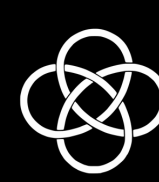




Updates on Aditya-L1 mission and Possible Coordinated Observations

Dipankar Banerjee

On behalf of Aditya-L1 Science Working Group



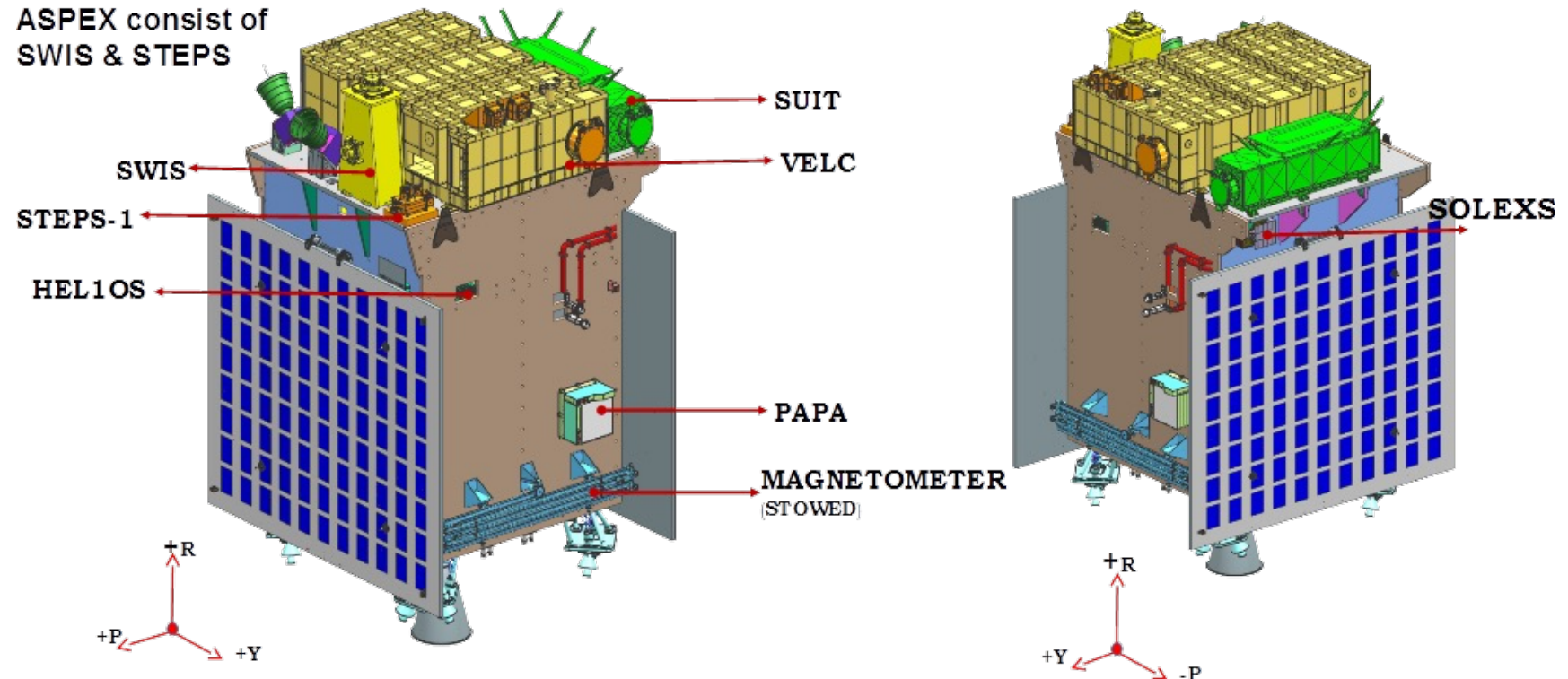
Aditya-L1 mission

All Instruments delivered, integration continuing
(expected launch 2023)

Salient Features:

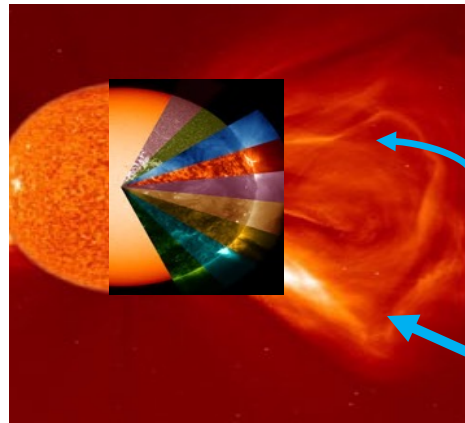
- Multi payload observatory class
- Multi-wavelength covering different atmospheric layers
- 4 Remote sensing & 3 In-situ observations – establishing connecting between source and in-situ (space weather)
- Capability to address many scientific problem in solar as well as space weather aspects

PAYLOADS – Stowed View of Satellite



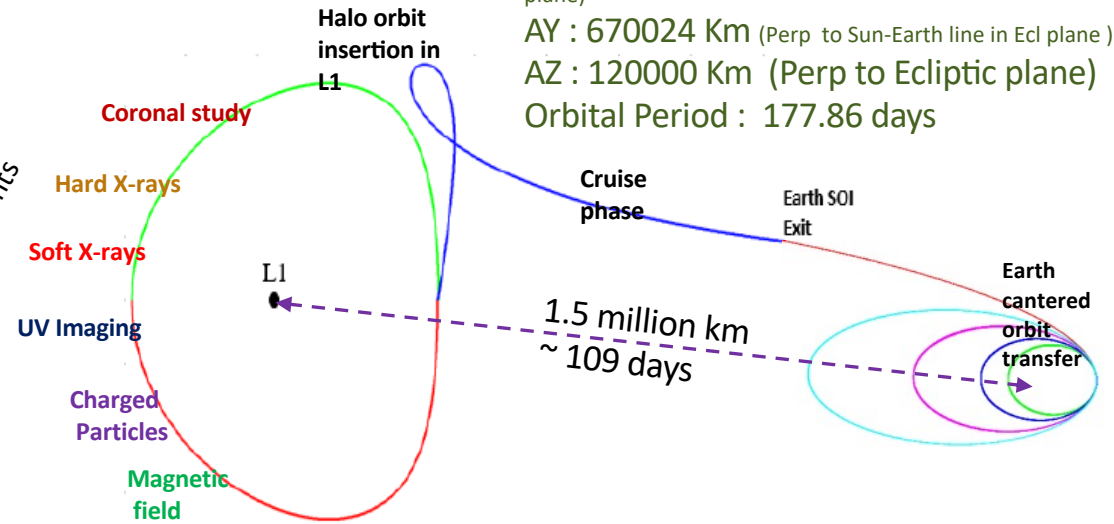
Aditya L1 – Upcoming Indian Solar Mission

Continuous observation of the Sun from Earth-Sun Lagrange points L1



PAPA, ASPEX,
MAG: in situ
measurements

VELC, SUIT,
SoLEX, HeLIOS



Halo orbital parameters

AX : 208951 Km (along Sun-Earth line in Ecliptic plane)

AY : 670024 Km (Perp to Sun-Earth line in Ecl plane)

AZ : 120000 Km (Perp to Ecliptic plane)

