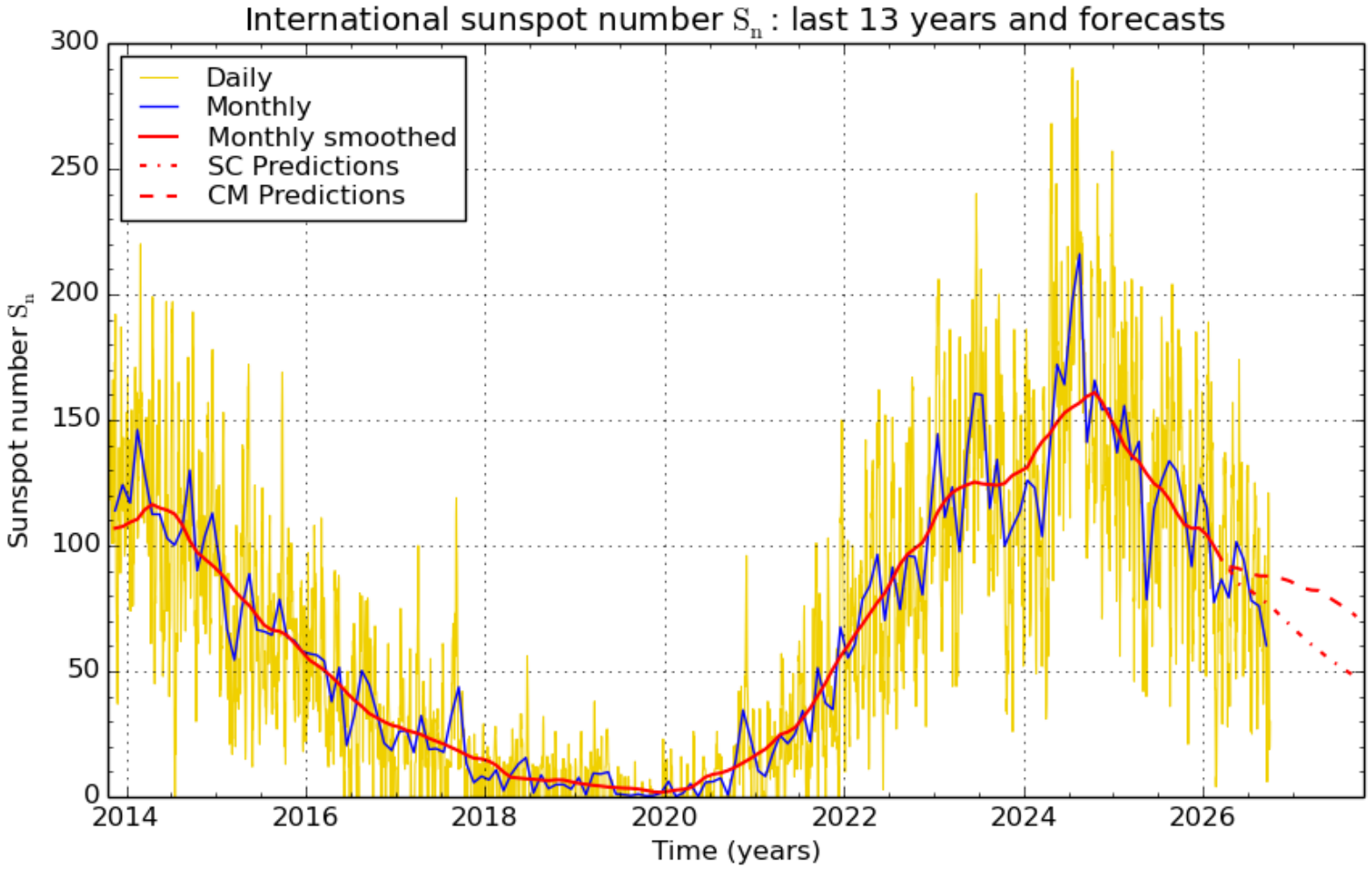
SUNSPOTS



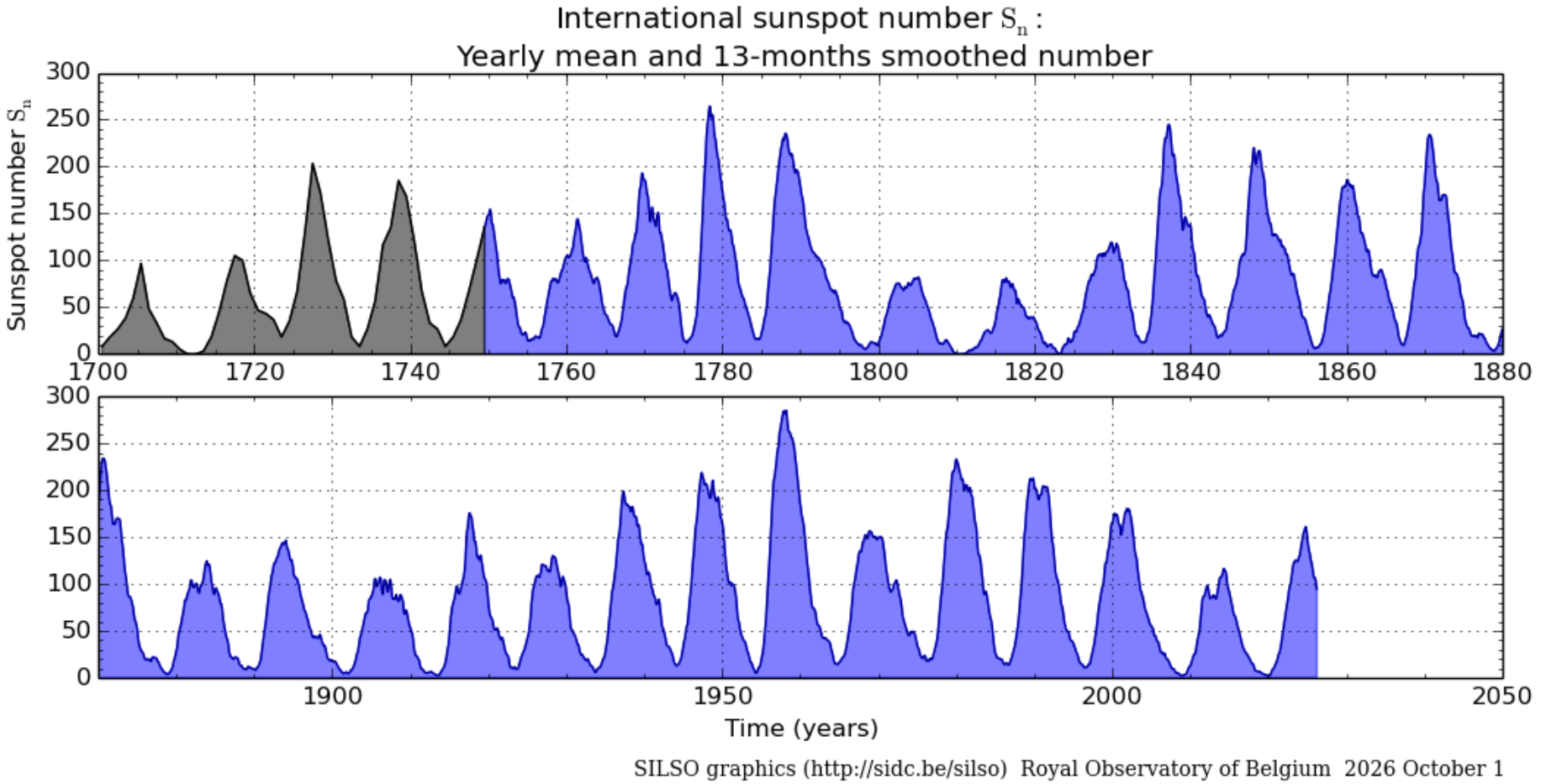

Convection zone
Radiative zone
Nuclear
burning core
Sunspots

SUNSPOT NUMBER AND SOLAR CYCLE

$$R = K\,(10g + s)$$



LONG TERM SOLAR ACTIVITY





SPACE WEATHER BRIEFING

Sneak preview

Elke D'Huys & Jennifer O'Hara

SIDC Space Weather Briefing

29 December 2025-04 January 2026

Jennifer O'Hara

& the SIDC forecaster team

Royal Observatory
of Belgium

Solar Influences
Data analysis Centre
www.sidc.be

Summary Report

Solar activity from 2025-12-29 00:00 to 2026-01-04 23:59

Active regions	18 numbered regions over the week, most active were SIDC Sunspot Group 744 (NOAA AR4324) and SIDC Sunspot Group 745 (NOAA AR4325)
Flares	# C-class flare: 35 # M-class flare: 2 # X-class flare: 0
Coronal Holes	Negative polarity CH and a small positive polarity CH transited central meridian
CMEs	3 CMEs with possible Earth directed components observed

Proton flux	Below 10 pfu threshold
Electron flux	Above 1000 Pfu threshold, moderate fluence

Solar wind and geomagnetic conditions

ICMEs	ICME signatures on January 03 - 04
Solar wind conditions	|B|: 1.04 - 12.28 nT //Bz: -8.87 nT to 11.53 nT //Speed: 321.5 – 700.0km/s
Geomagnetic conditions	max KBel: 4.0, max Kp(NOAA): 5.0, Minor Storm conditions

All Quiet Alert: Not quiet

Solar Activity

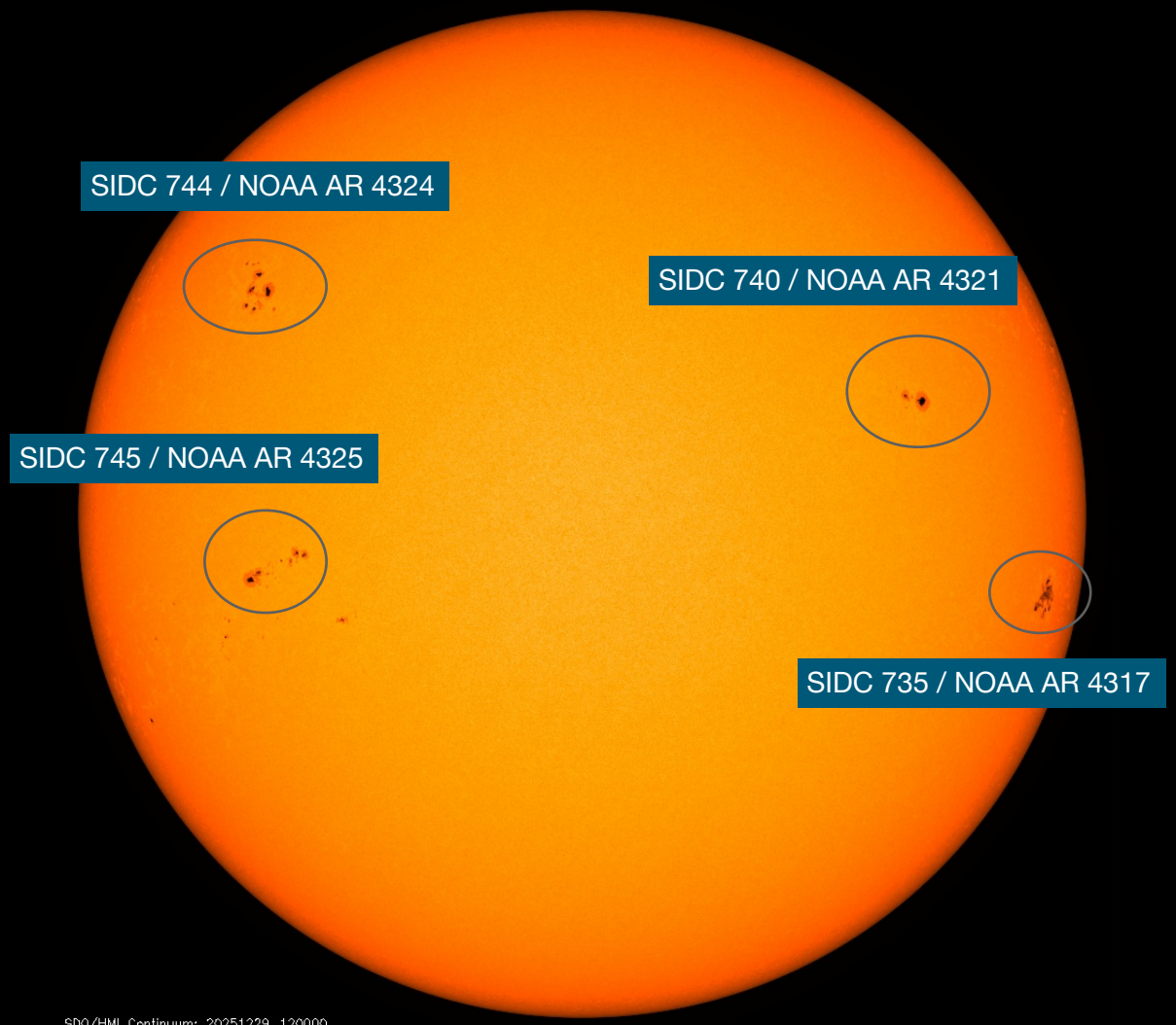


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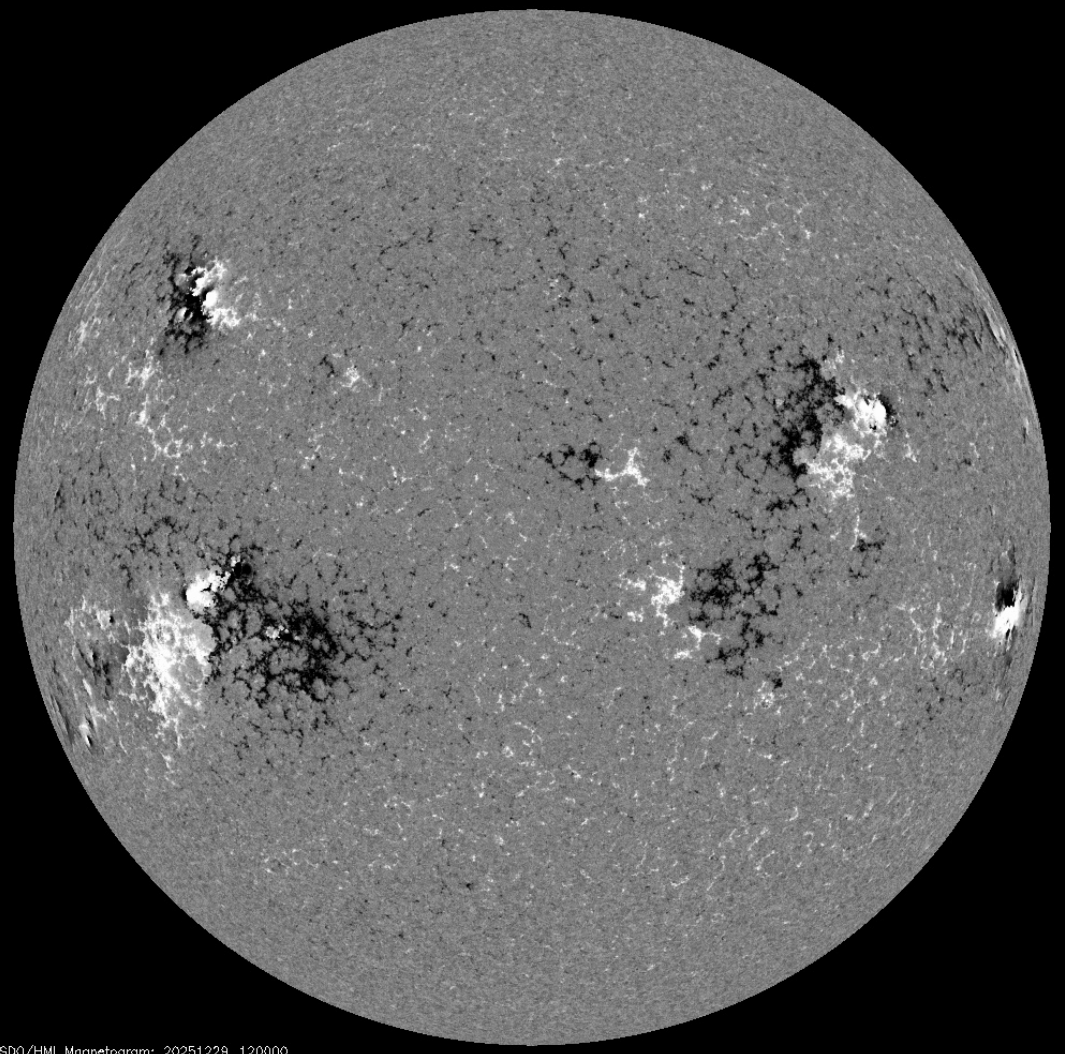
Solar Influences
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Solar active regions

