

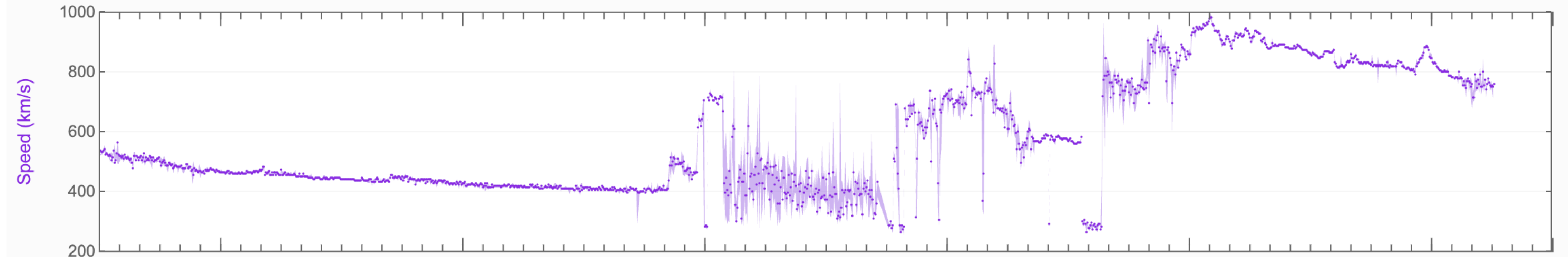
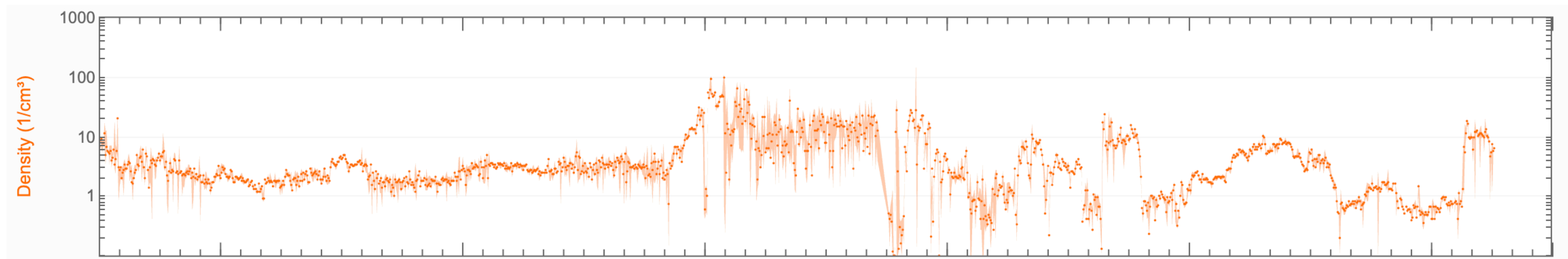
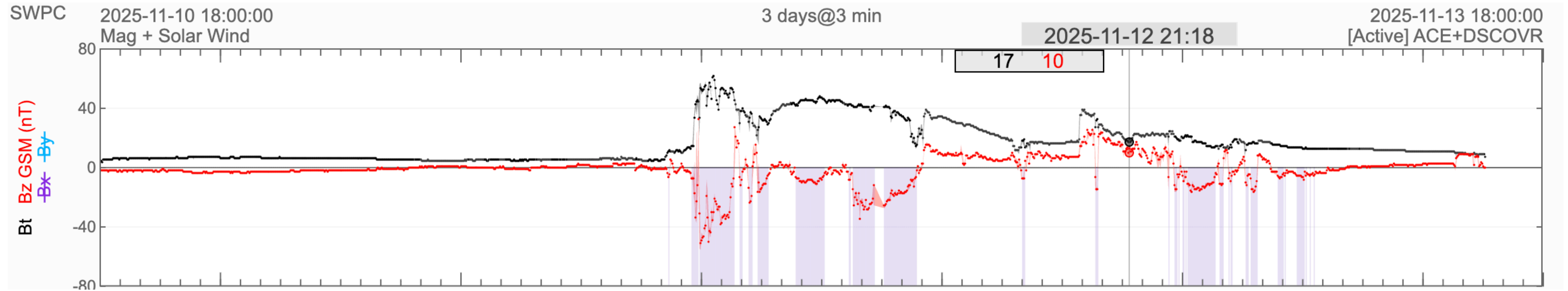
# Introduction Space Weather Track

David Berghmans (Royal Observatory of Belgium)

DIRS / SIRRIS Workshop Diegem 2025 Nov 14

Noorderlicht boven Gierle, in het noorden van de provincie Antwerpen.