Orbital Period : 177.86 days

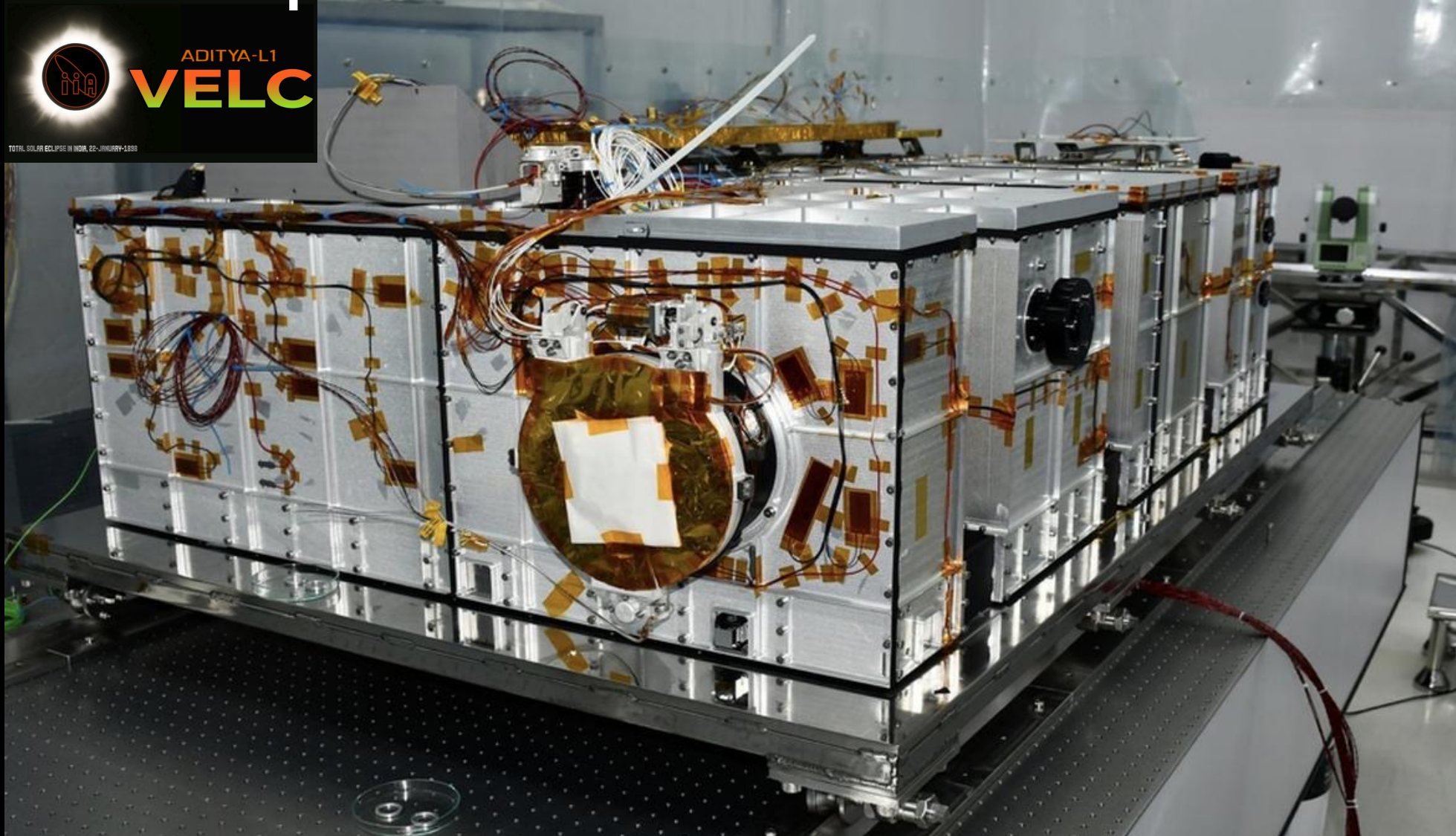
Payloads:

1. **VELC:** Visible Emission line Coronagraph
2. **SUIT:** Solar Ultra Violet Imaging Telescope
3. **HEL1OS:** High Energy L1 Orbiting X-ray Spectrometer
4. **SoLEXS:** Solar Low Energy X-ray Spectrometer
5. **PAPA:** Plasma Analyzer Package for ADITYA
6. **ASPEX:** Aditya Solar wind Particle Experiment
7. **MAGNETOMETER**

Major objectives:

- Understanding the Coronal Heating and Solar Wind Acceleration.
- Understanding initiation of Coronal Mass Ejection, flares and near-Earth space weather.
- Coupling and Dynamics of the Solar Atmosphere.
- Solar wind distribution and temperature anisotropy.

Status Update: VELC



Courtesy: IIA

Status Update: SUIT



Courtesy: IUCAA

The complete list of payloads: (ISRO website)

Visible Emission Line Coronagraph (VELC): To study the diagnostic parameters of solar corona and dynamics and origin of Coronal Mass Ejections (3 visible and 1 Infra-Red channels); magnetic field measurement of solar corona down to tens of Gauss – Indian Institute of Astrophysics (IIA)

Solar Ultraviolet Imaging Telescope (SUIT): To image the spatially resolved Solar Photosphere and Chromosphere in near Ultraviolet (200-400 nm) and measure solar irradiance variations - Inter-University Centre for Astronomy & Astrophysics (IUCAA)

Aditya Solar wind Particle Experiment (ASPEX) : To study the variation of solar wind properties as well as its distribution and spectral characteristics – Physical Research Laboratory (PRL)

Plasma Analyser Package for Aditya (PAPA) : To understand the composition of solar wind and its energy distribution – Space Physics Laboratory (SPL), VSSC

Solar Low Energy X-ray Spectrometer (SoLEXS) : To monitor the X-ray flares for studying the heating mechanism of the solar corona – ISRO Satellite Centre (ISAC)

High Energy L1 Orbiting X-ray Spectrometer (HEL1OS): To observe the dynamic events in the solar corona and provide an estimate of the energy used to accelerate the particles during the eruptive events - ISRO Satellite Centre (ISAC) and Udaipur Solar Observatory (USO), PRL

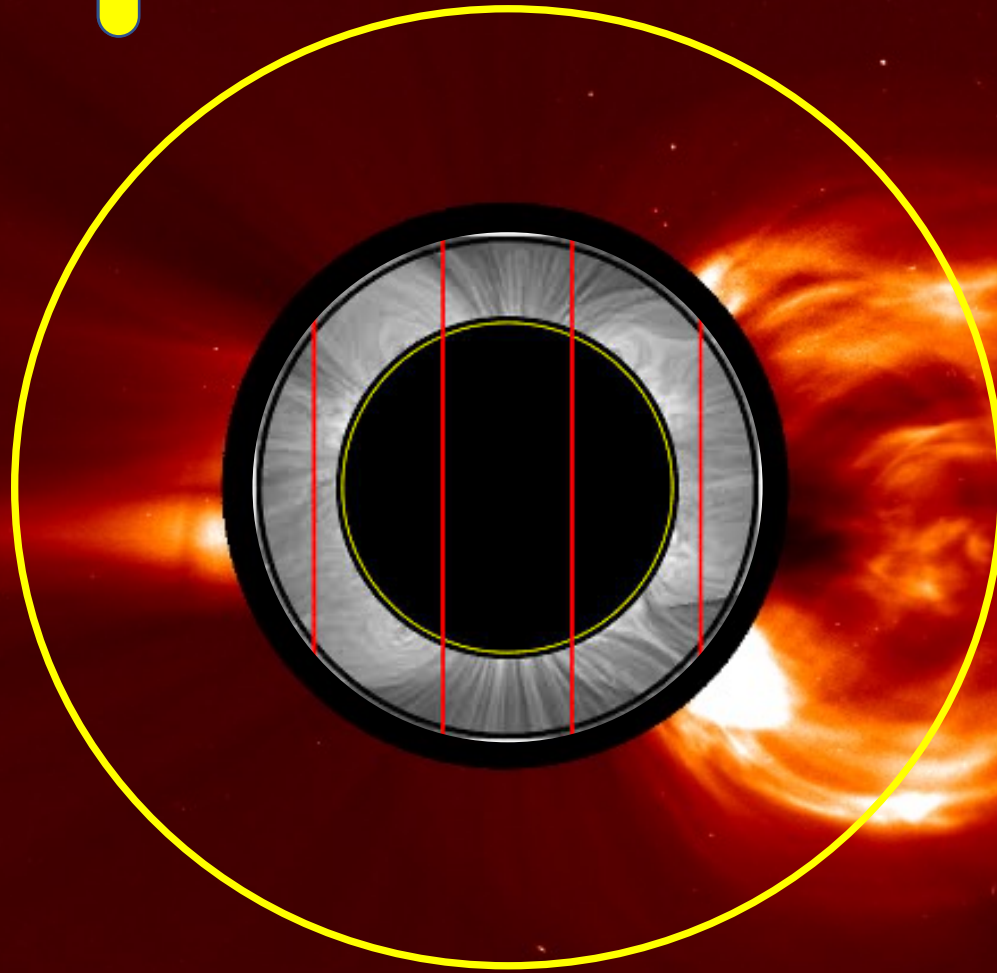
Magnetometer: To measure the magnitude and nature of the Interplanetary Magnetic Field – Laboratory for Electro-optic Systems (LEOS) and ISAC.