SDO/HMI White Light 2025-12-29

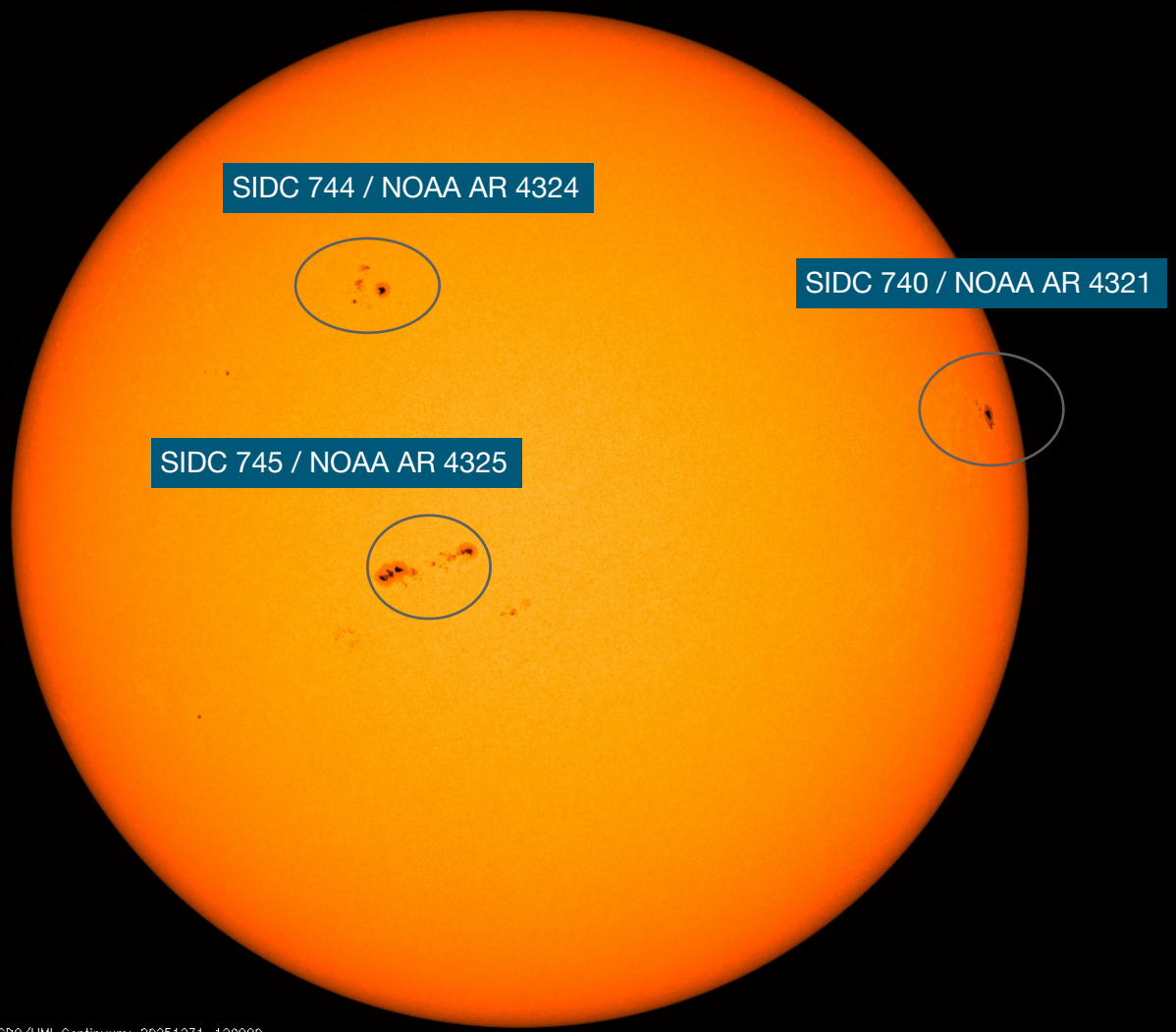


SDO/HMI Magnetogram 2025-12-29

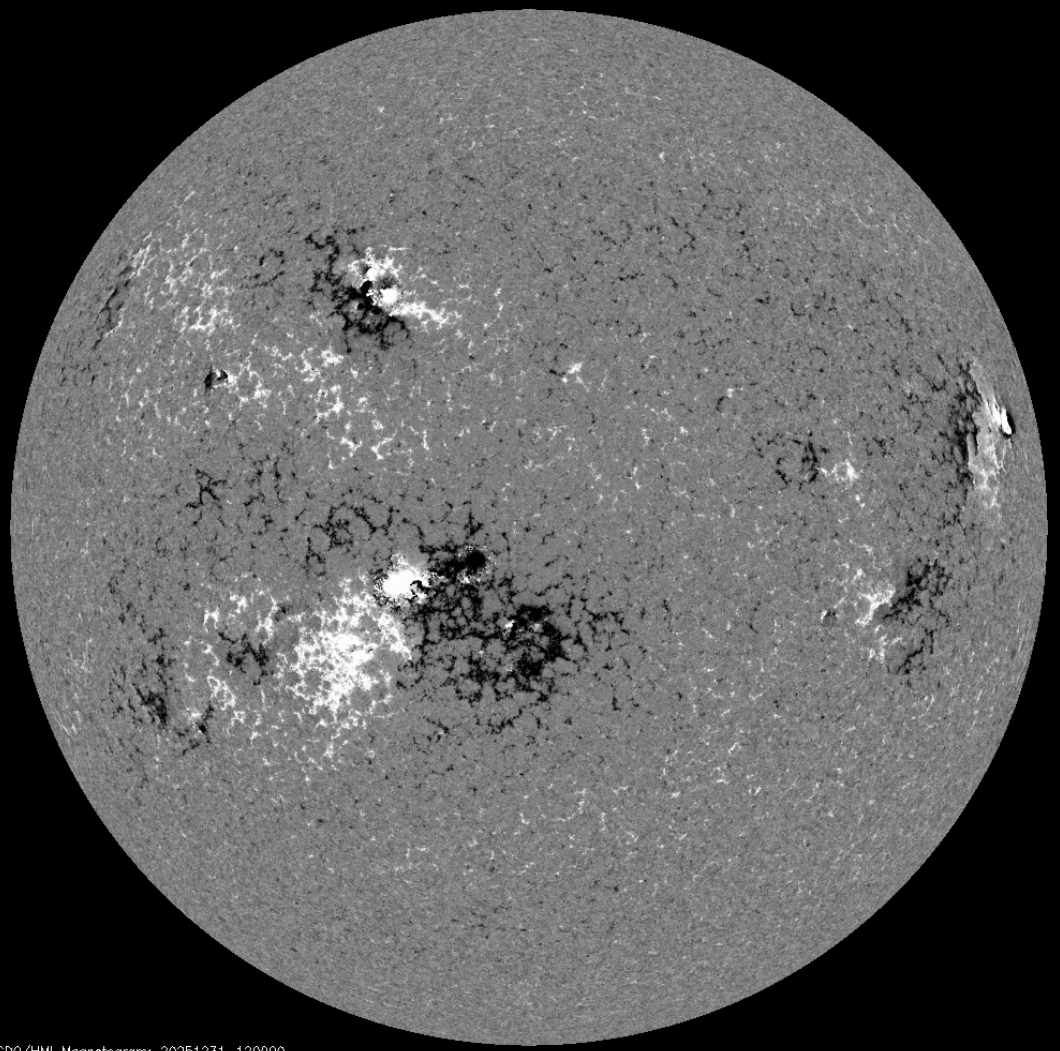


Solar active regions

SDO/HMI White Light 2025-12-31

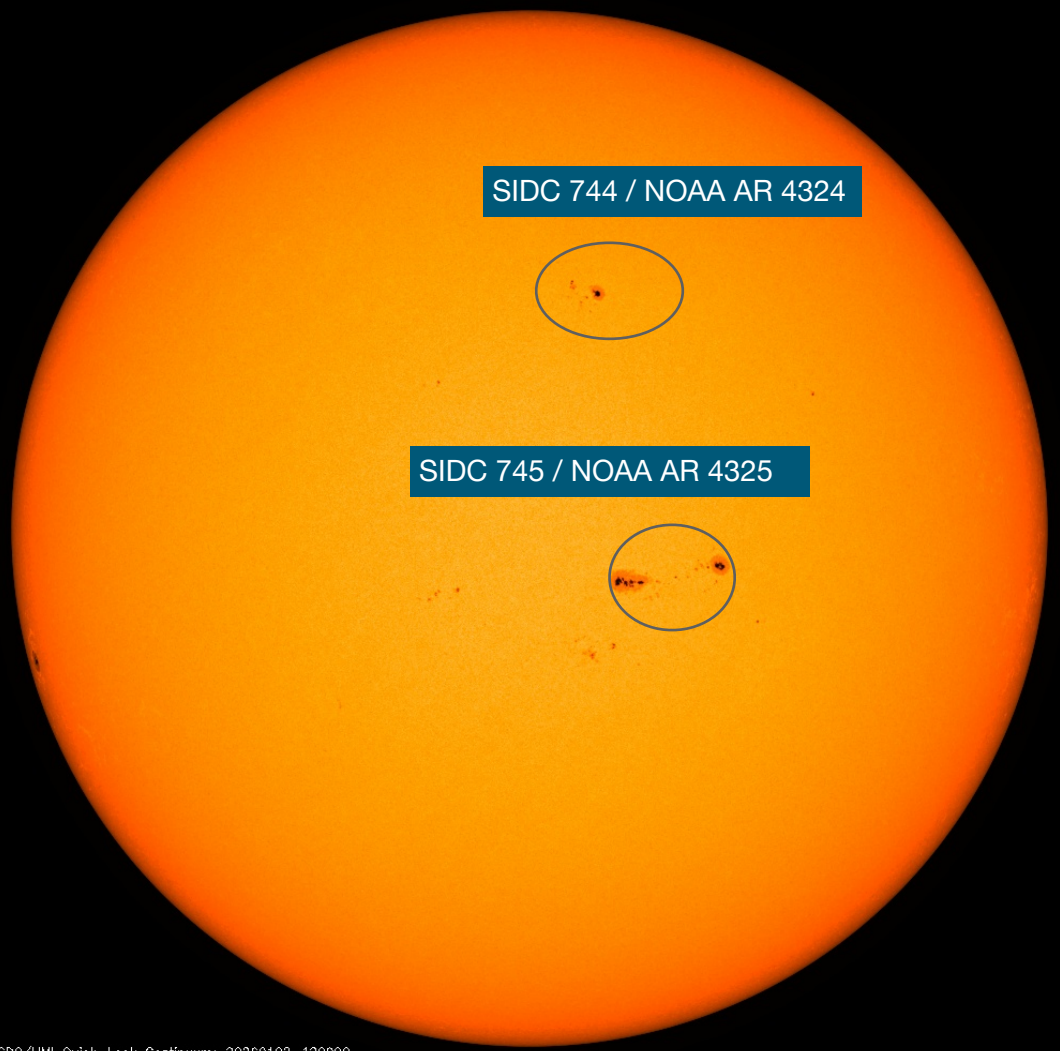


SDO/HMI Magnetogram 2025-12-31

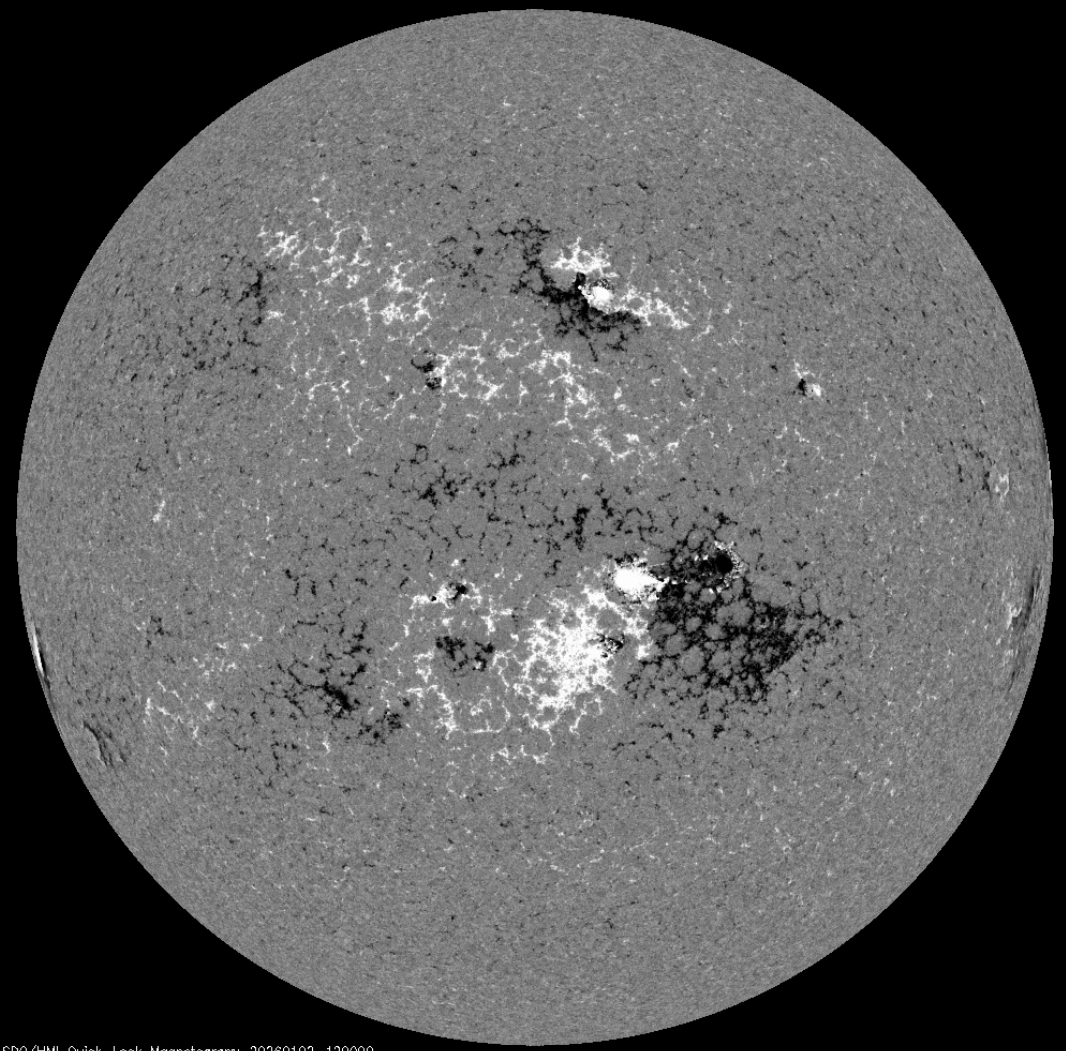


Solar active regions

SDO/HMI White Light 2026-01-02

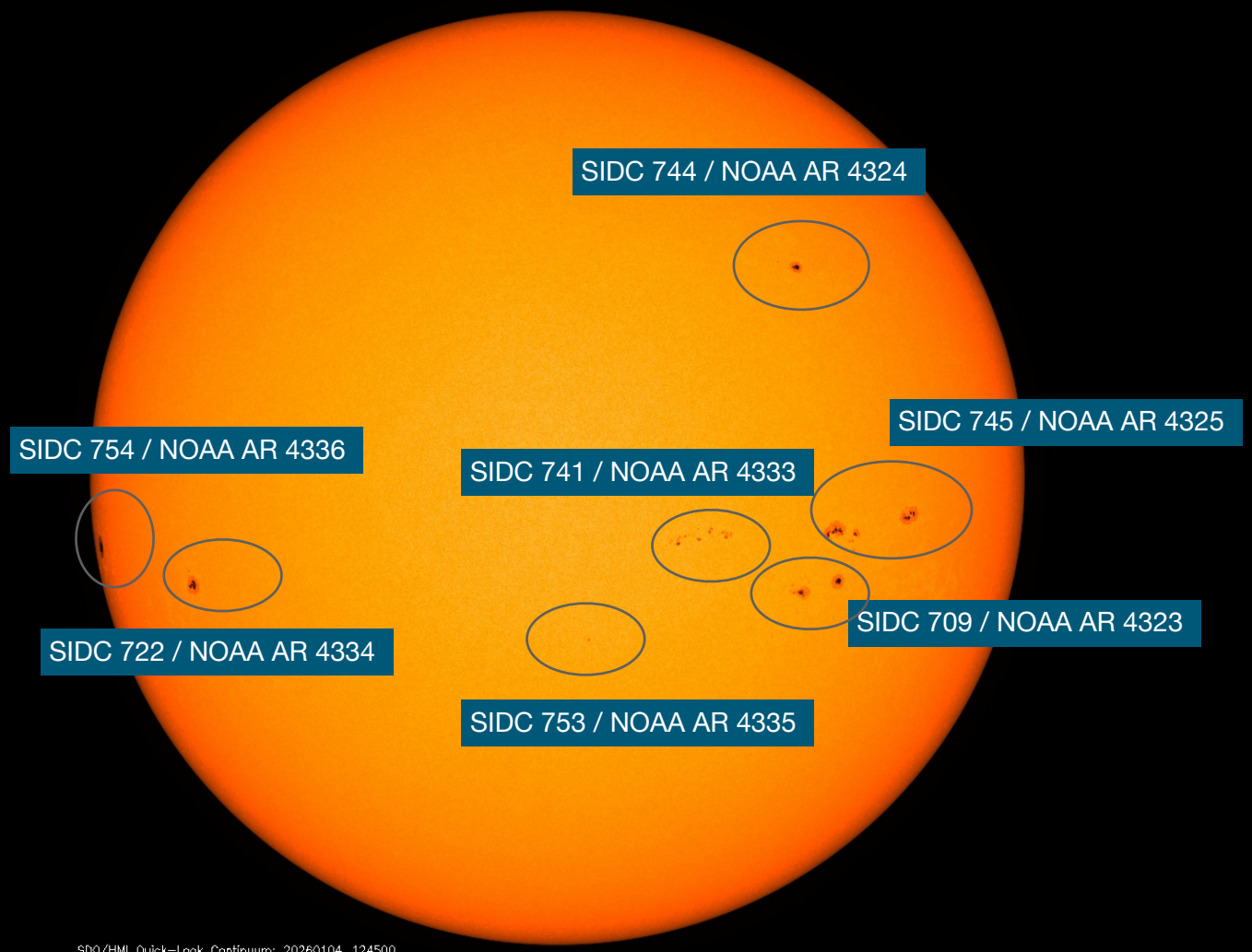


SDO/HMI Magnetogram 2026-01-02

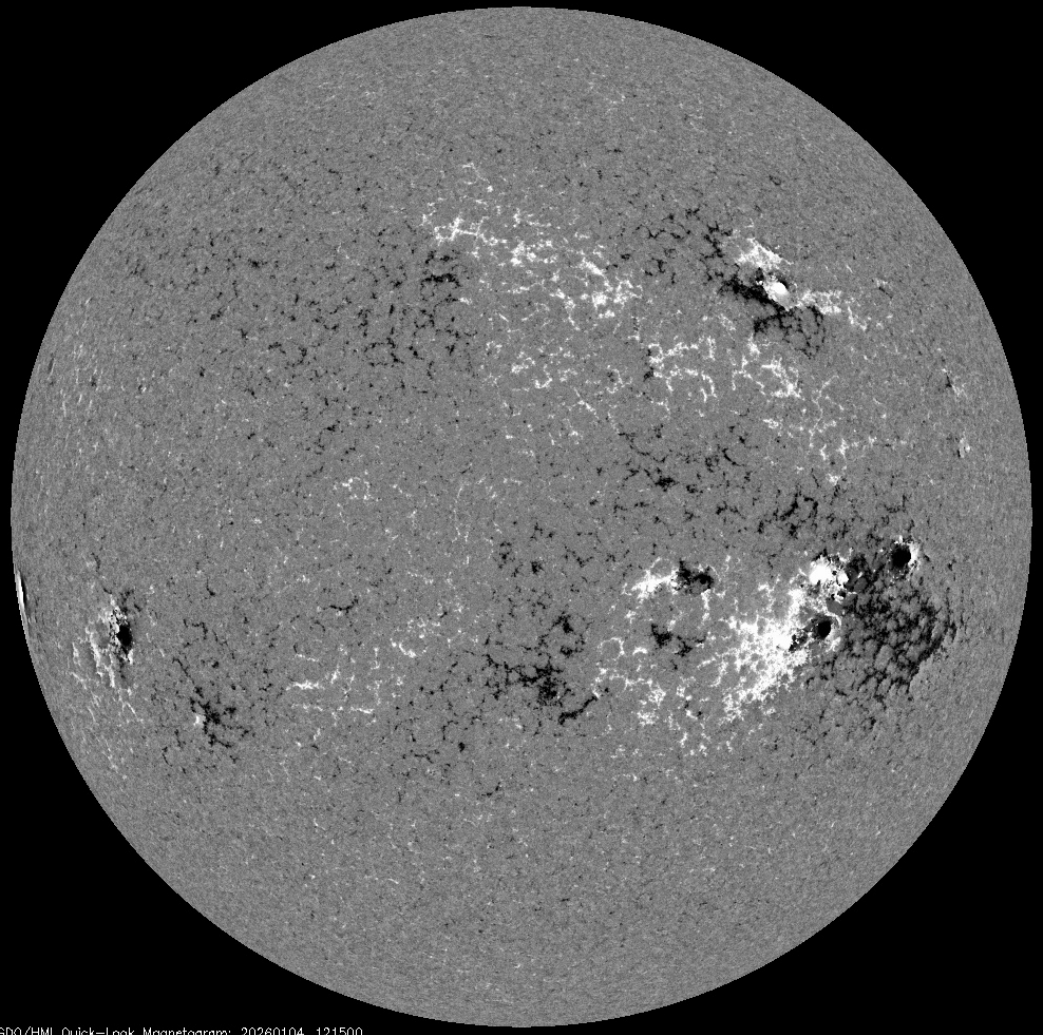