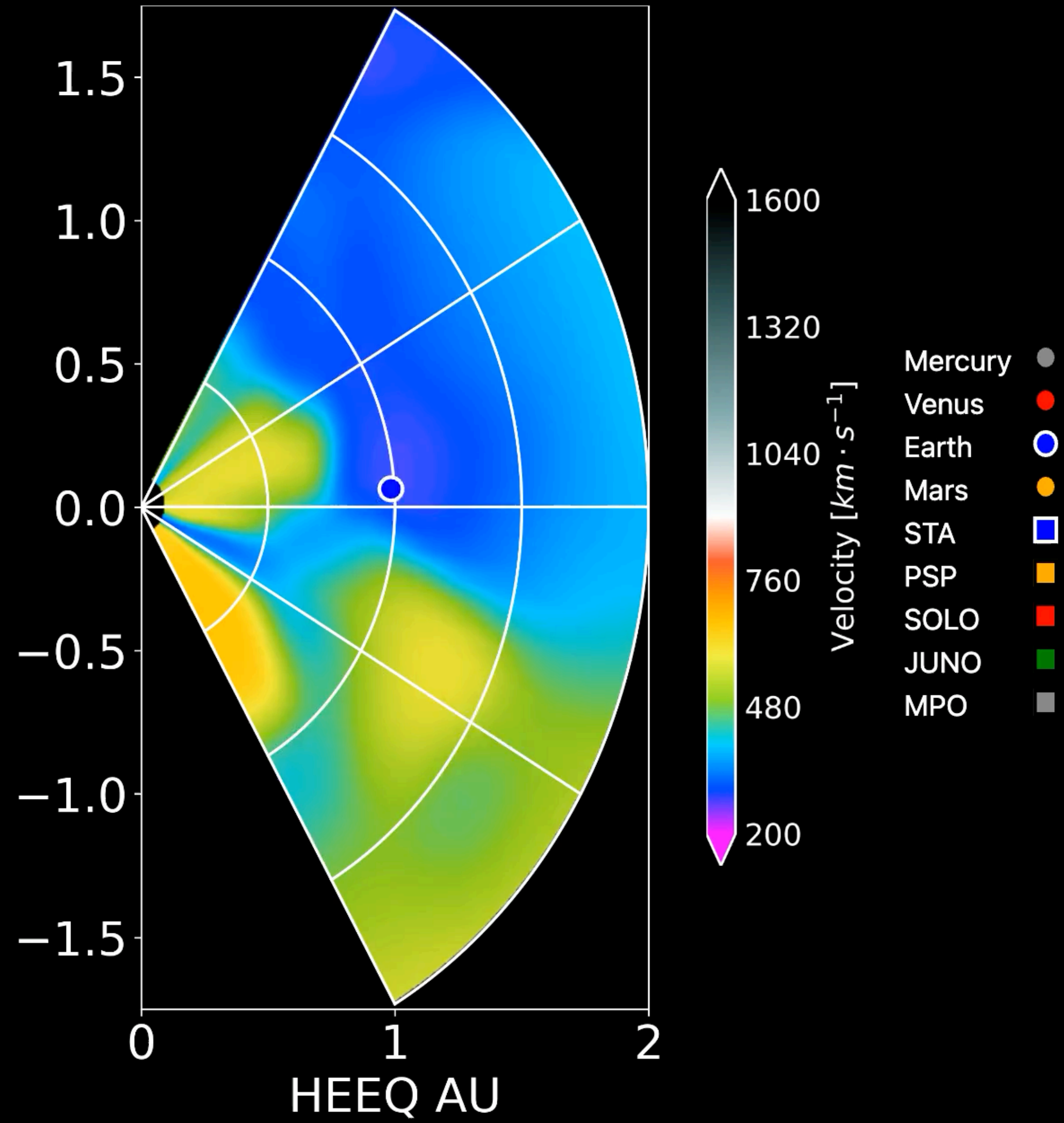
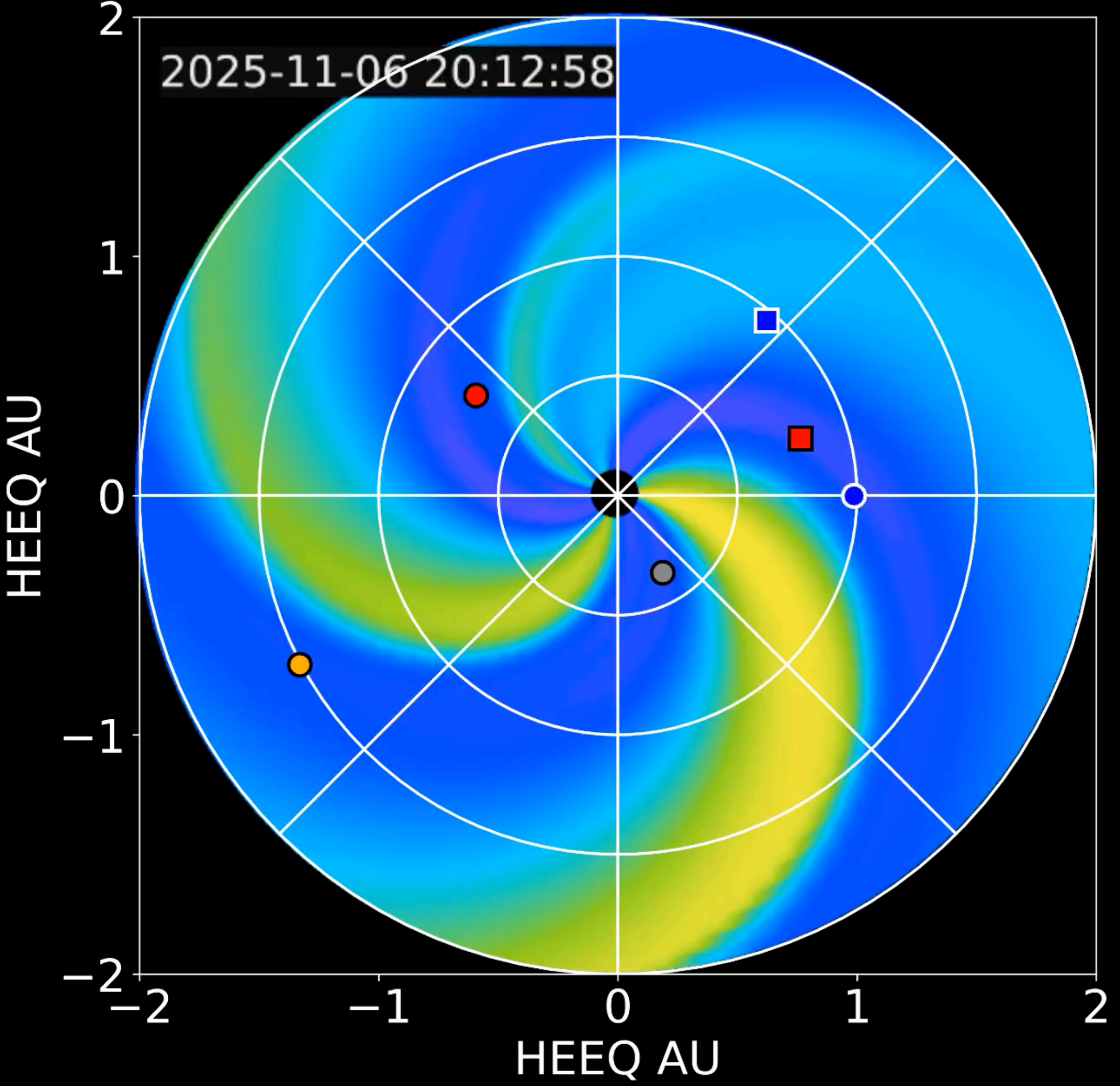
© @ Bart Medaer