Comparison of ADITYA-L1 VELC with other space based coronagraphs

	SOHO			STEREO		ADITYA-L1
Instrument	LASCO C1	LASCO C2	LASCO C3	COR1	COR2	VELC
FOV (R_{\odot})	1.1 - 3.0	1.5 - 6.0	3.7 - 30	1.2 - 4.0	2 - 15	1.05 - 3
Occulter Type	Internal	External	External	Internal	External	Internal
Pixel Resolution	5.6"	11.4"	56.0"	3.75"	14.7"	2.51"
Objective Element	Mirror	Lens	Lens	Lens	Lens	Mirror
Aperture Size (mm)	47	20	9	36	34	192

CME O

Cadence: 60 s



LASCO C2
AIA 131

2017-09-10 16:12:08
2017-09-10 16:10:19

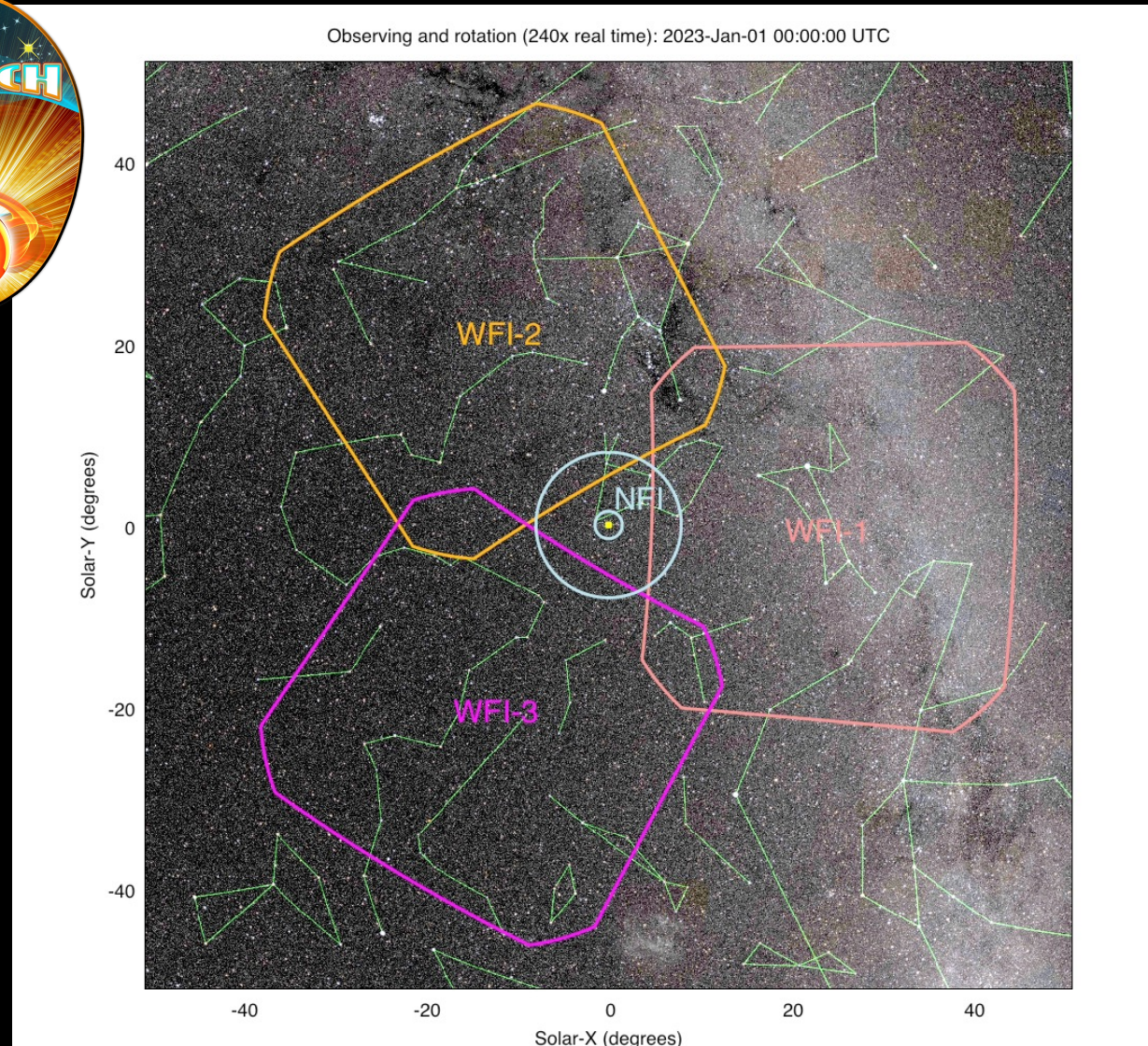
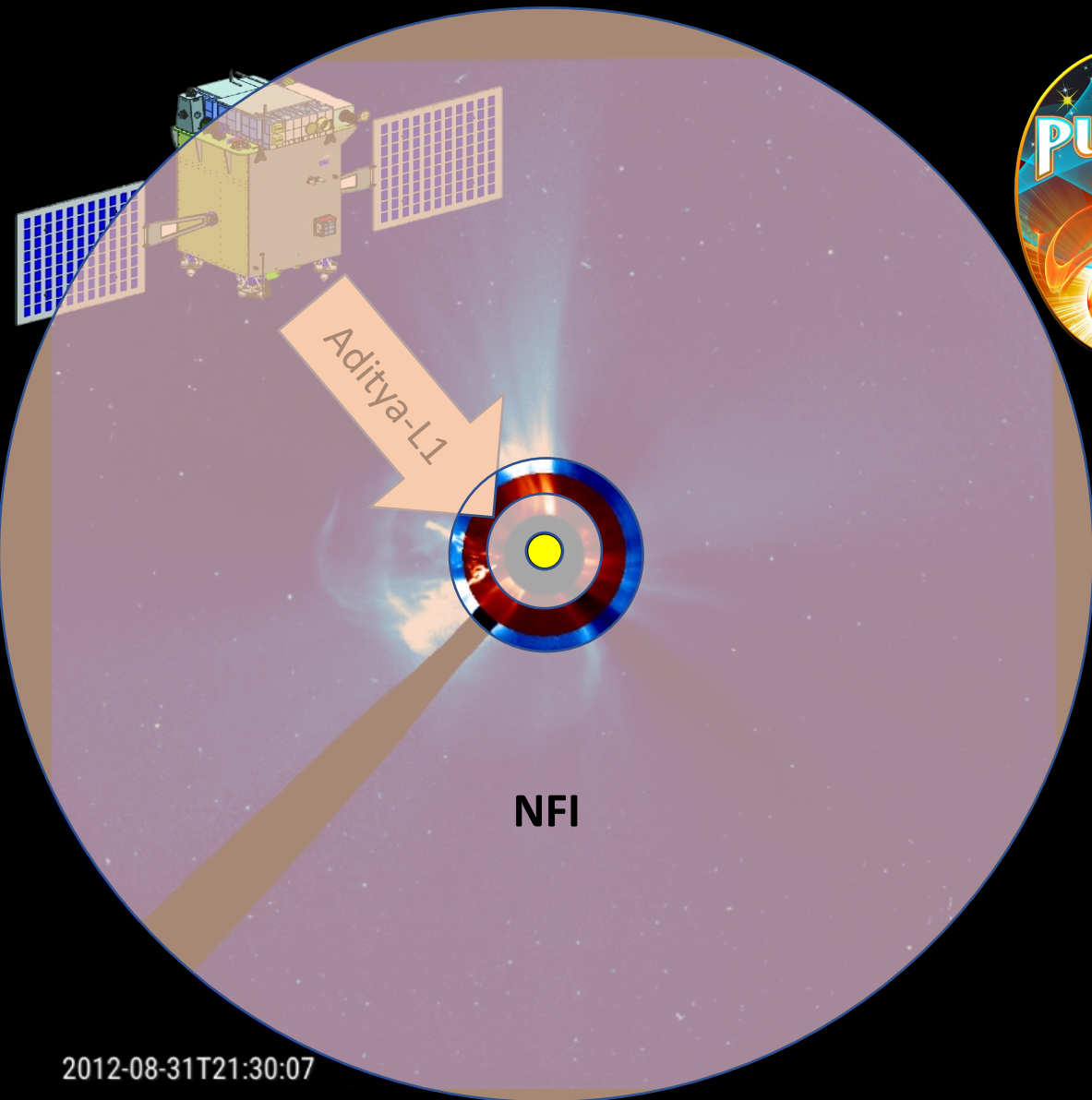
www.helioviewer.org