Solar active regions

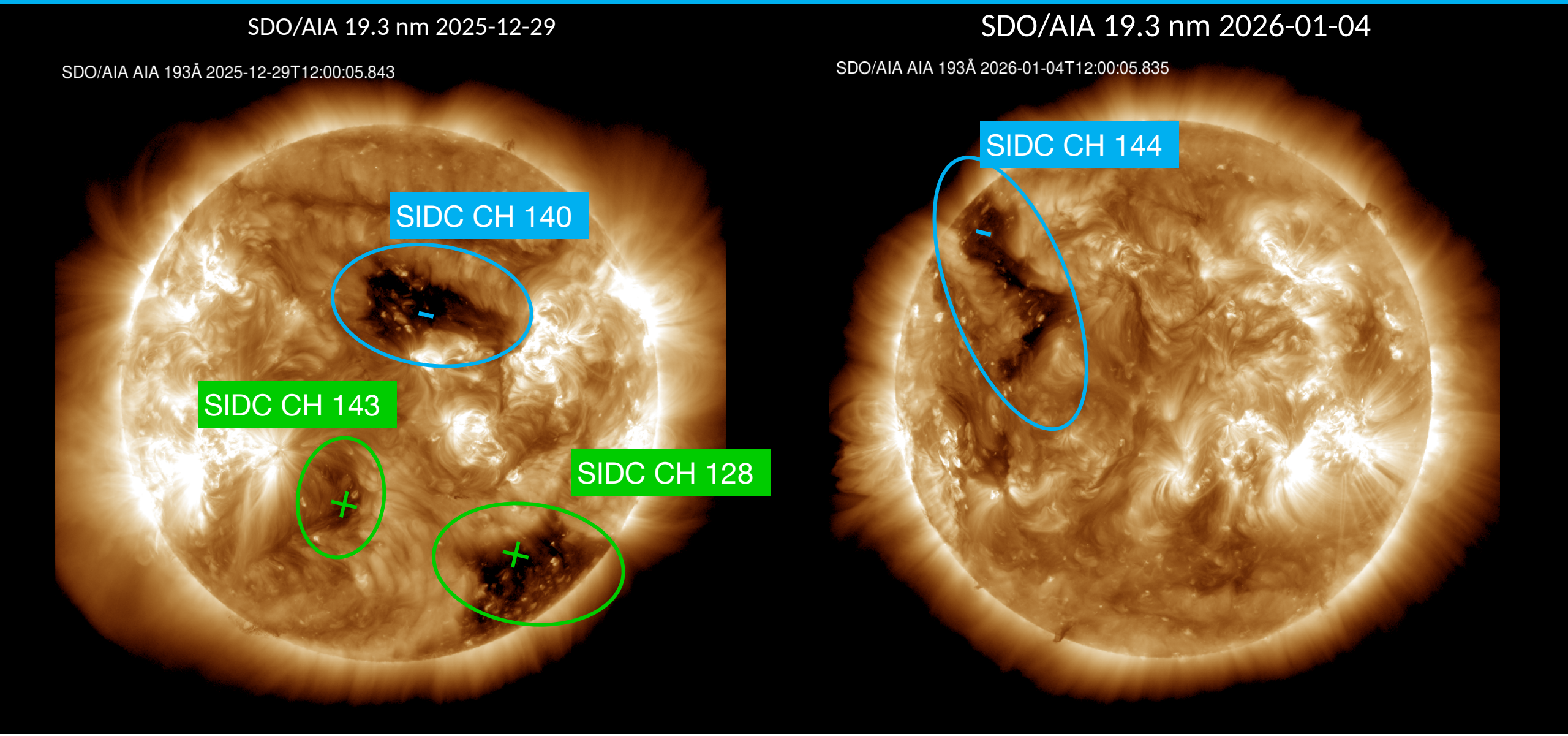
SDO/HMI White Light 2026-01-05



SDO/HMI Magnetogram 2026-01-05

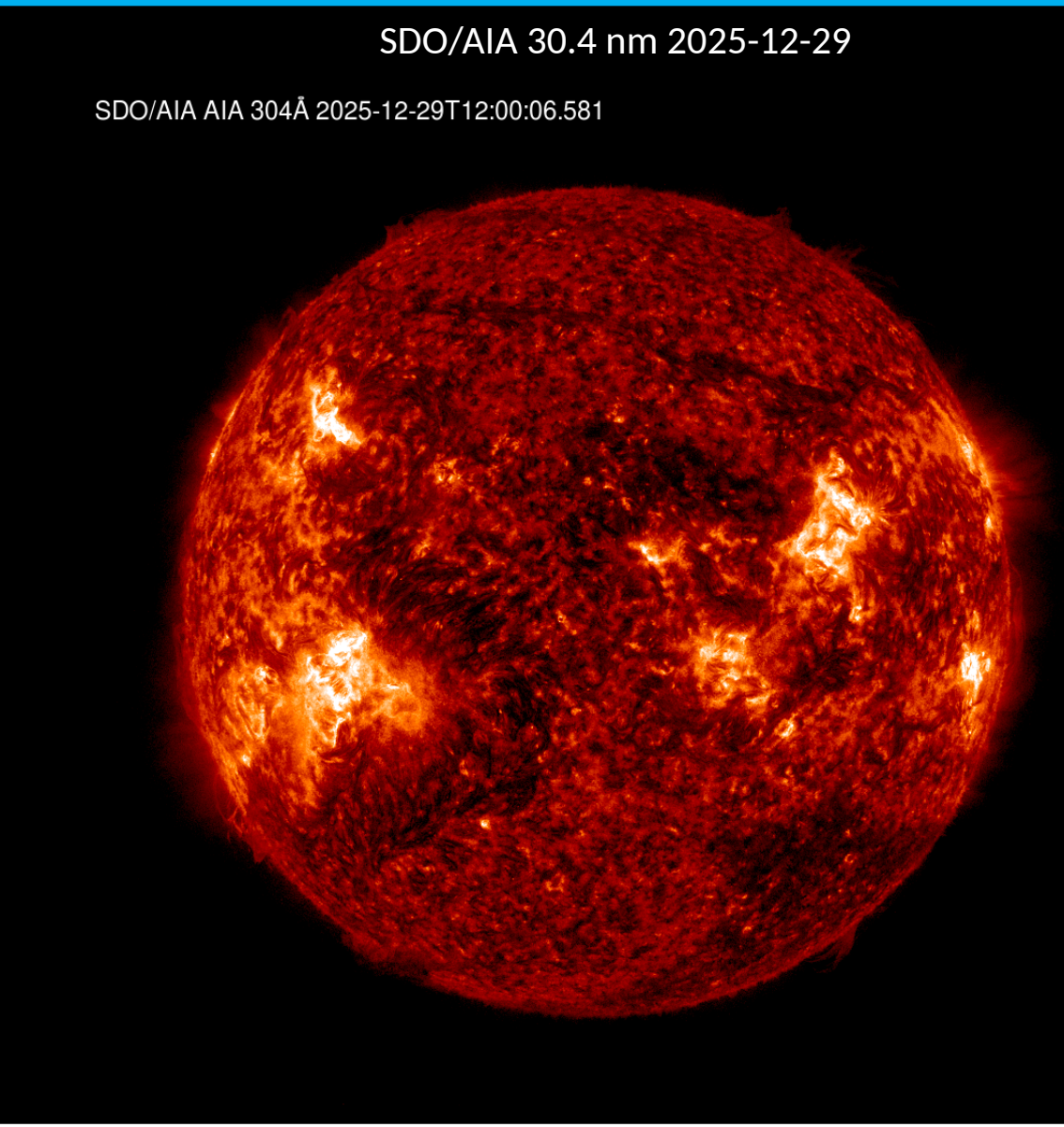


Coronal holes

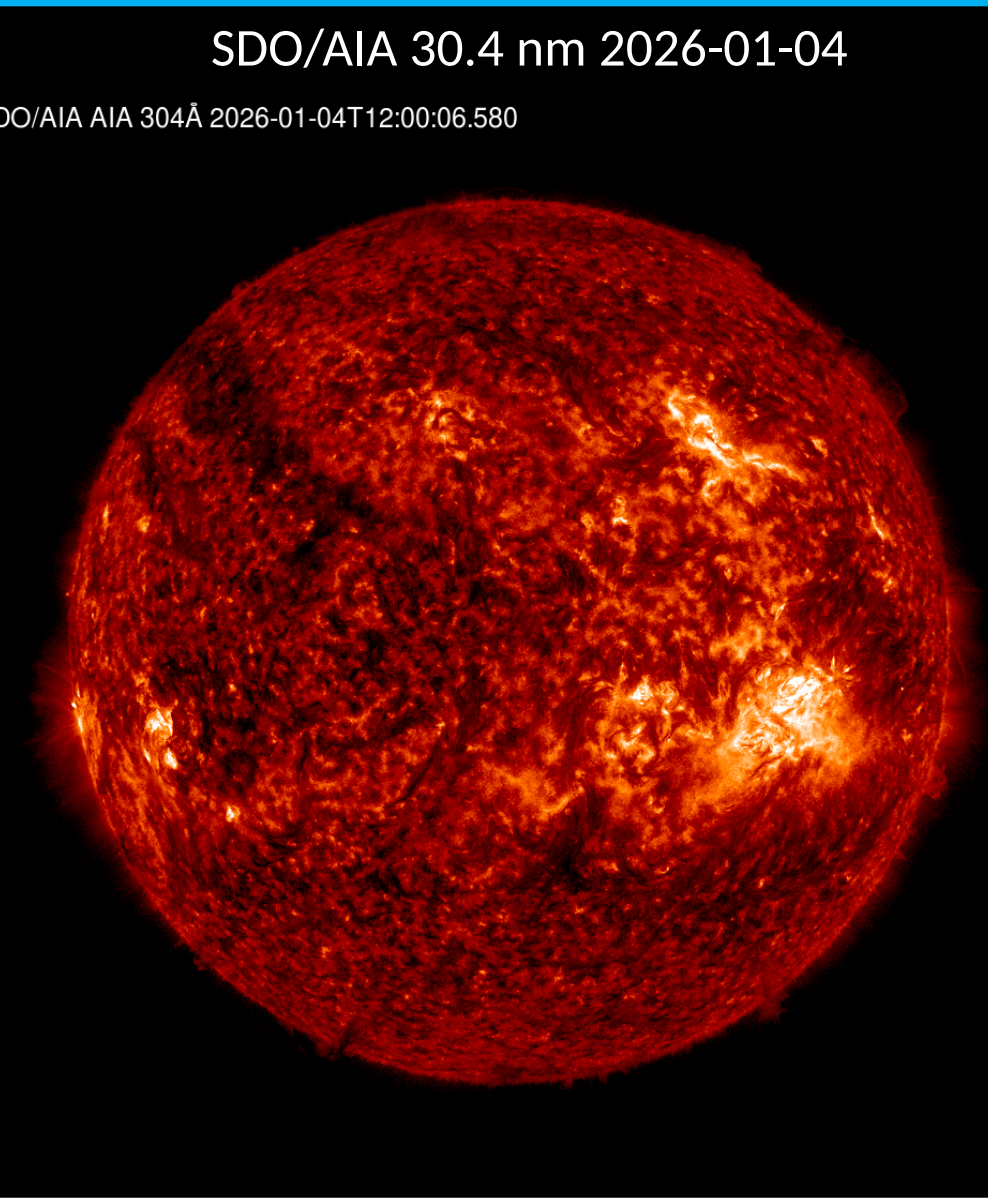


Filaments

SDO/AIA 30.4 nm 2025-12-29

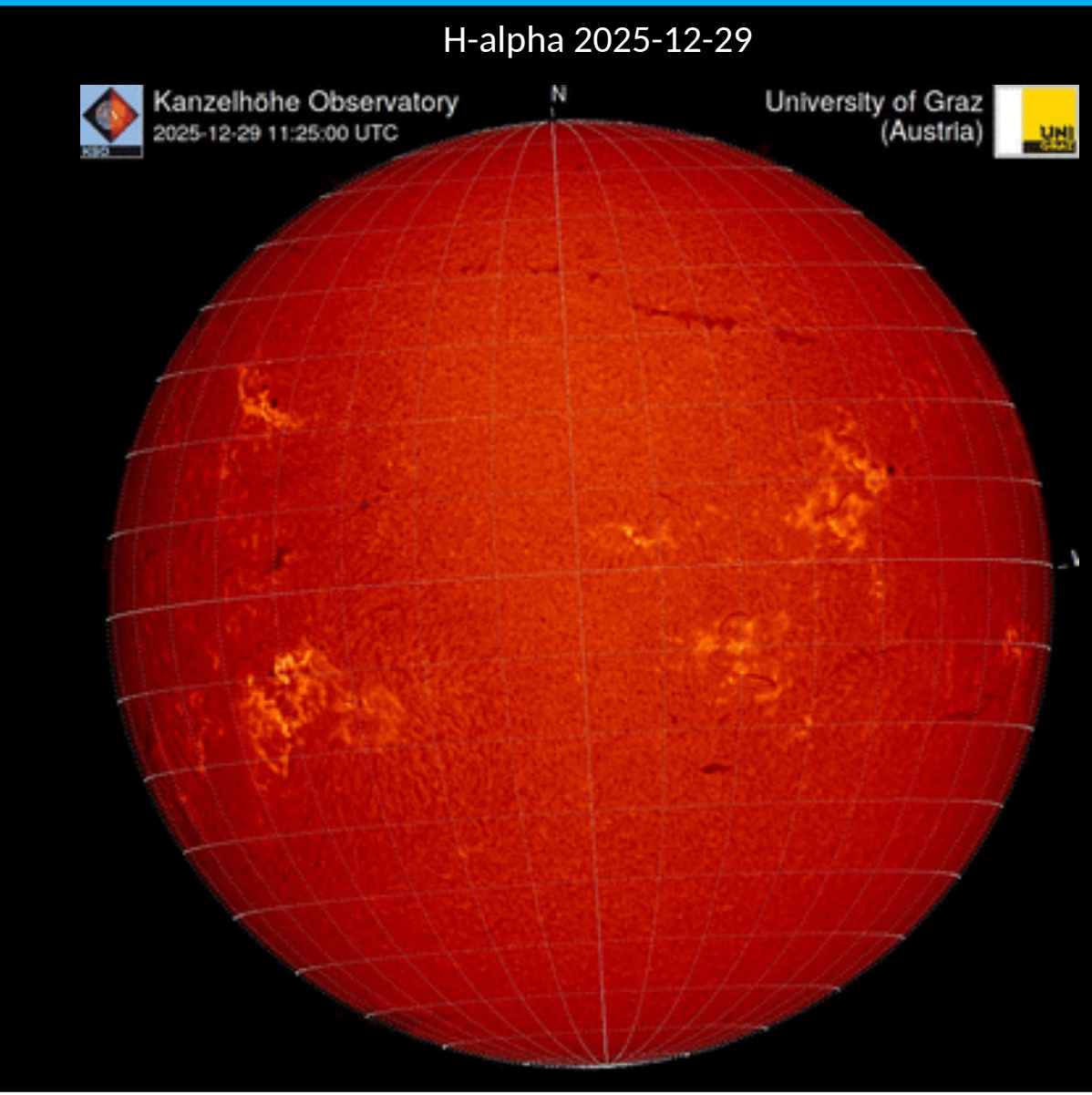


SDO/AIA 30.4 nm 2026-01-04

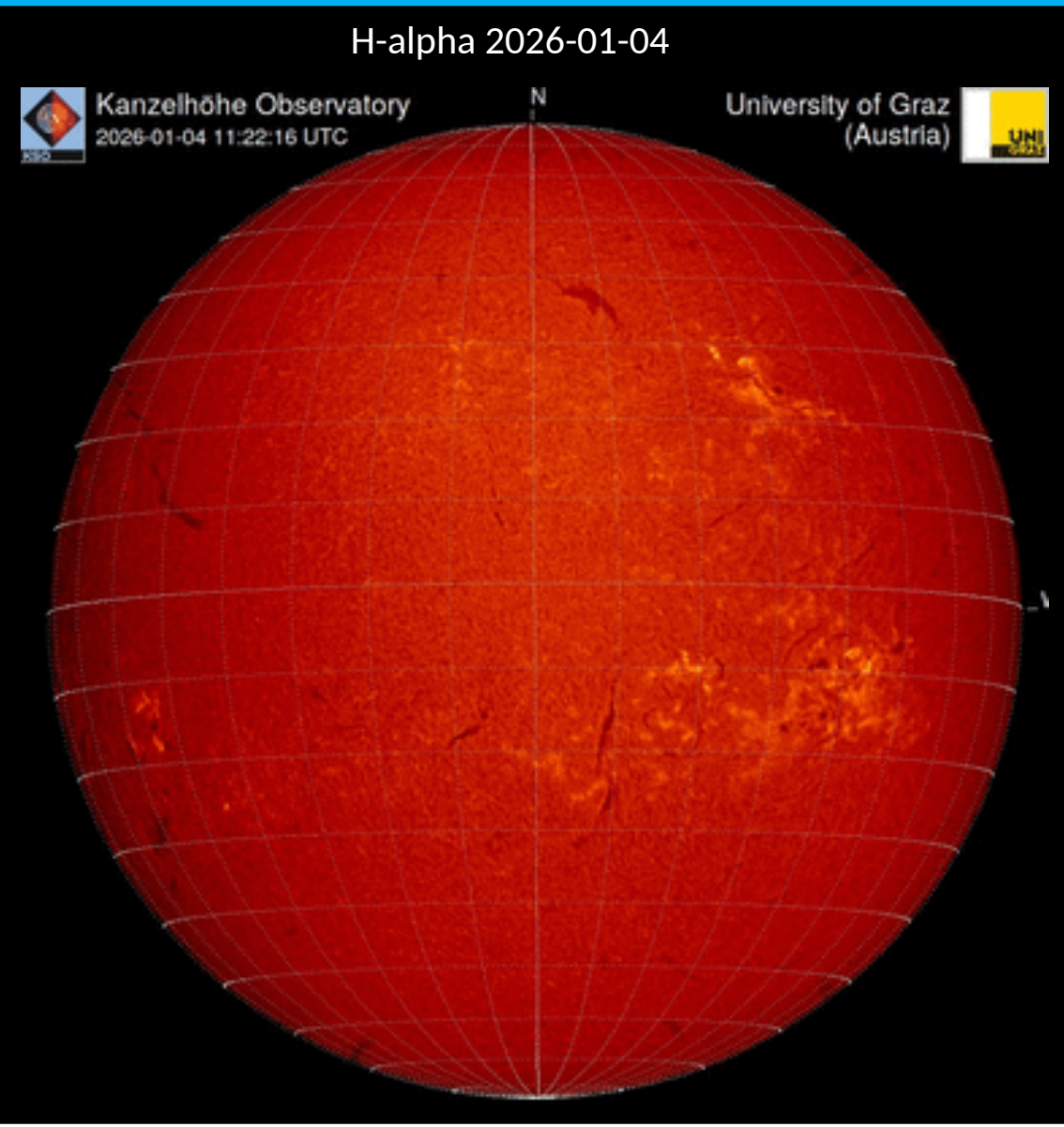


Filaments & Filament eruptions

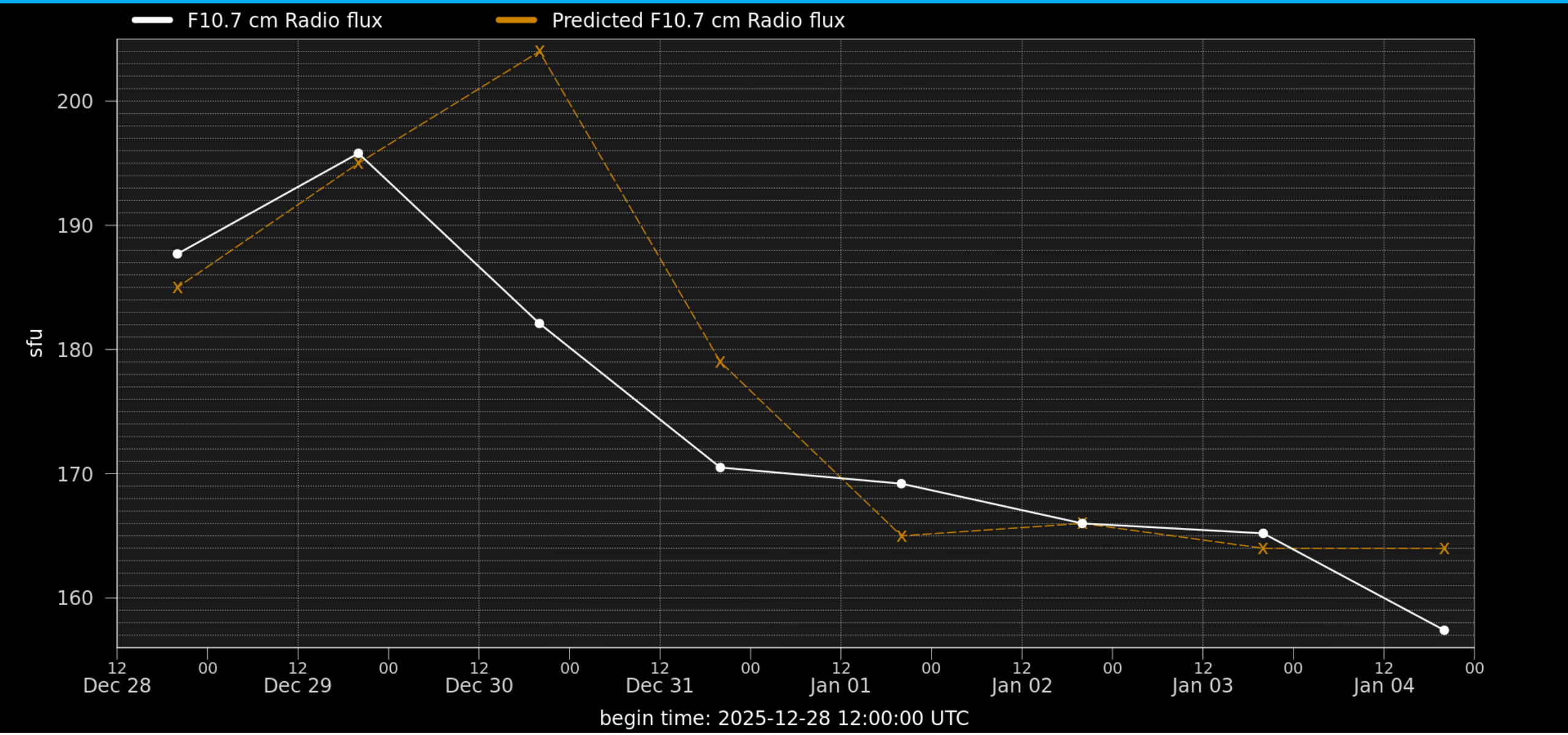