Collection : CME - 2025-11-11 21:32:43

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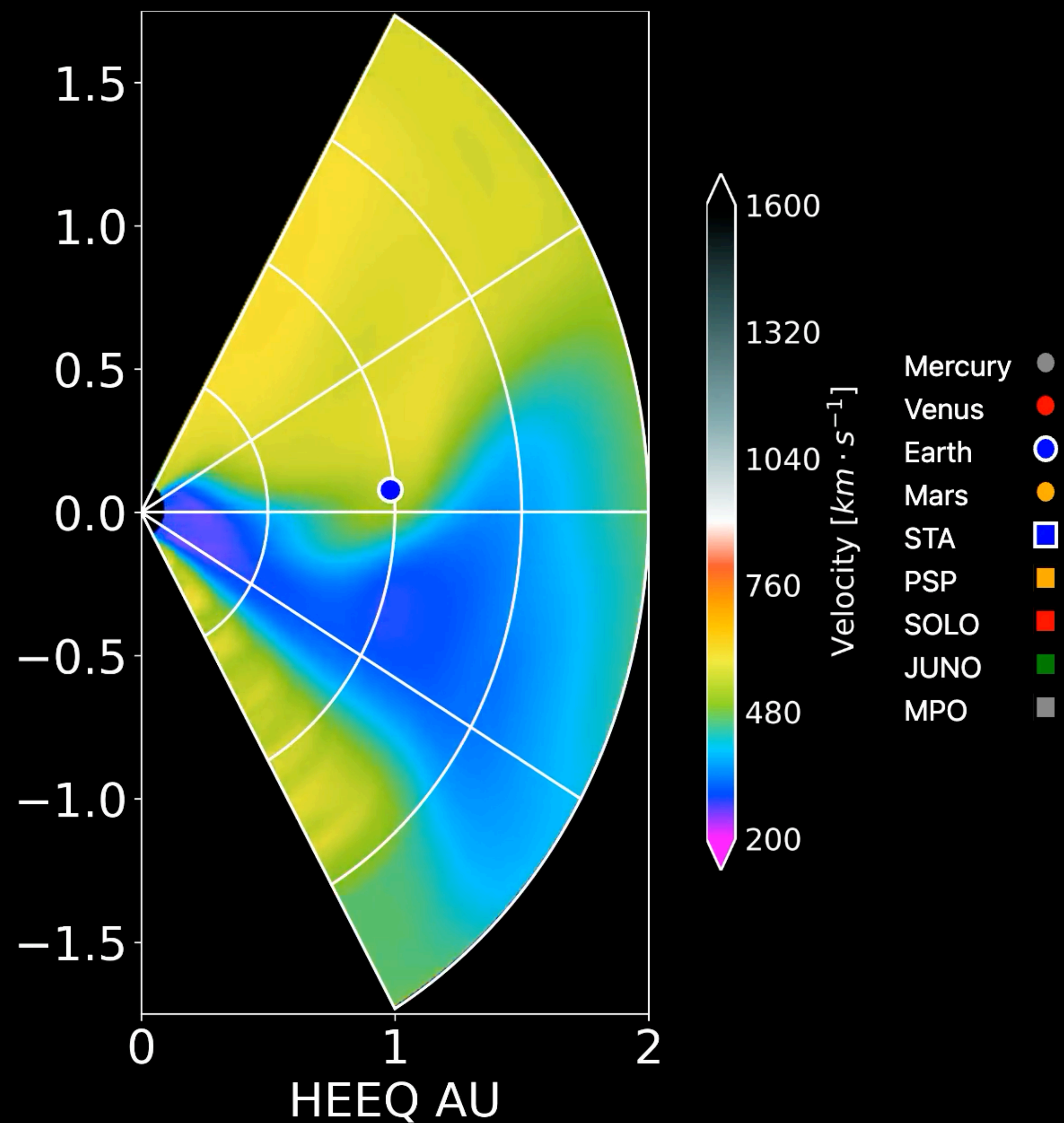
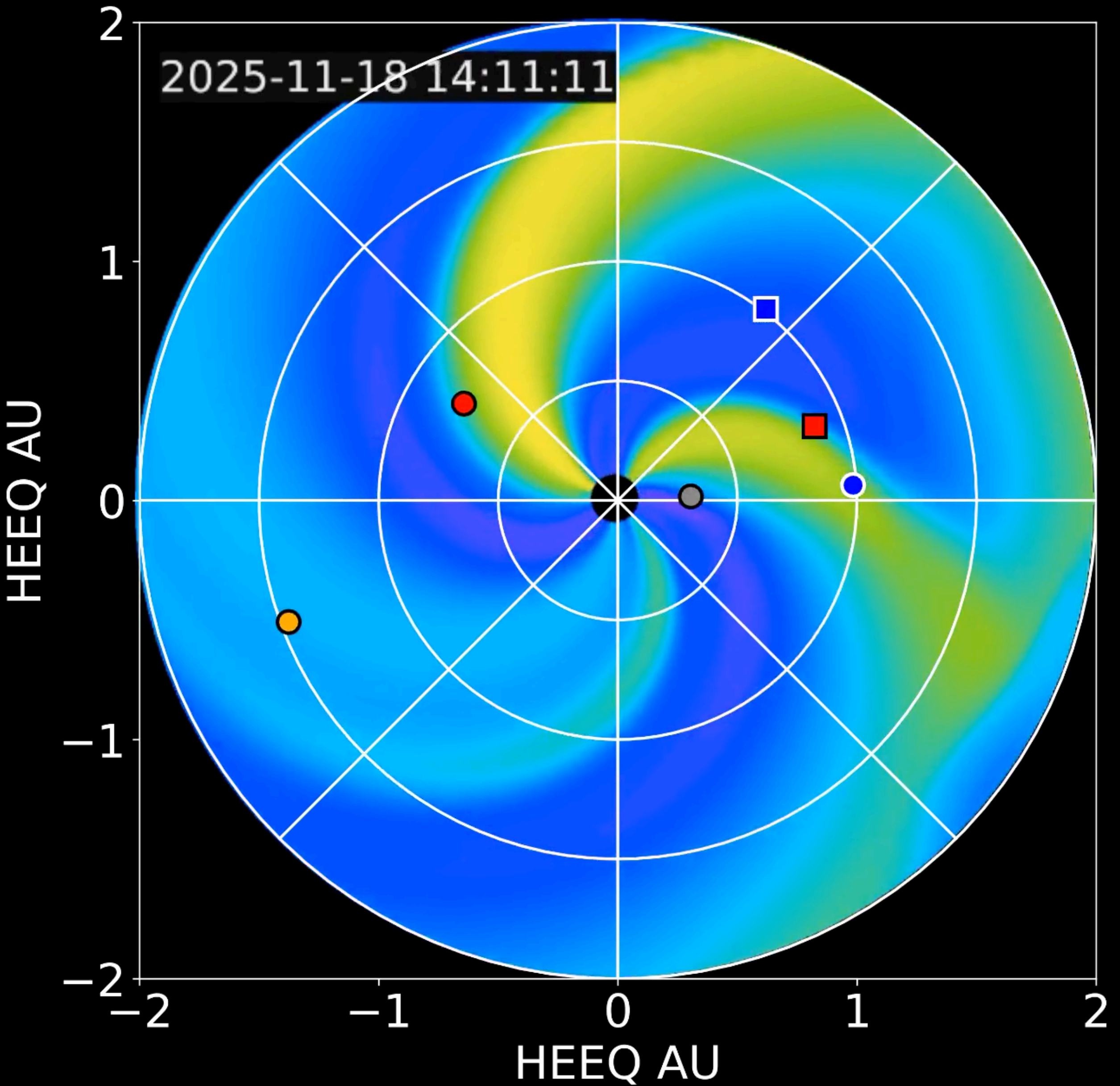
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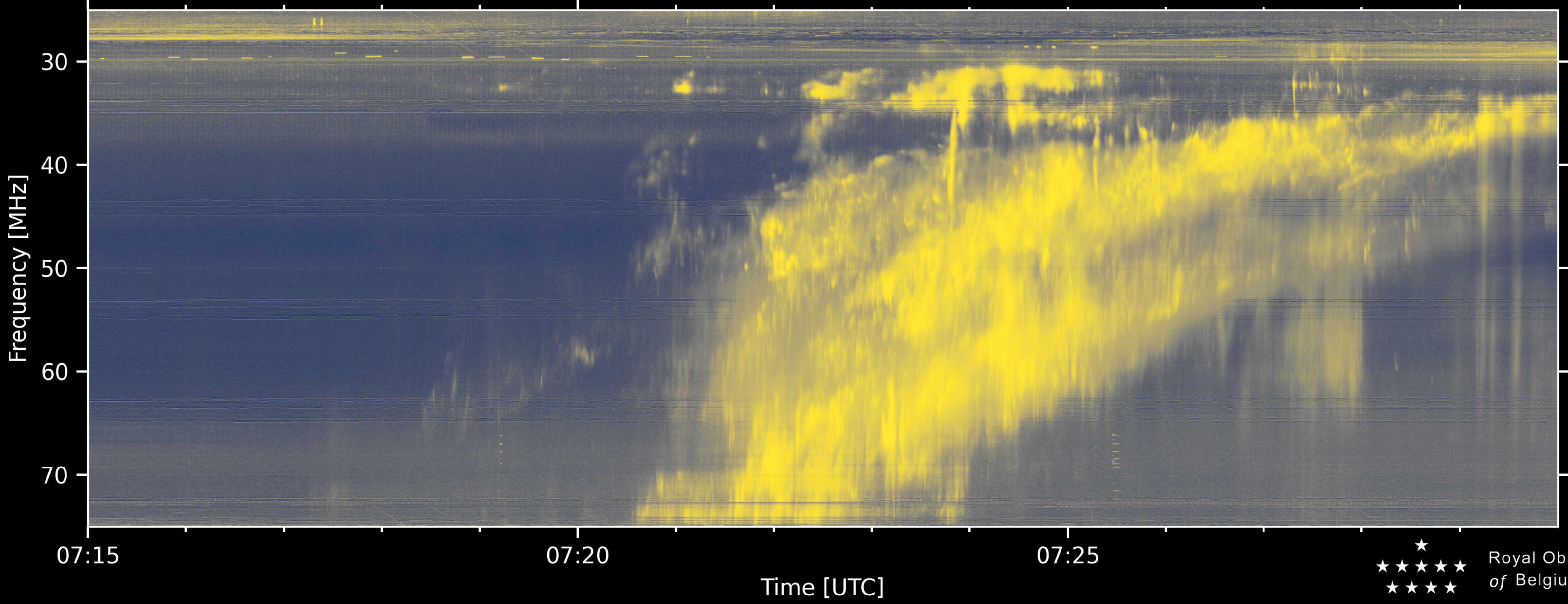
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# SPADE Interferometer Humain Radio Observatory