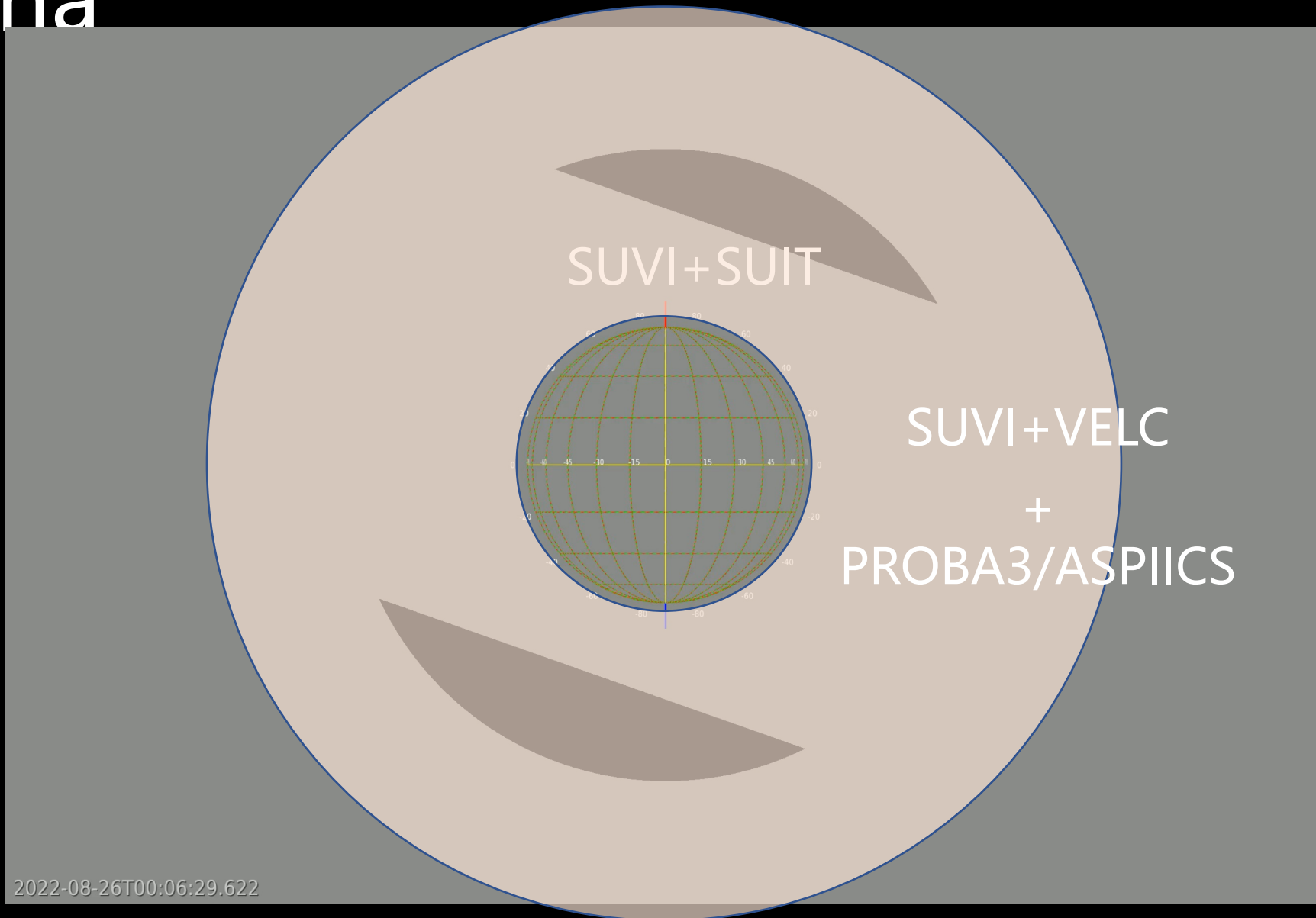


Sun-synchronous orbit; 6:00AM local time ascending node

Coordinated Science



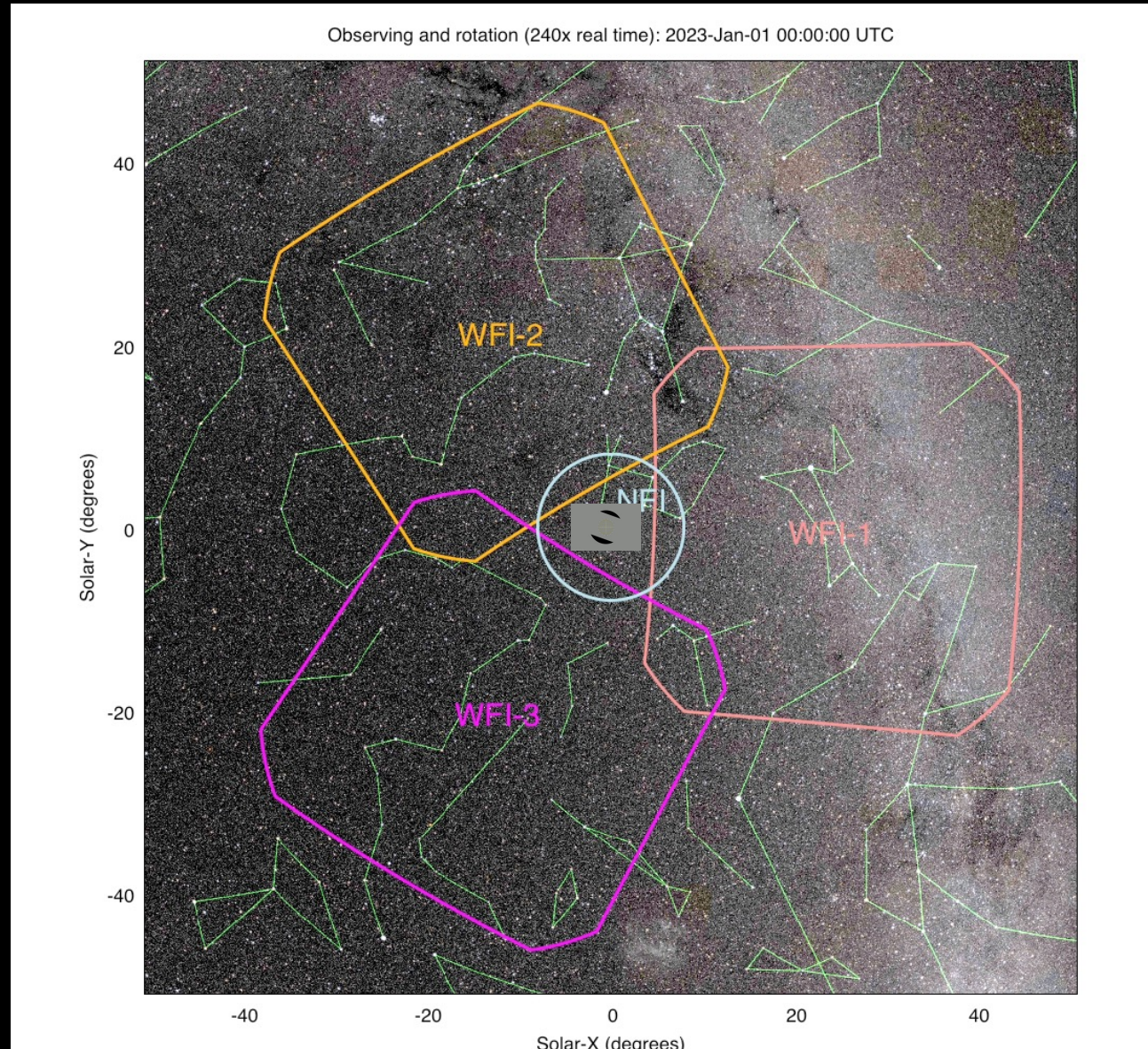
Coordinated Science: Inner + Middle Corona