H-alpha 2025-12-29



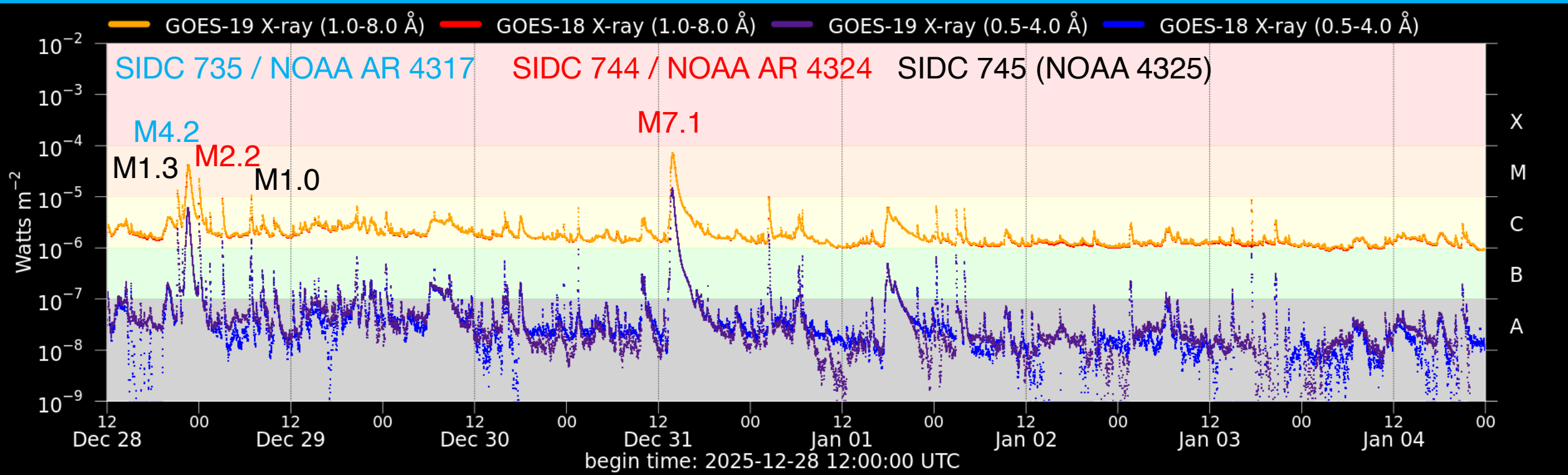
H-alpha 2026-01-04



Solar F10.7cm radio flux



Flaring activity

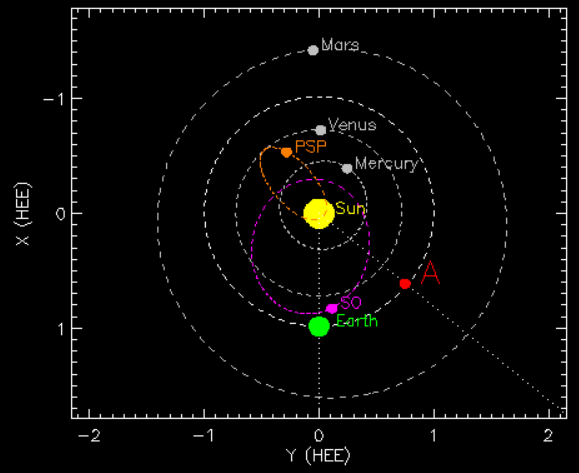


Probabilities (%) and occurrences (#) of C/M/X-flares daily, from noon to noon:

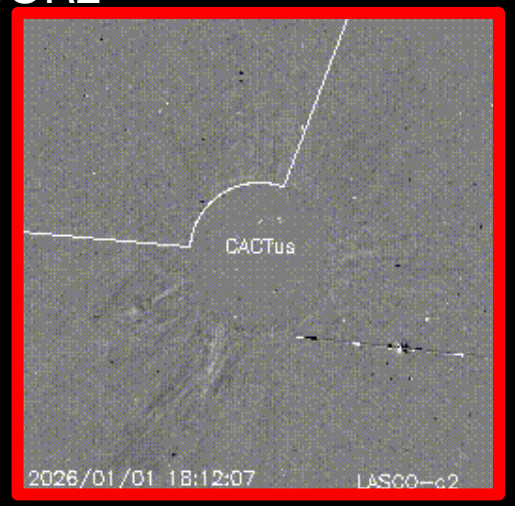
Issue date	2025-12-28	2025-12-29	2025-12-30	2025-12-31	2026-01-01	2026-01-02	2026-01-03	2026-01-04
Probability (%)	90|49|25	99|80|15	99|75|15	99|55|10	99|69|10	99|60|10	99|60|05	99|60|05