2025-11-09



07:15

07:20

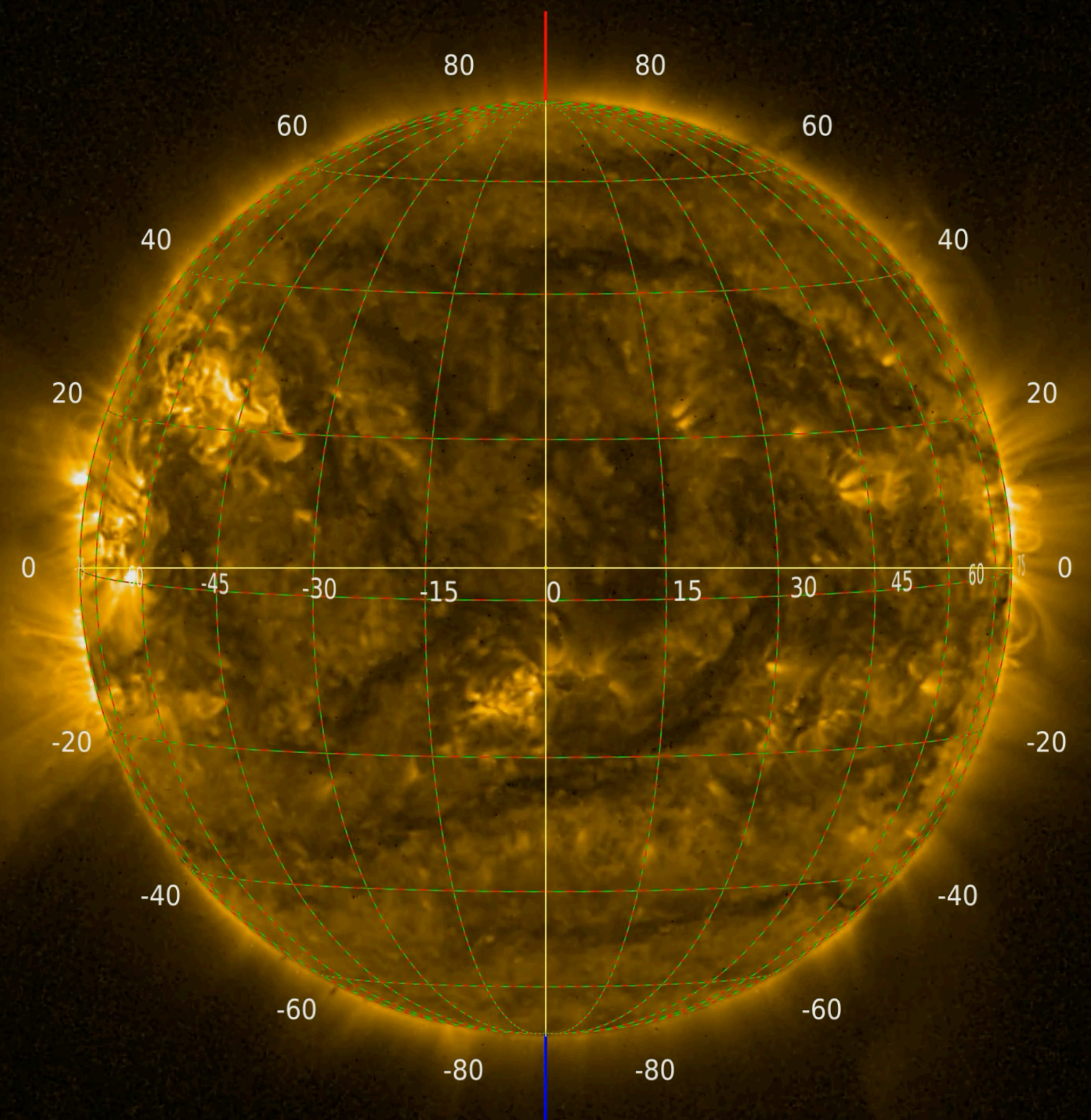
07:25

Time [UTC]