Credit: Dan Seaton

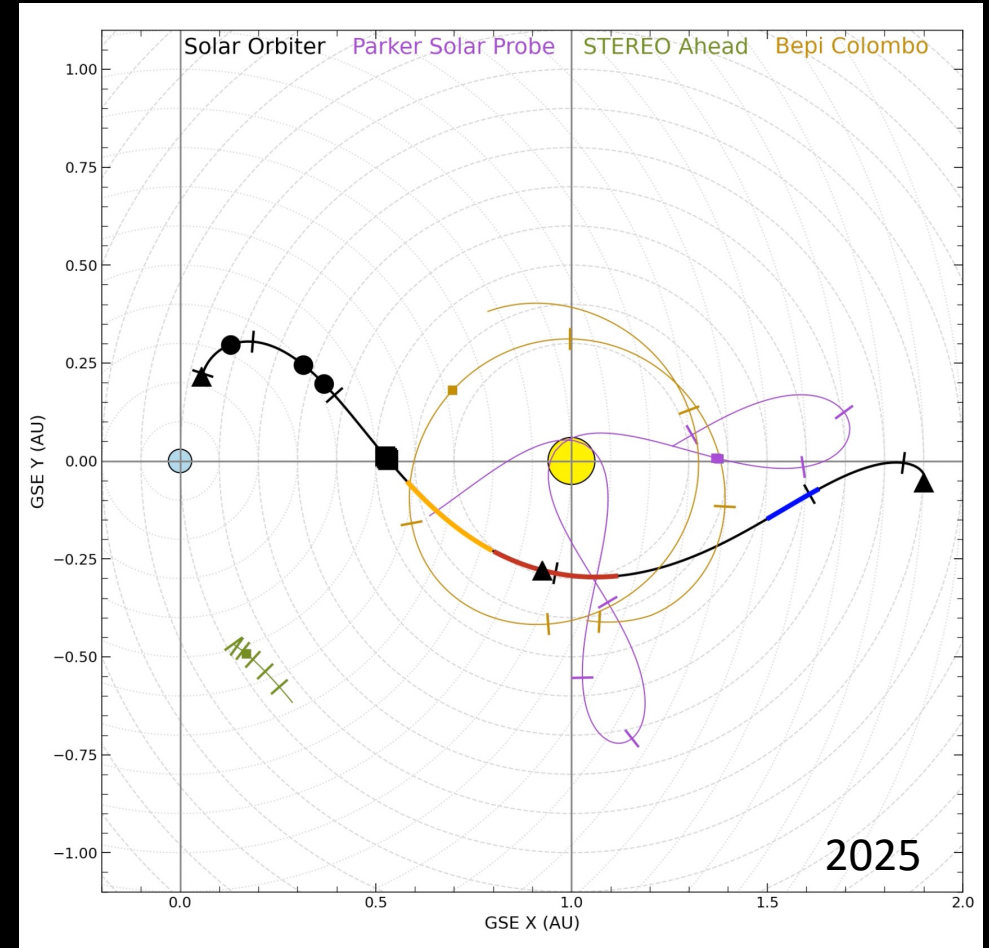
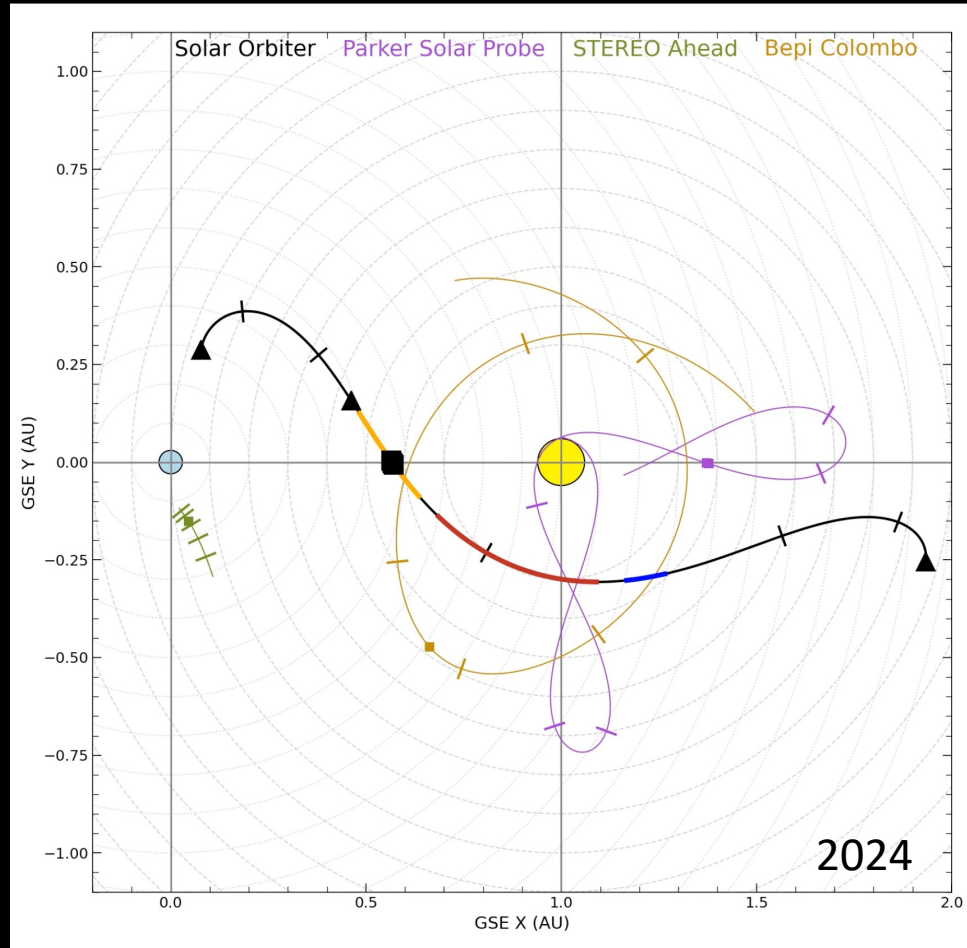
Coordinated Science: To Heliosphere