Observed (#)	07|04|00	06|00|00	05|00|00	04|01|00	06|00|00	02|00|00	04|00|00	01|00|00

Coronal Mass Ejections

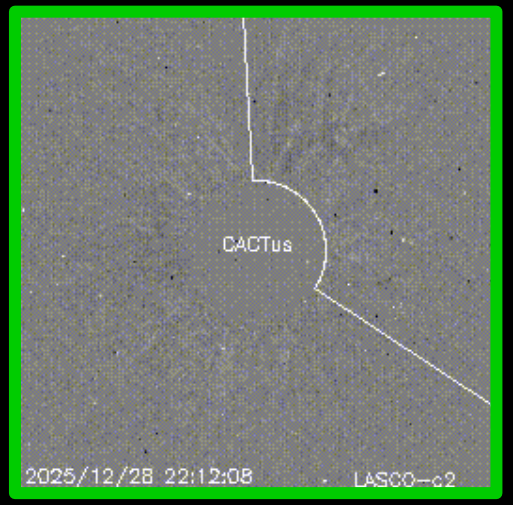
3 CMEs with Possible Earth Directed components: observed from SOHO/LASCO-C2 and STEREO-A/COR2



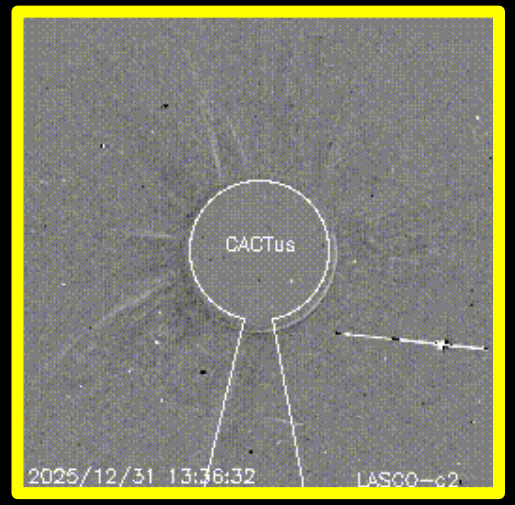
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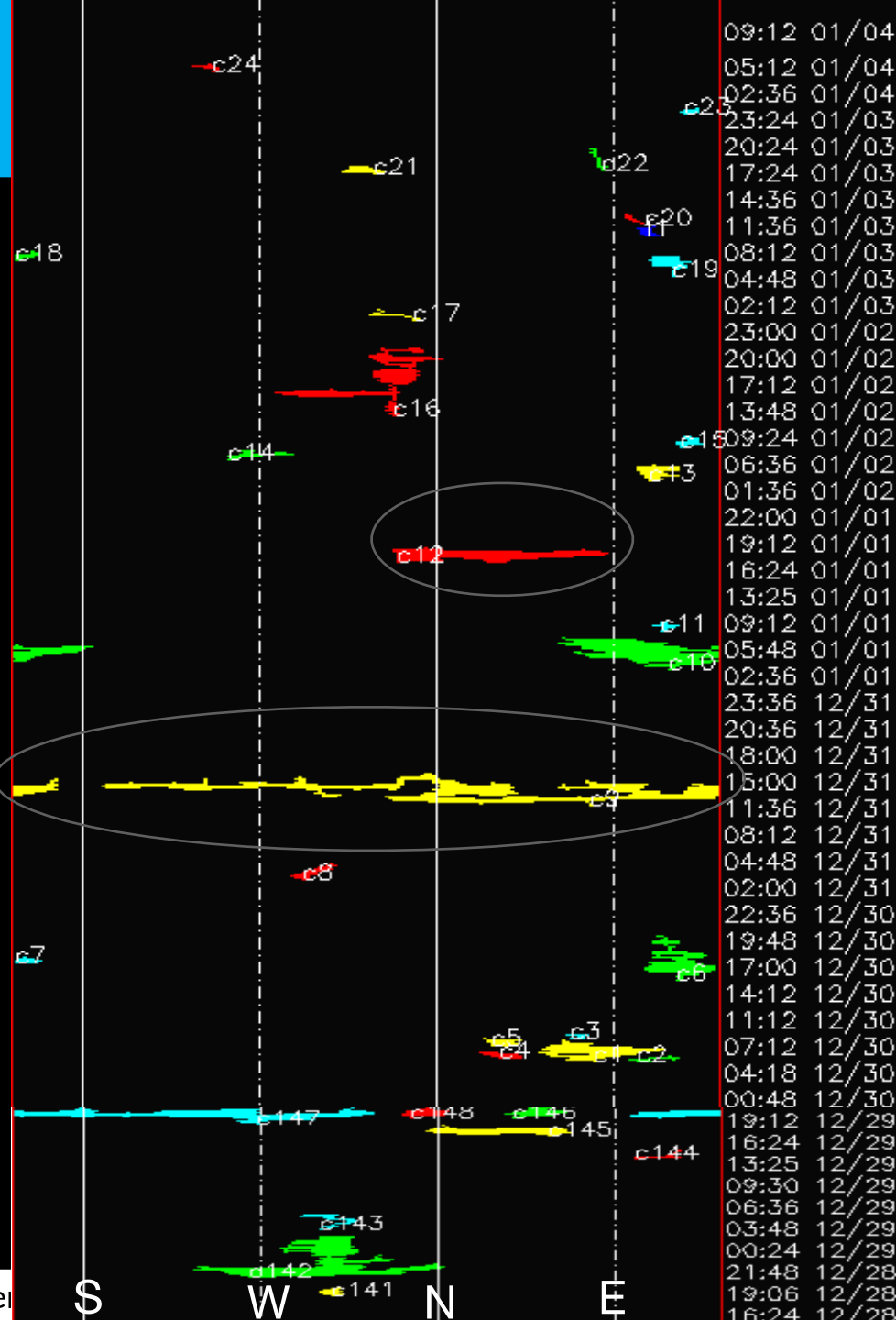


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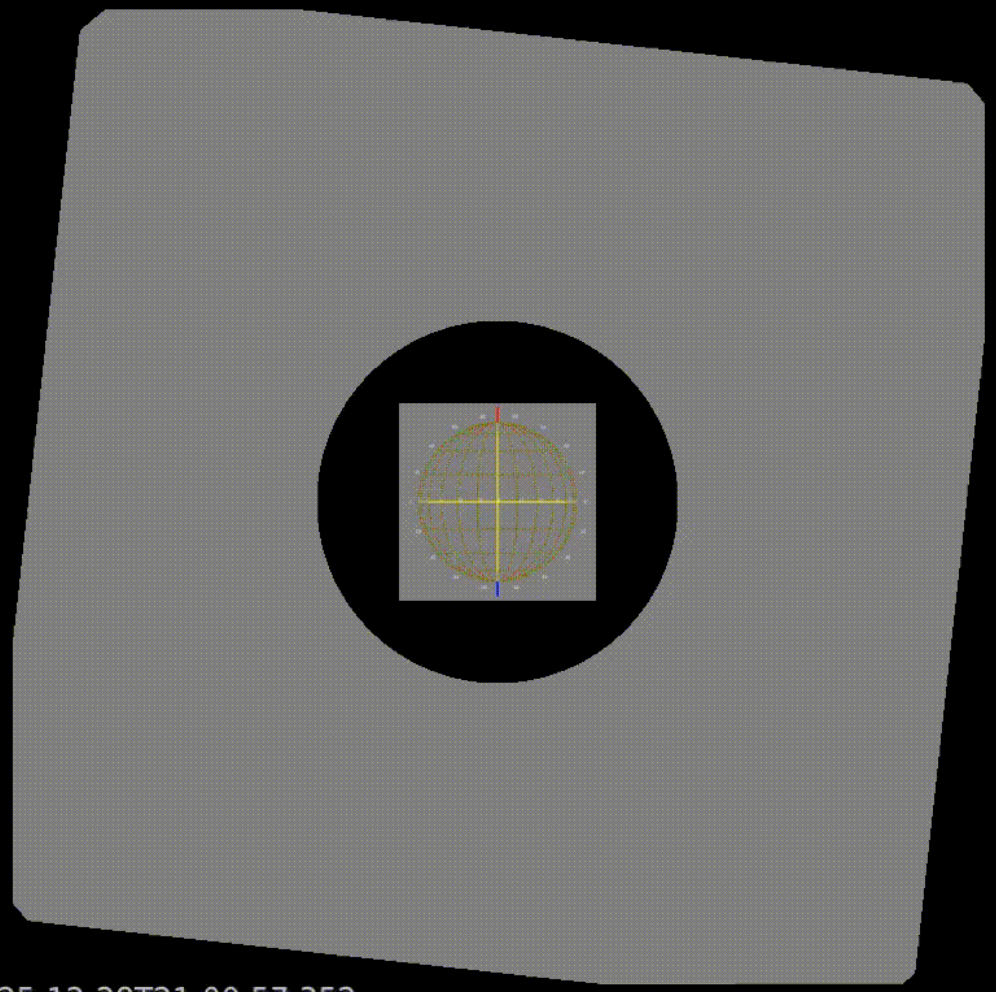