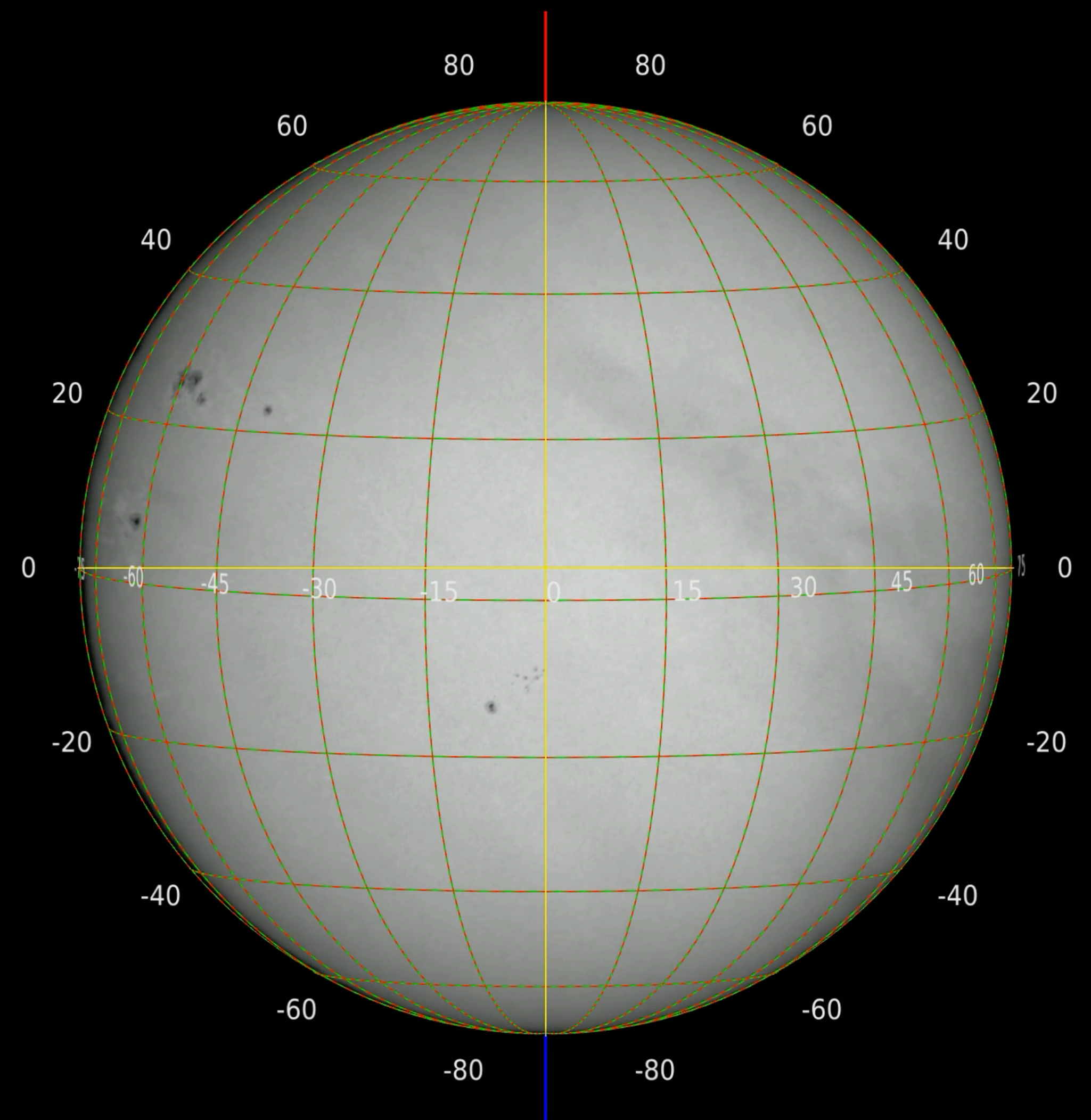
Royal Observatory  
of Belgium

# SWAP onboard PROBA-2

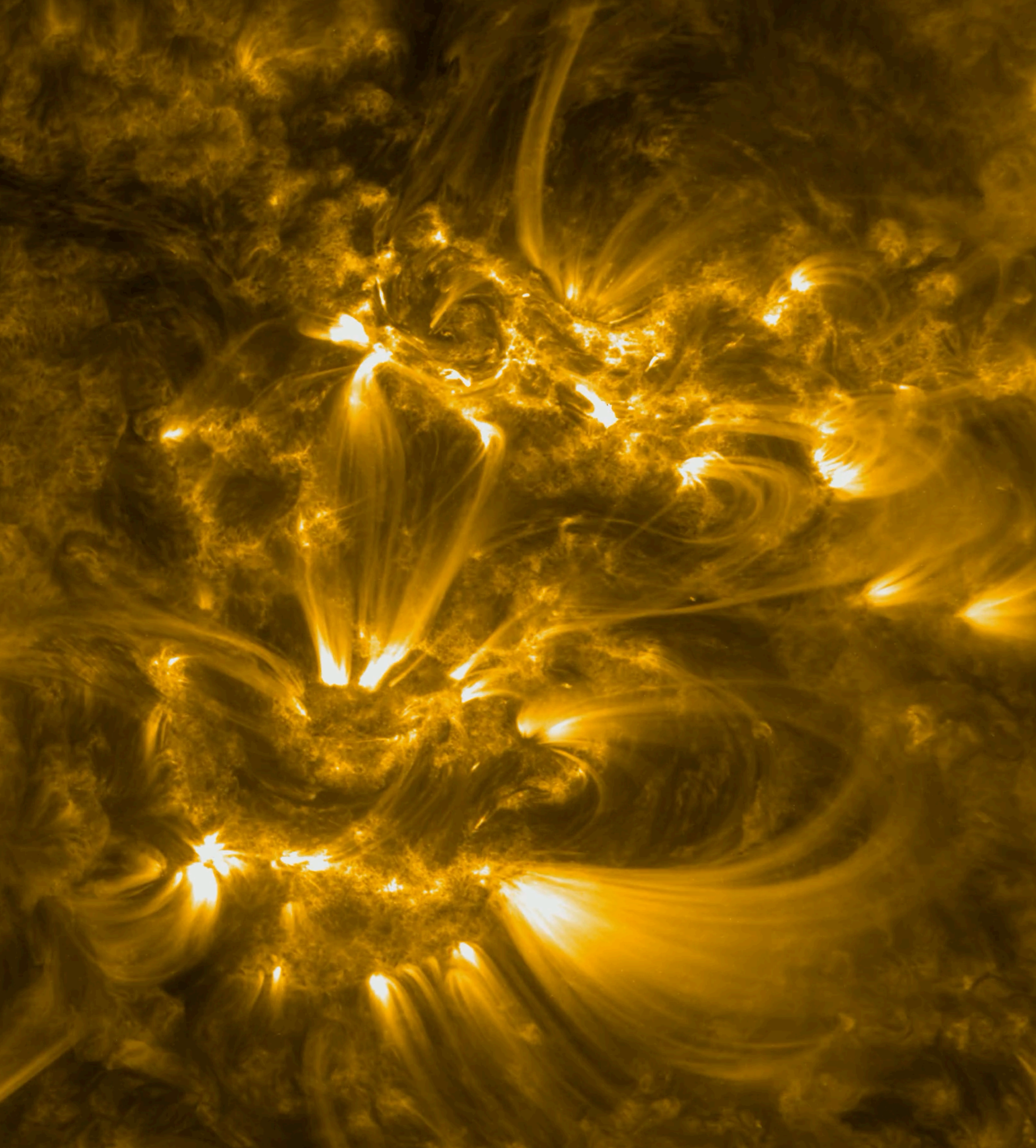


2025-11-04T16:47:44.495 SWAP 174 | D $\odot$ : 0.9917au

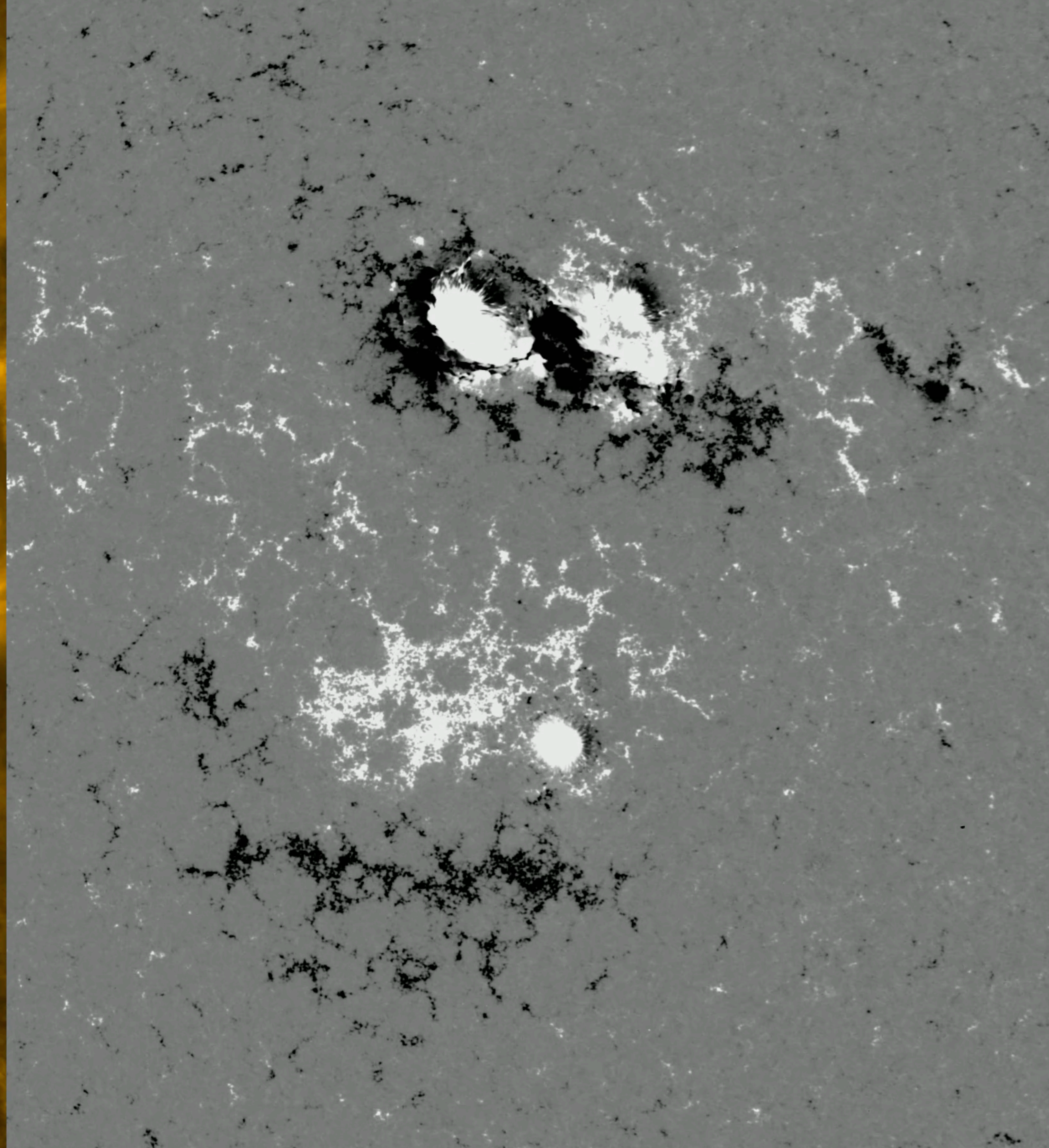
# USET Royal Observatory of Belgium



2025-11-04T09:35:05.000 USET white-light | D $\odot$ : 0.9917au

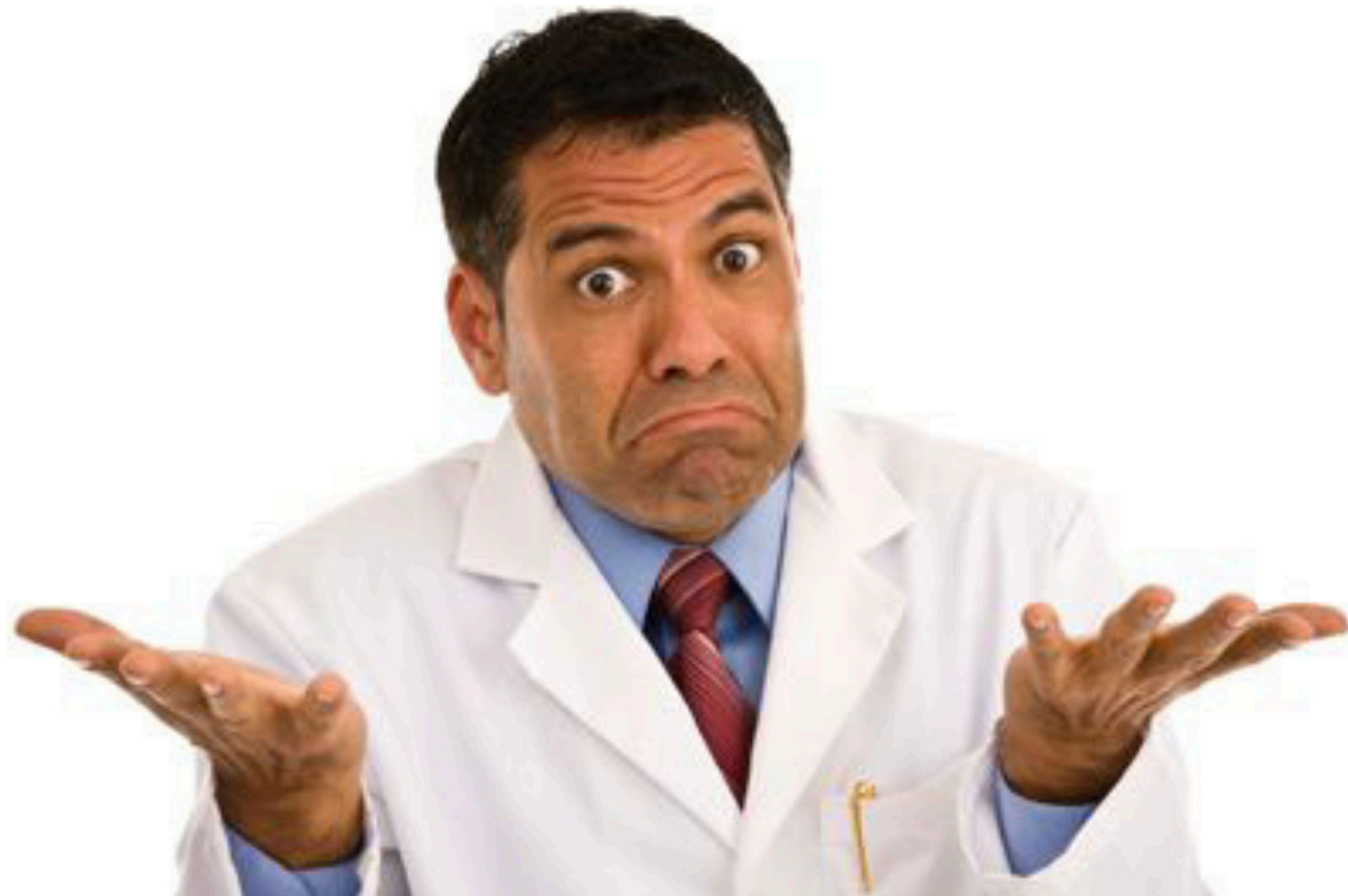


2025-11-11T08:46:09.350 AIA 171 | D☉: 0.9901au