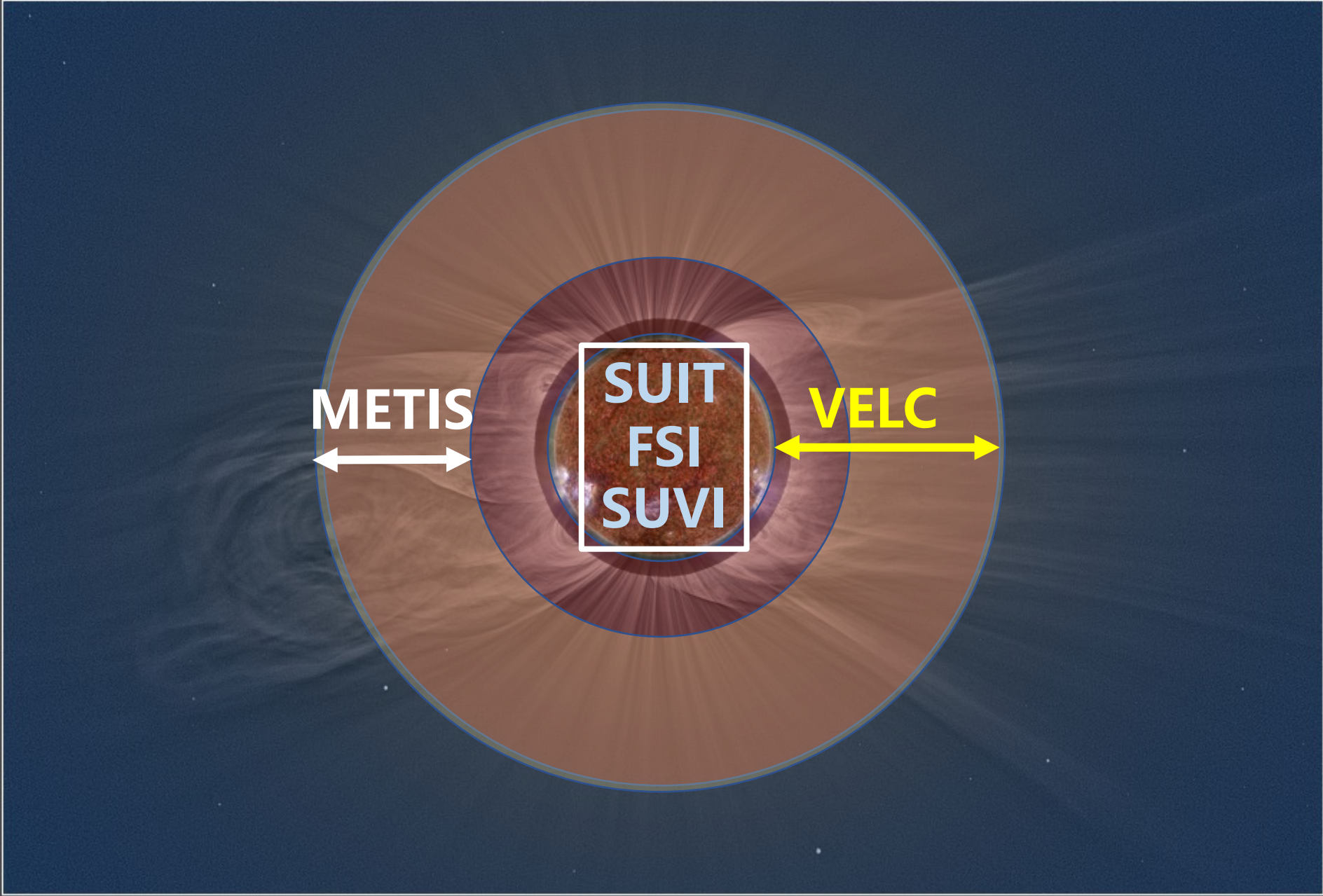
Tracking of
flows and
transients from
inner corona to
outer
heliosphere