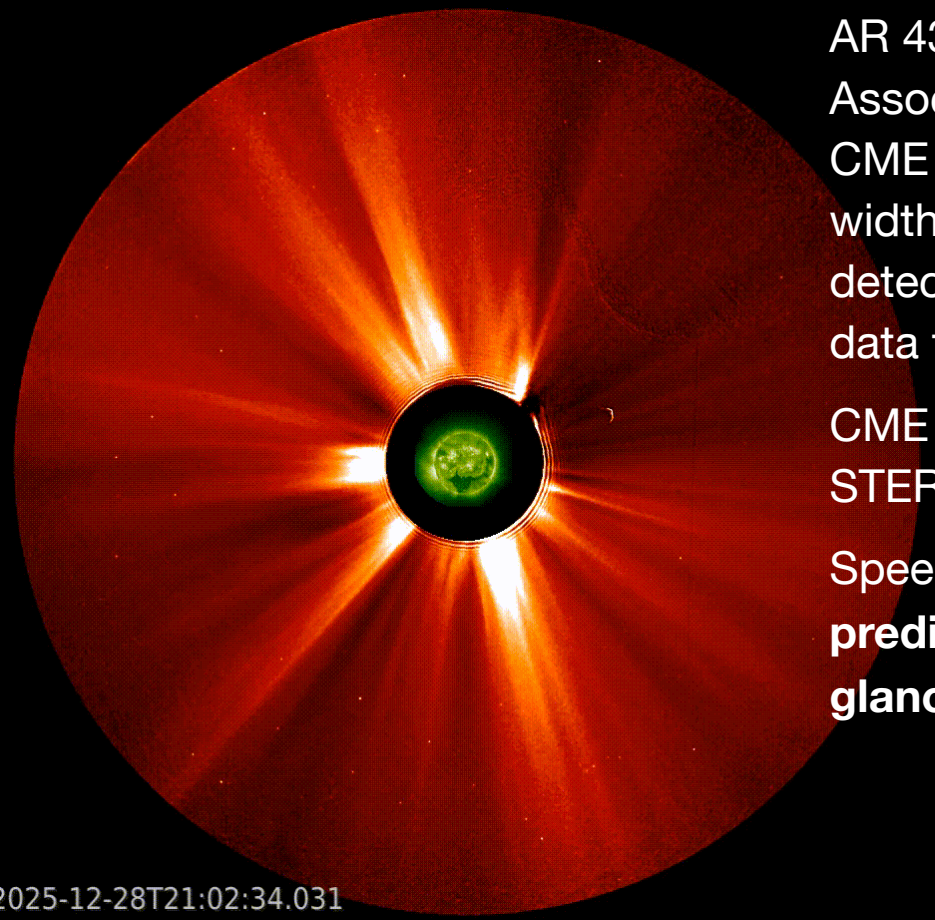
Coronal Mass Ejections

CME 1 Dec 28:

SOHO/LASCO-C2



STEREO-A/COR2



Associated with an M4.2 flare (SIDC Flare 6518) on December 28 at 22:39 UTC, SIDC SG735 (NOAA AR 4317).
Associated dimming.
CME to north-west, with a width of 120 degrees, was detected in LASCO-C2 data from 23:00 UTC.

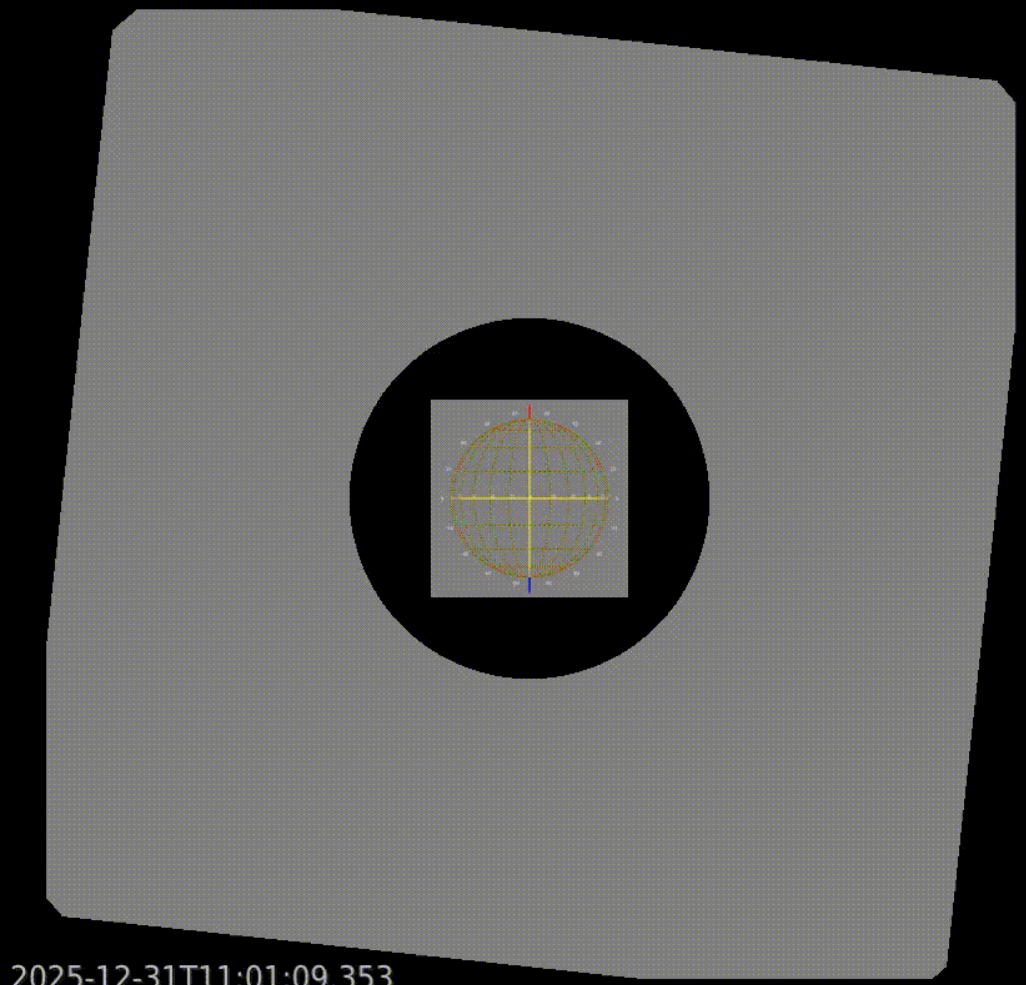
CME to north-east in STEREO A.

Speed around 450 km/s **predicted possible glancing blow on Jan 01.**

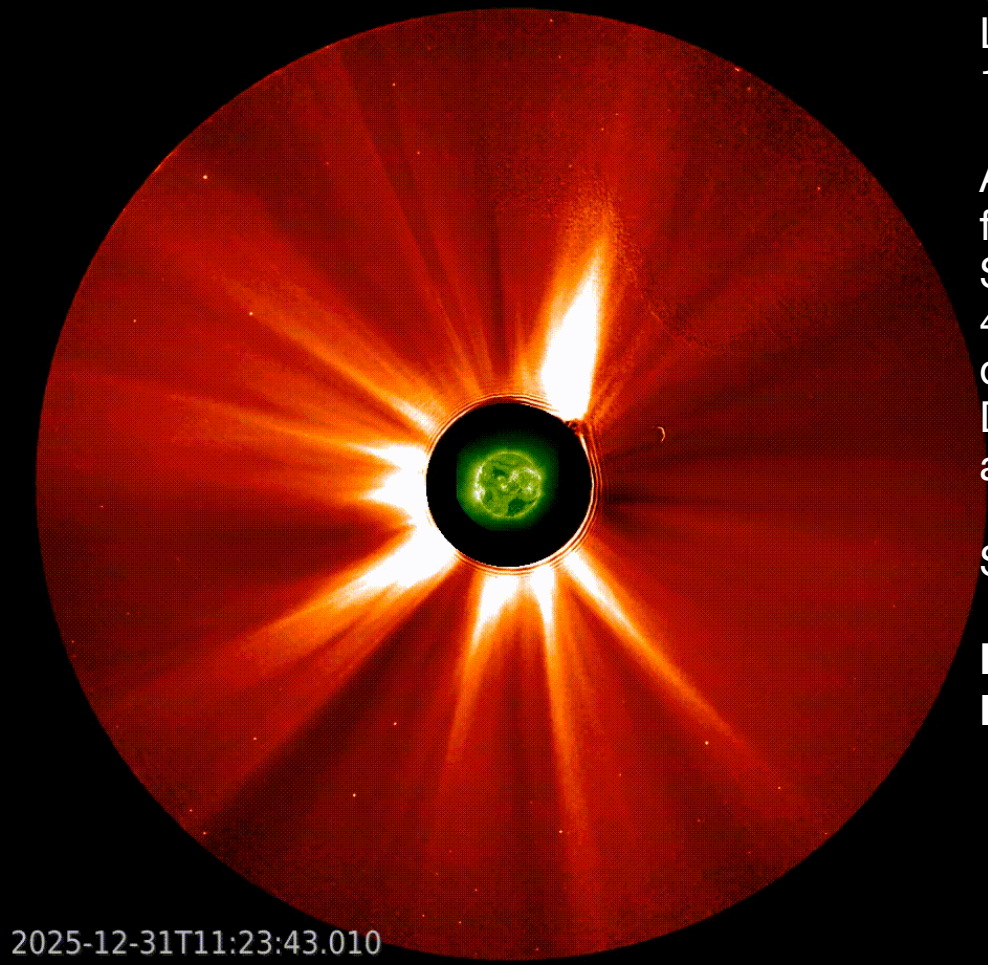
Coronal Mass Ejections

CME 2 Dec 31:

SOHO/LASCO-C2



STEREO-A/COR2



A partial halo, north-east, was observed in LASCO-C2 data from 14:12 UTC on Dec 31.

Associated with M7.1 flare at 13:51 UTC from SIDC SG 744 (NOAA AR 4324) in the north-east quadrant.
Dimming and Type II and IV radio emission ,

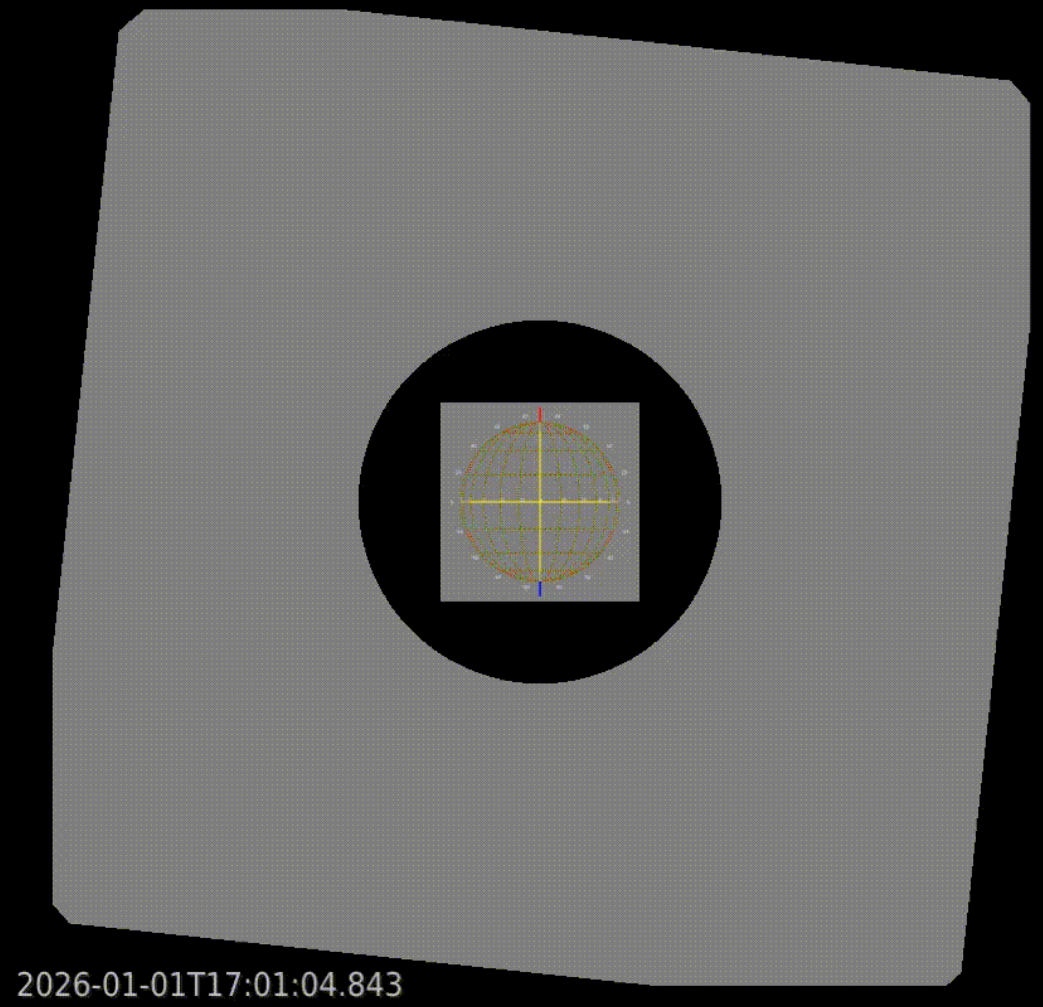
Speed around 800 km/s

Predicted to arrive at Earth early Jan 03.

Coronal Mass Ejections

CME 3 on January 01/02:

SOHO/LASCO-C2



A partial halo CME directed to the north-east . First seen in LACSCO-C2 data from 18:48 UTC on January 01.