2025-11-11T08:40:10.600 HMI magnetogram | D☉: 0.9901au

Who cares?



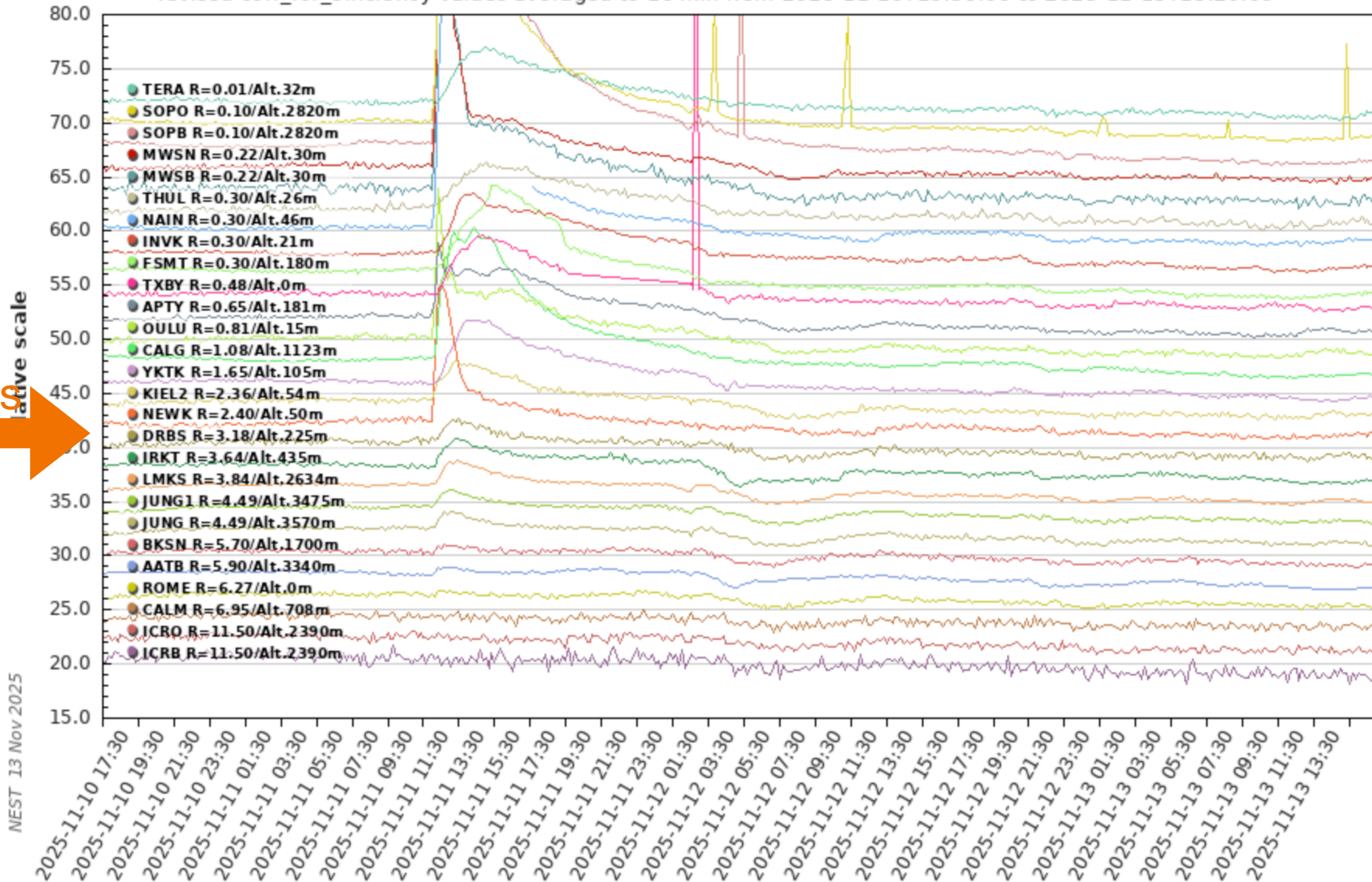
# NEW GLENN MISSION NG-2

NG-2 Update: New Glenn is ready to launch. However, due to highly elevated solar activity and its potential effects on the ESCAPADE spacecraft, NASA is postponing launch until space weather conditions improve. We are currently assessing opportunities to establish our next launch window based on forecasted space weather and range availability.