Coordinated Science: SolO Conjunction

March 2024, 2025: Solar Orbiter crosses Sun-Earth line

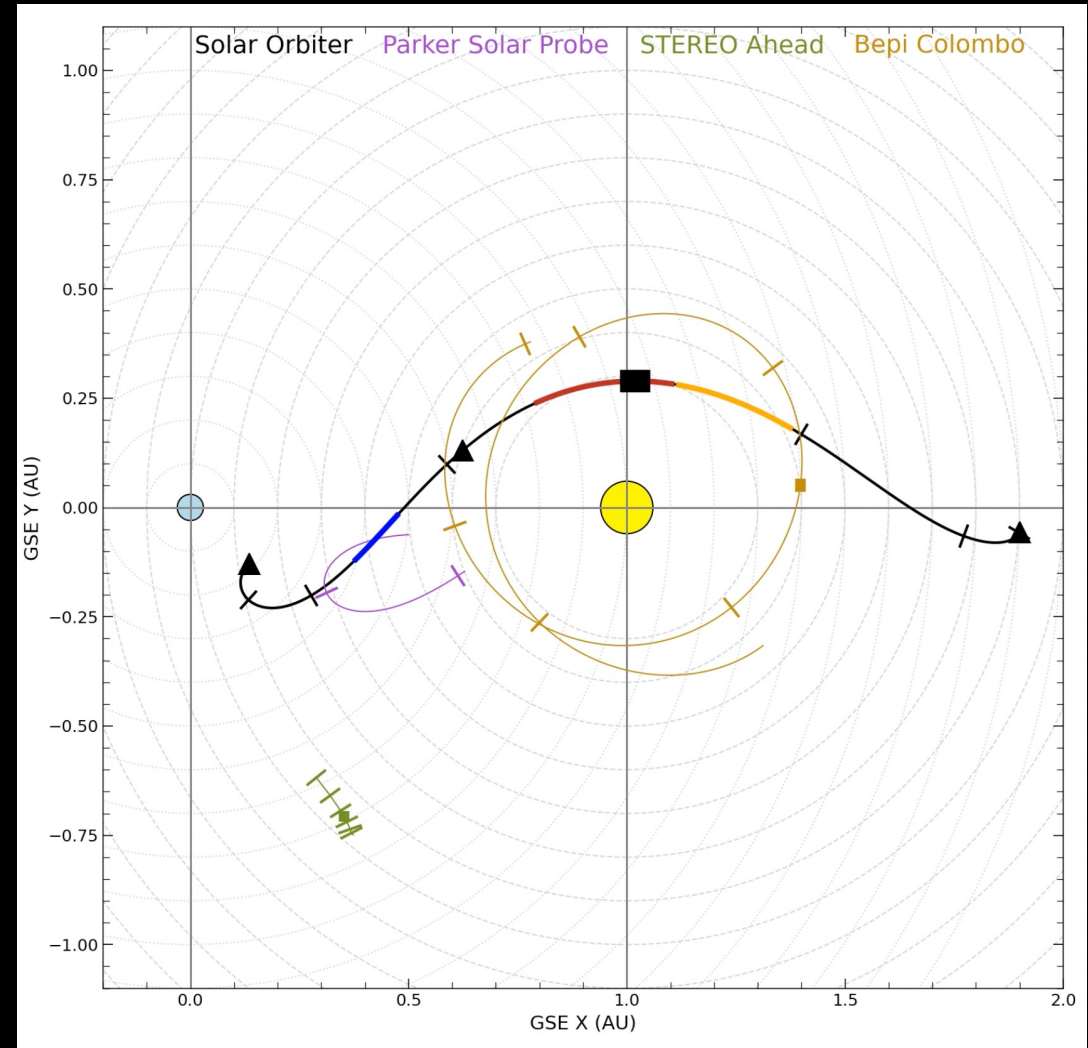




Coordinated Science: Future Conjunction

September 2025

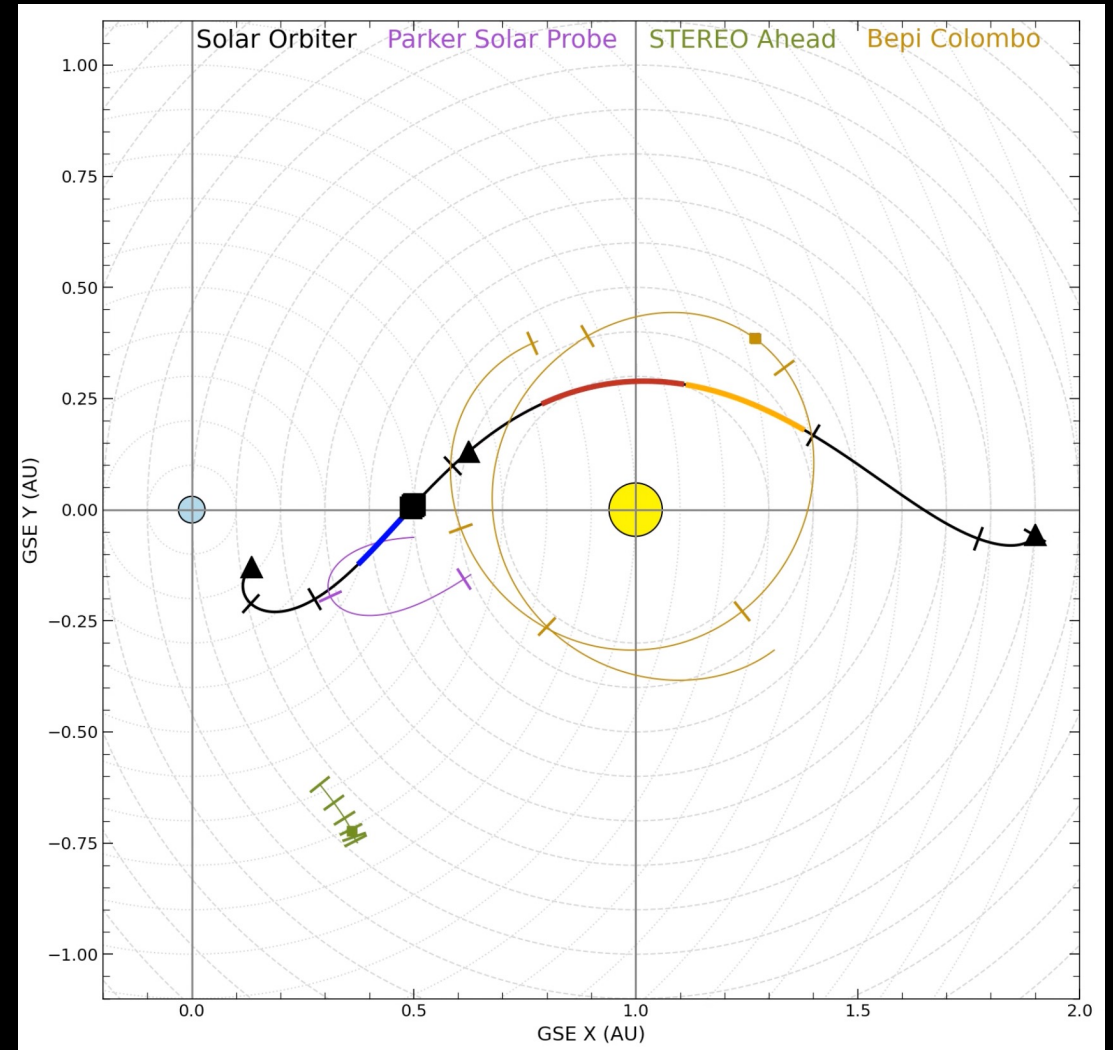
- Solar Orbiter in quadrature with Sun-Earth line
- Multiwavelength study of flows and transients from inner corona to heliosphere with remote sensing instruments onboard Aditya-L1, Solar Orbiter, PROBA3, SDO, uCoMP, GOES, STEREO, along with PUNCH
- Remote sensing + in-situ multiple possibilities



Coordinated Science: Future Conjunction

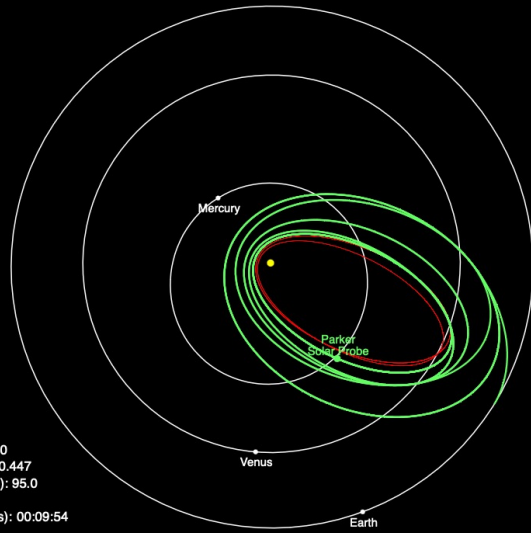
October 2025

- Solar Orbiter in Sun-Earth line and 20° above ecliptic
- Multiwavelength study of Earth-directed flows and transients with remote sensing and in-situ instruments onboard Aditya-L1, Solar Orbiter, PROBA3, SDO, uCoMP, GOES, STEREO, along with imaging observations from PUNCH

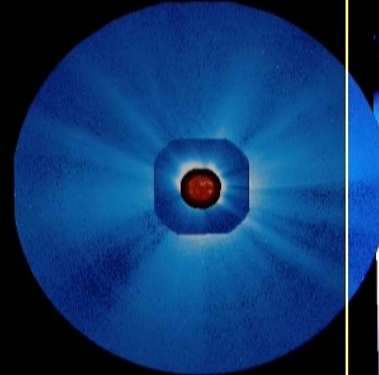


Coordinated Science: PSP Conjunction

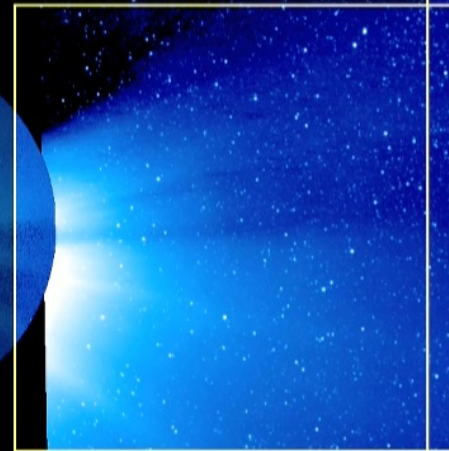
Parker Solar Probe Mission Trajectory and Current Position



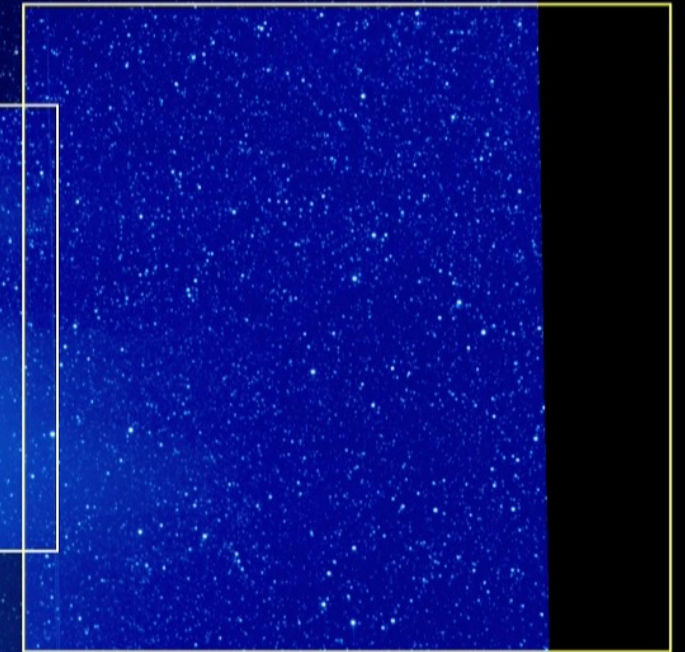
Heliocentric Velocity (km/s): 42.60
 Distance from Sun Center (AU): 0.447
 Distance from Sun's Surface (R_{\odot}): 95.0
 Distance from Earth (AU): 0.595
 Round-Trip Light Time (hh:mm:ss): 00:09:54
 4 Jul 2023 20:00:00 UTC