Associated with the C6.2 flare from SIDC SG 744 (NOAA AR 4324), with peak time 17:59 UTC.

Speed around 530 km/s.

Predicted possible glancing blow early Jan 05.

Solar Wind and Geomagnetic Activity



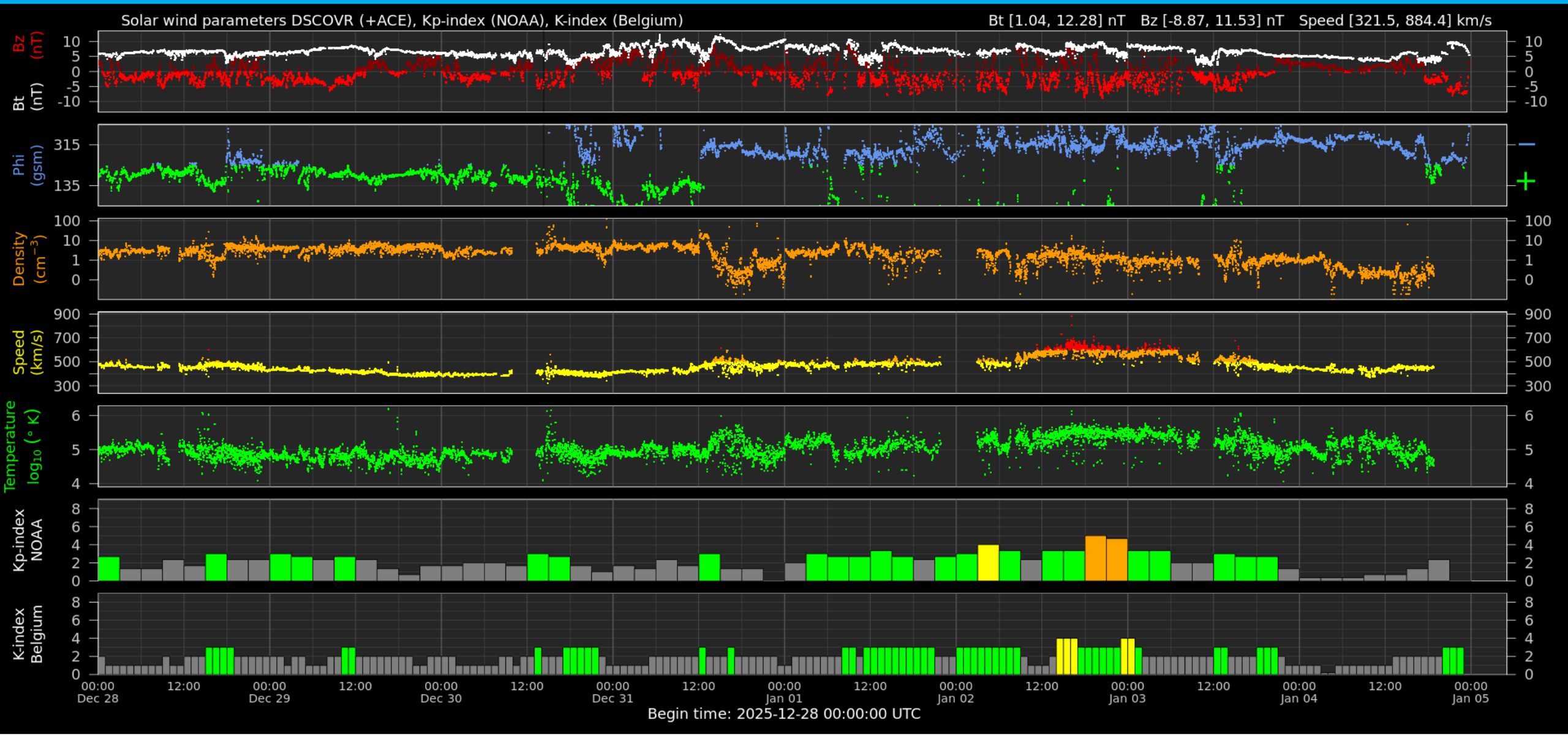
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Solar wind parameters



Solar wind parameters & K-indices

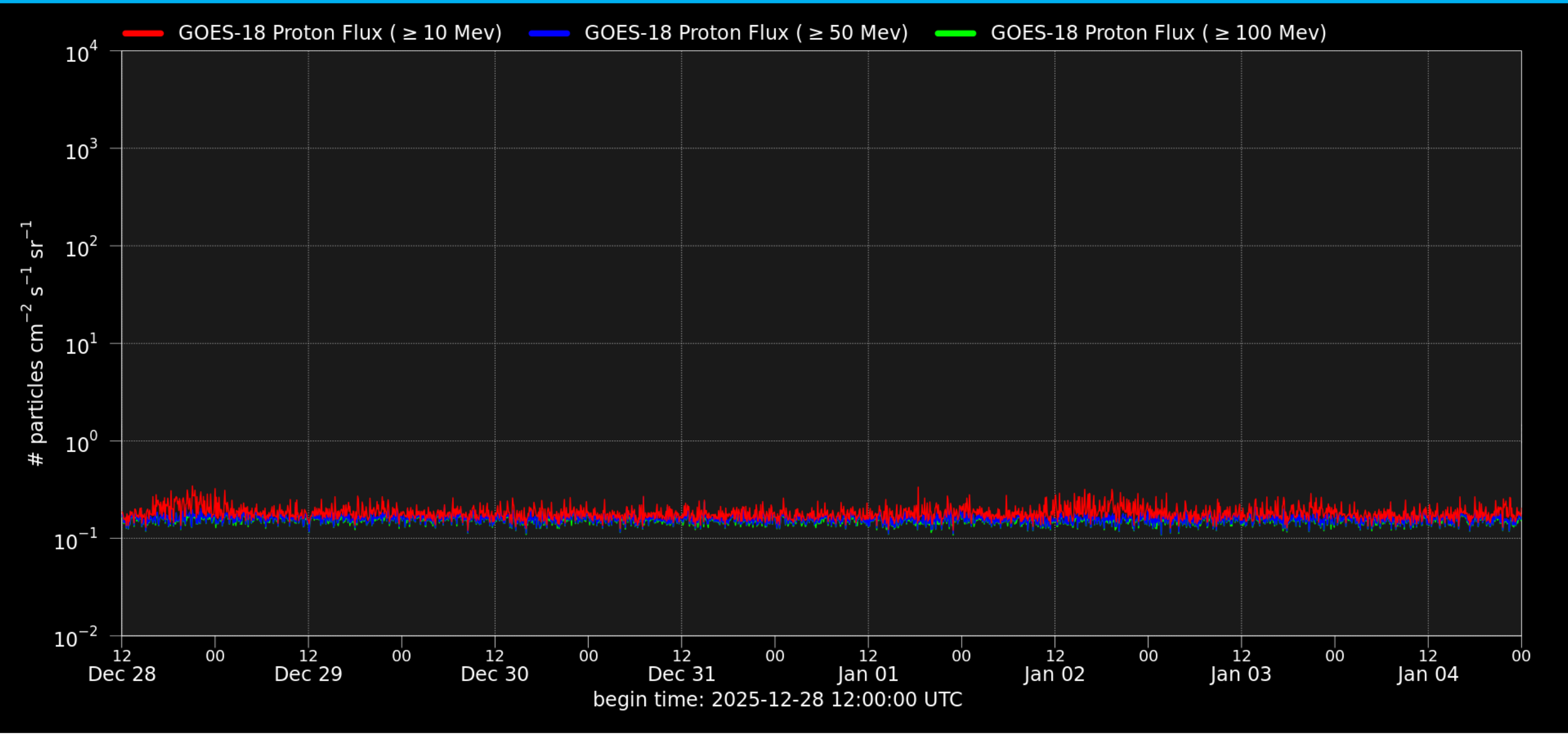


Energetic Particles

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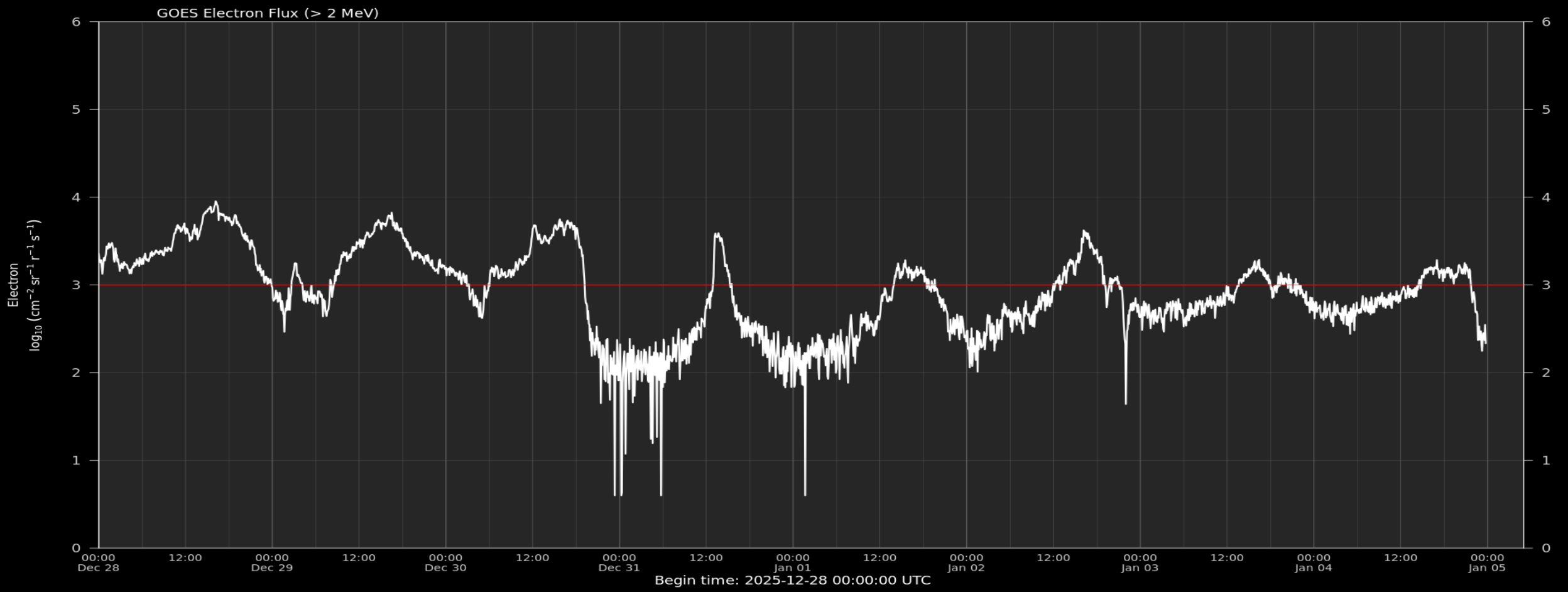
Solar proton flux