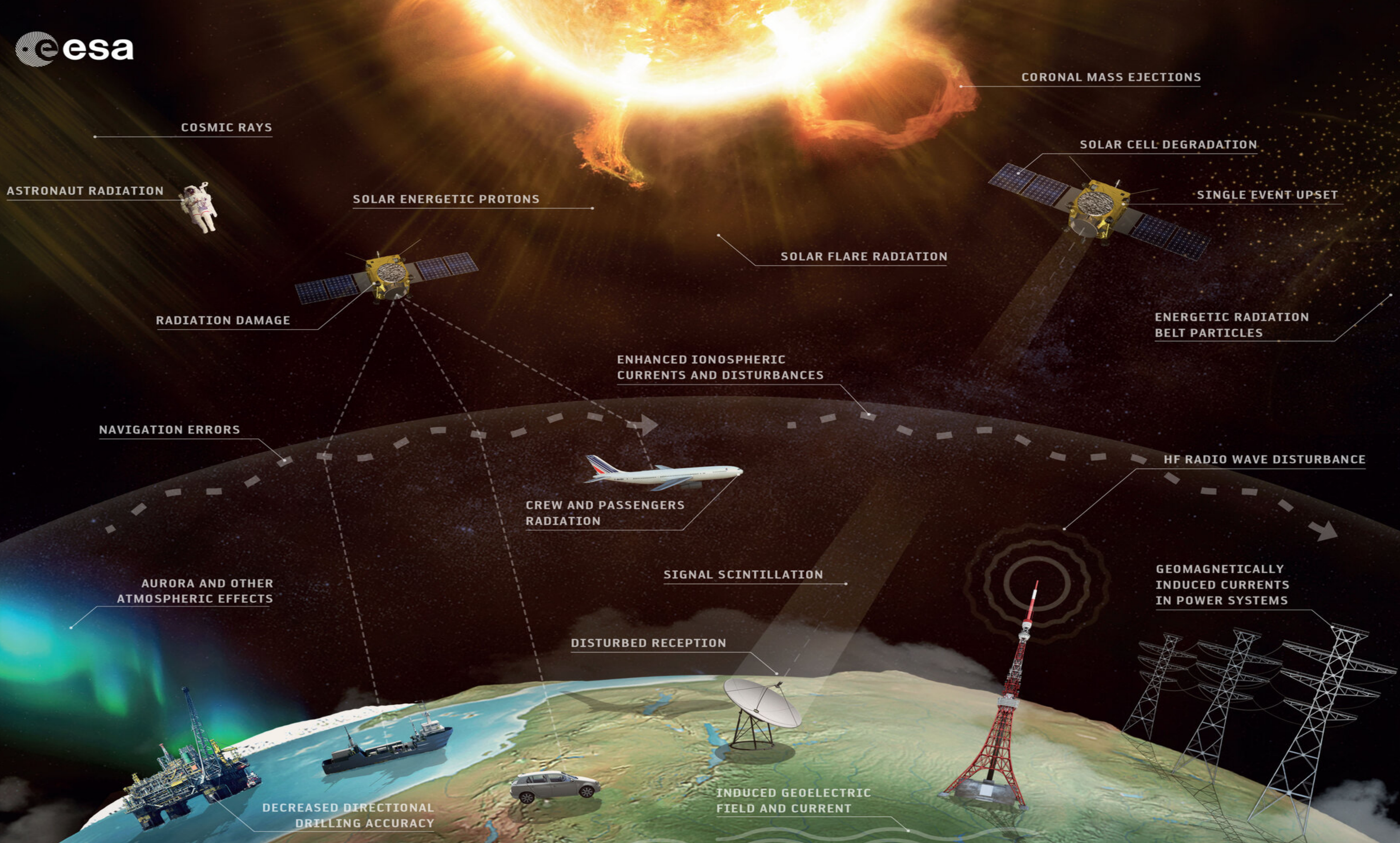
## NEW GLENN MISSION NG-2

W E B C A S T C O M I N G S O O N

revised corr\_for\_efficiency values averaged to 10 min from 2025-11-10T15:30:00 to 2025-11-13T15:29:00