Electron flux at GEO

www.stce.be/educational/classification#electrons

www.spaceweather.gc.ca/forecast-prevision/space-spatiale/sffl-en.php

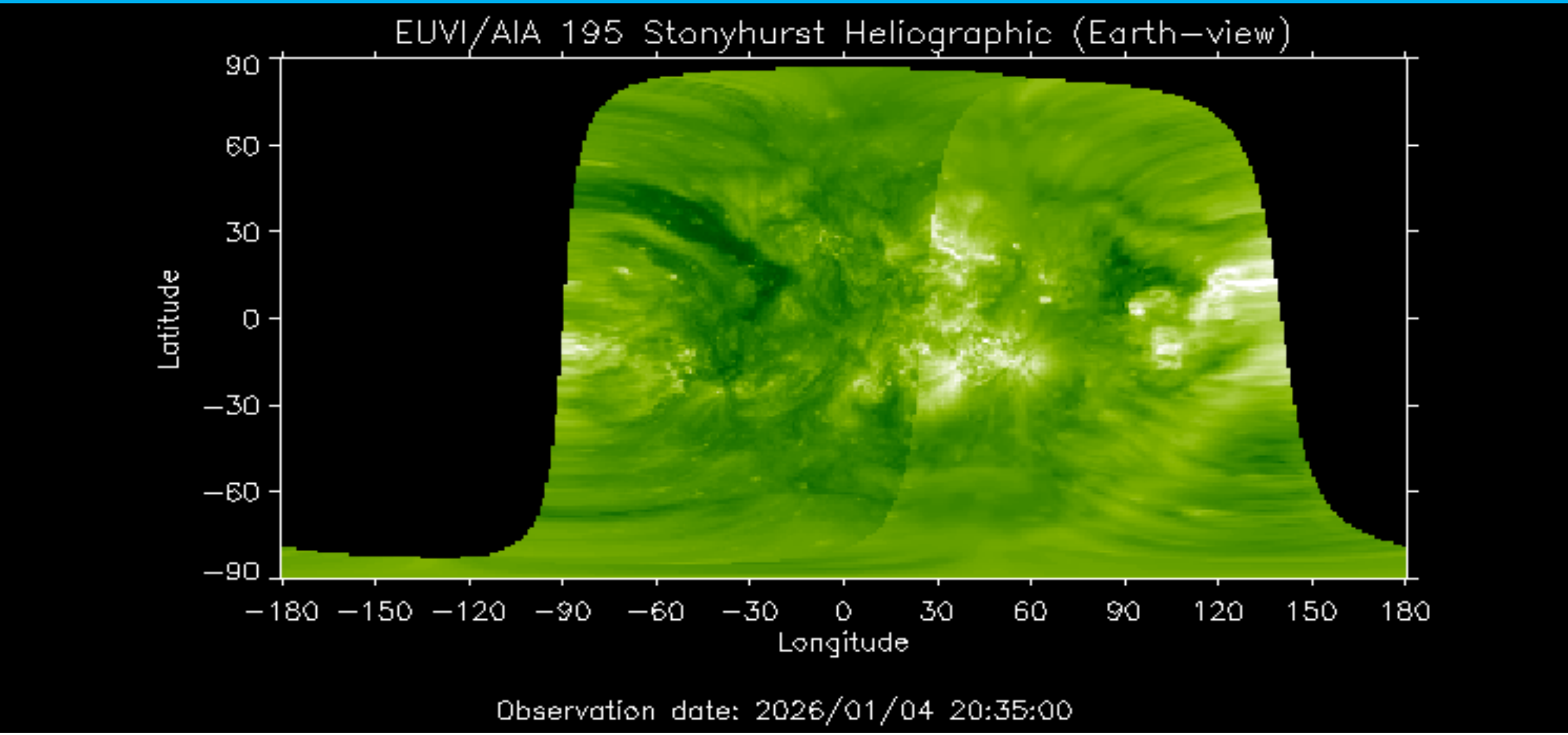


Outlook

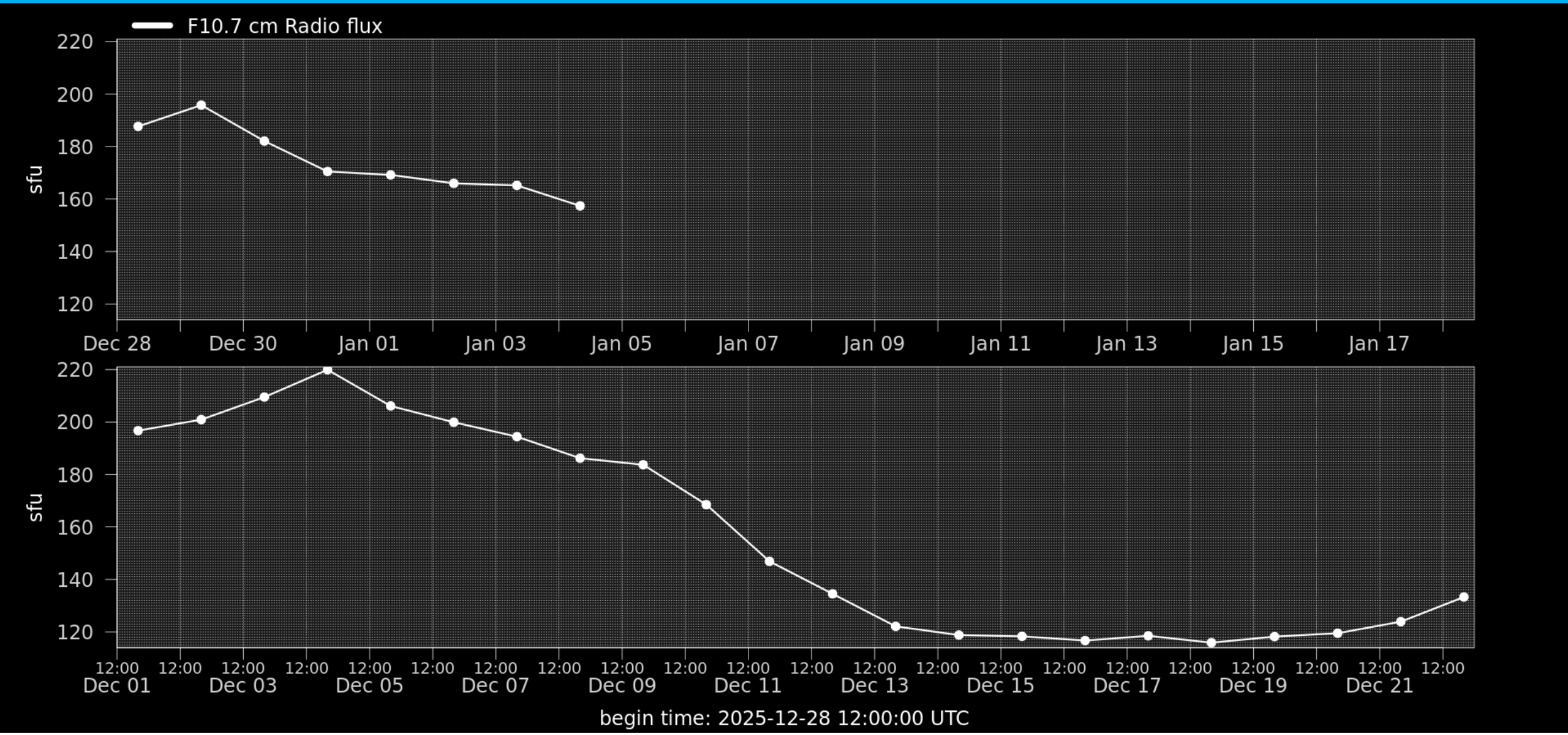
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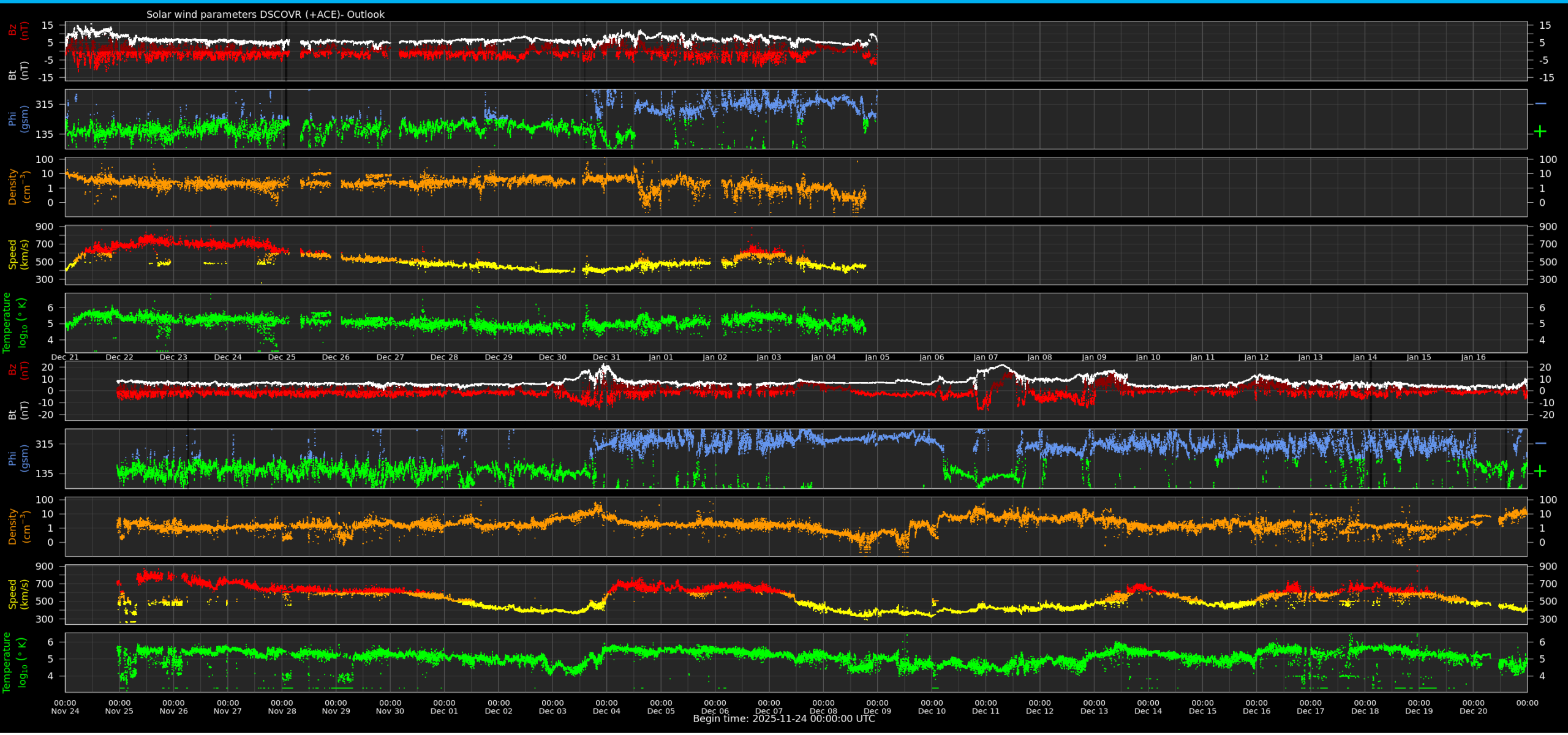
Outlook: Solar activity



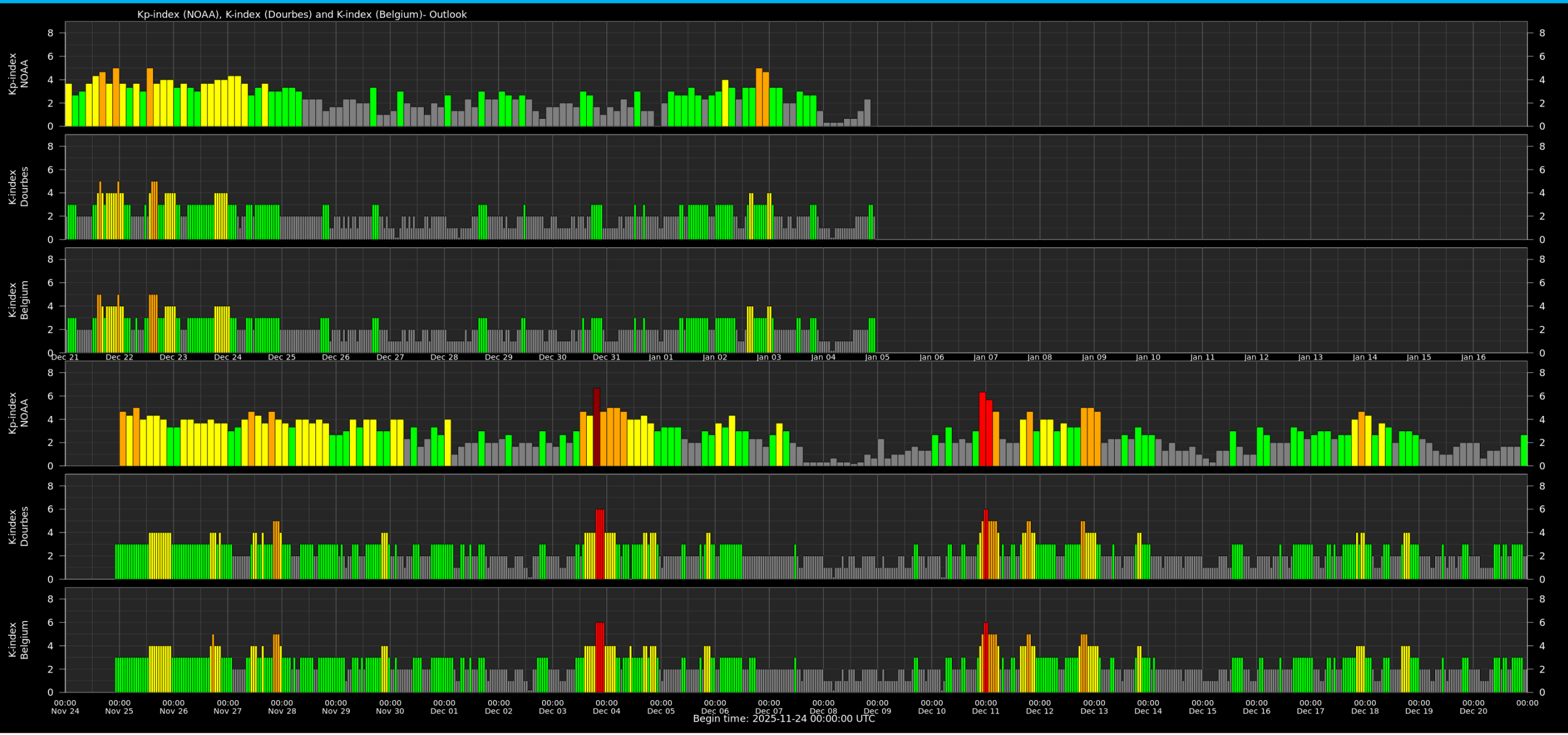
Outlook: Solar F10.7cm radio flux



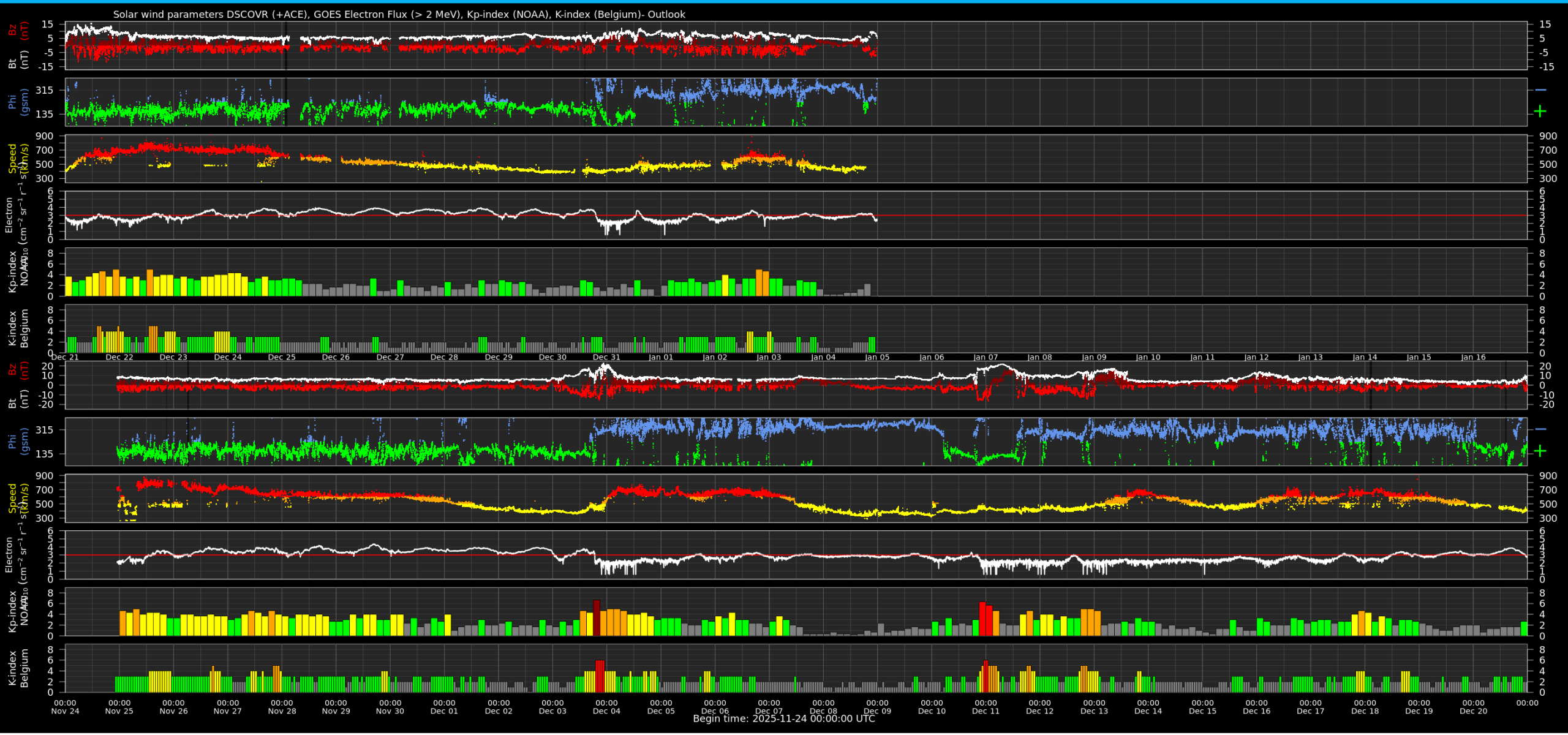
Outlook: Solar wind parameters



Outlook: Geomagnetic activity



Outlook: Electron Flux at GEO Outlook



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SIDC Space Weather Briefing

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