KMI  
Dourbes





COSMIC RAYS

ASTRONAUT RADIATION

SOLAR ENERGETIC PROTONS

CORONAL MASS EJECTIONS

SOLAR CELL DEGRADATION

SINGLE EVENT UPSET

SOLAR FLARE RADIATION

RADIATION DAMAGE

ENERGETIC RADIATION BELT PARTICLES

ENHANCED IONOSPHERIC CURRENTS AND DISTURBANCES

NAVIGATION ERRORS

CREW AND PASSENGERS RADIATION

HF RADIO WAVE DISTURBANCE

AURORA AND OTHER ATMOSPHERIC EFFECTS

SIGNAL SCINTILLATION

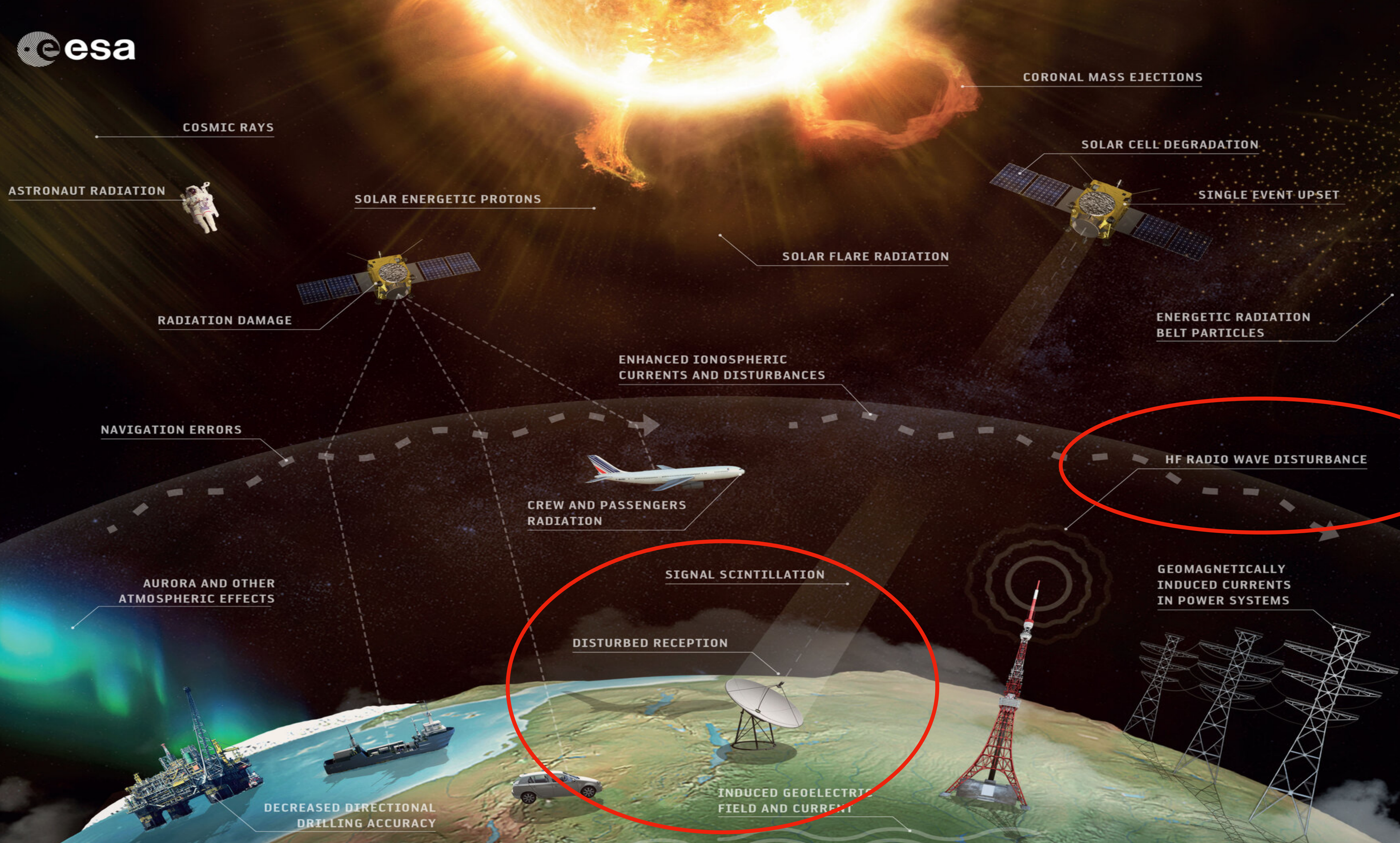
GEOMAGNETICALLY INDUCED CURRENTS IN POWER SYSTEMS

DISTURBED RECEPTION

DECREASED DIRECTIONAL DRILLING ACCURACY

INDUCED GEOELECTRIC FIELD AND CURRENT

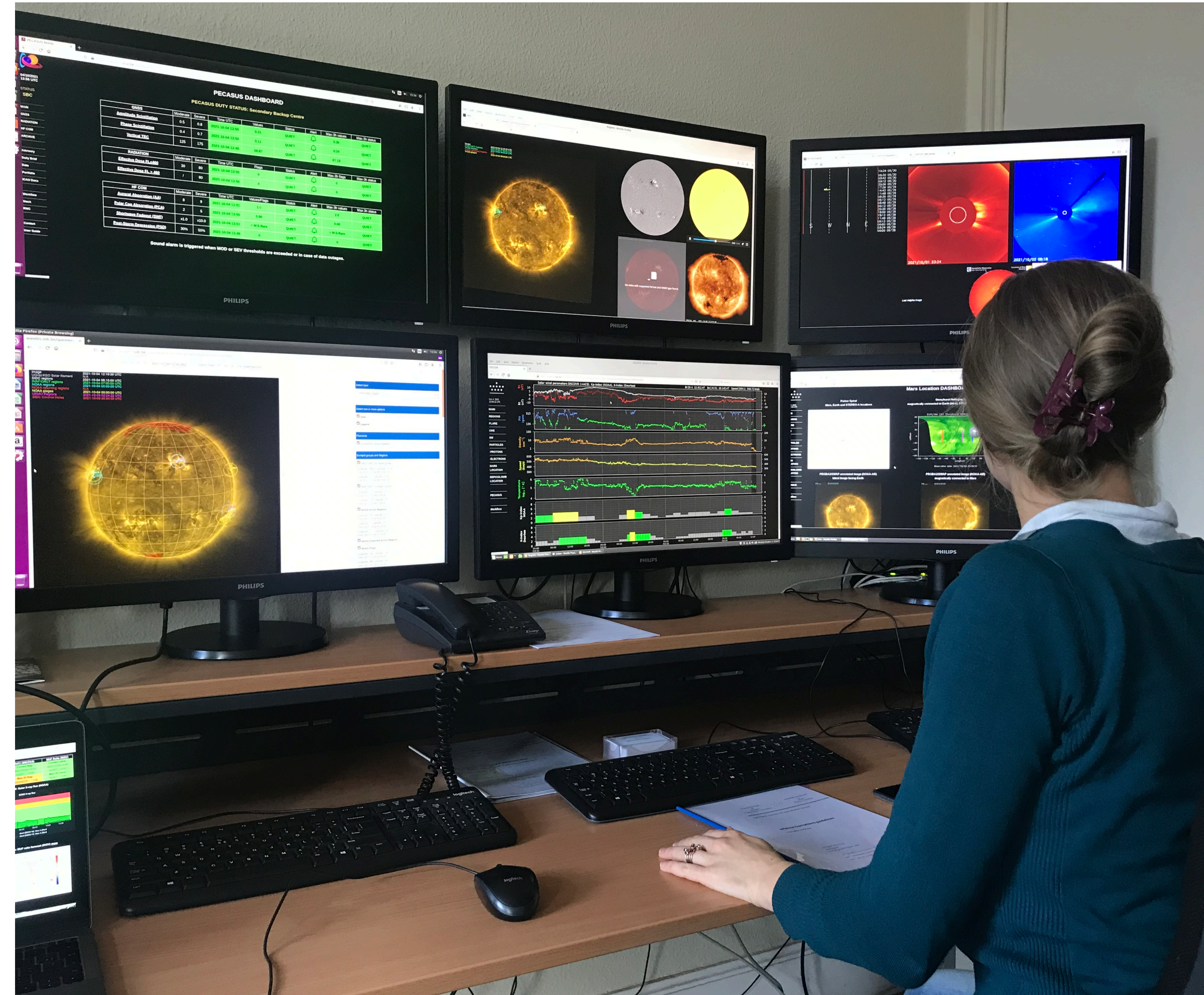




# Space Weather Resilience & Military Infrastructure Protection

1. Make systems robust for the worst space weather

2. A 24/7 space weather monitoring and forecasting service designed to address and mitigate the impact of space weather threats/vulnerabilities on military equipment in space and on the ground.



# What is needed?

- Ground-based observations
- Space-based observations
- Heliospheric simulations
- Data assimilation
- User-domain expertise

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- Ground-based observations
- Space-based observations
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- User-domain expertise

- Multi-site robotic observatories
- Autonomous operations
- Environmental Resilience
- Solar magnetograms through Zeeman splitting
- Radio-spectra

# What is needed?

- Ground-based observations
- **Space-based observations**
- Heliospheric simulations
- Data assimilation
- User-domain expertise

- Solar telescopes (EUV imager/coronagraph) on LEO satellite(s)
- Further miniaturisation (additive manufacturing, novel actuators)
- Onboard data handling & autonomy

# What is needed?

- Ground-based observations
- Space-based observations
- **Heliospheric simulations**
- Data assimilation
- User-domain expertise

- Multi-fluid time-accurate modeling of solar atmosphere
- Magnetic connectivity of Earth to solar surface
- Solar energetic particle modelling

# What is needed?

- Ground-based observations
- Space-based observations
- Heliospheric simulations
- **Data assimilation**
- User-domain expertise

- Image processing
- Integrated AI/ML models for ingestion of observations
- Data flow optimization

# What is needed?

- Ground-based observations
- Space-based observations
- Heliospheric simulations
- Data assimilation
- **User-domain expertise**

- How does the changing space weather environment affect defense user systems?
- GNSS receivers
- Radio communication
- Other equipment