Telescope 1

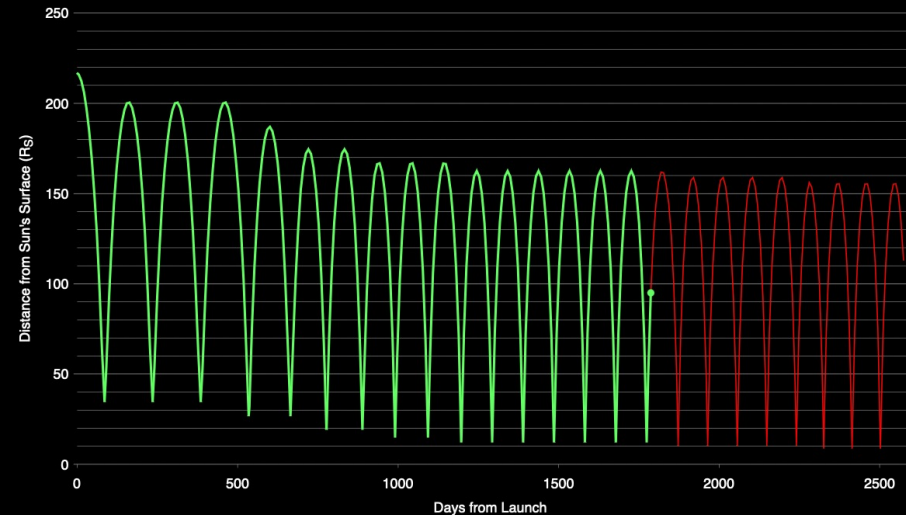


Telescope 2



WISPR FOV

Parker Solar Probe Distance from Sun



0.250 AU spacecraft to Sun
 6-09-2025 Parker Solar Probe
 6-01-2011 SECCHI images

- WISPR in future perihelia will have significant overlap with VELC FOV.
- Significant coordinated observations possible along with other remote sensing and in-situ instruments.

Some Possible Outcomes

- Enhanced understanding of kinematics of large-scale transients from inner corona to heliosphere.
- Understanding of where and how anti-Sunward moving structures accelerate.
- Identify where do the coronal inflows terminate.
- Thermodynamics of the transients and solar wind flows can be understood which are observed in heliosphere.
- Imaging and in-situ observations of transients as well as background can help constrain the space weather forecasting models.
- Improve understanding of the coupling of sub-structures of the observed dynamic structures.
- Origin and evolution of small- and large-scale structures.

Aditya-L1 Support Cell (AL1SC)

Aditya-L1
Support Cell

[Mission](#)

[Data Products](#)

[Planning](#)

[Media](#)

[Team members](#)

[Workshops](#)

Aditya-L1 Support Cell

A joint effort of ISRO and ARIES will act as a community service centre for the guest observers.



What do we do?



What do we do?



What do we do?



What do we do?



Aditya-L1 first
workshop in
June 2022

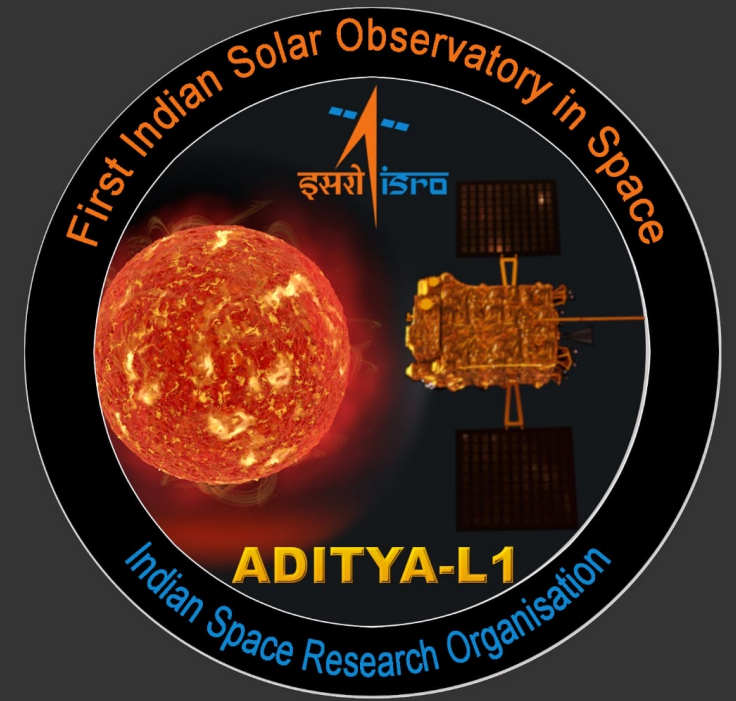


Aditya-L1
second
workshop in
November
2022



Aditya-L1 third
workshop in
February 2023





THANK YOU!



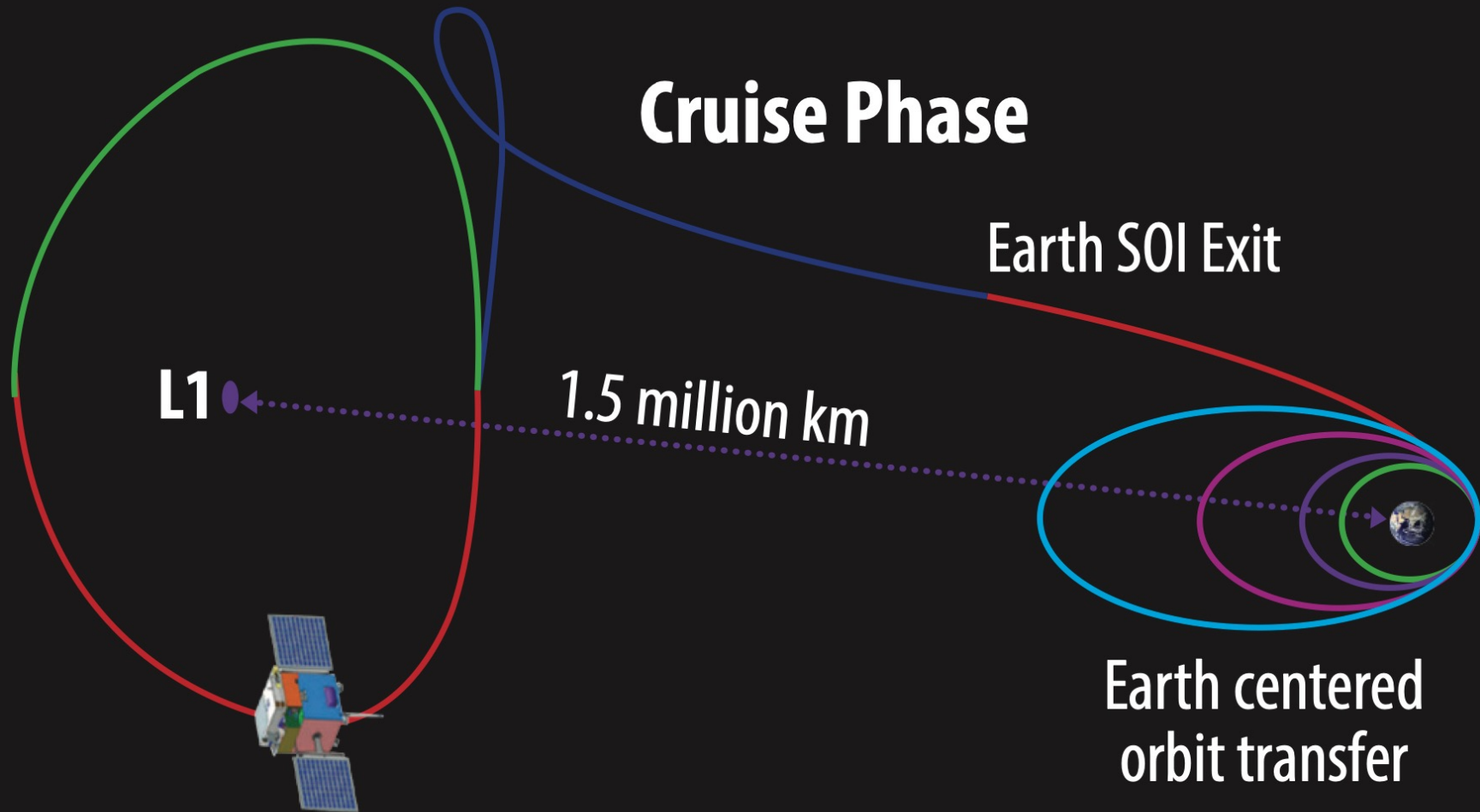
DIPU@ARIES.RES.IN



[HTTPS://WWW.ARIES.RES.IN](https://www.aries.res.in)

Halo orbit insertion in L1

ADITYA-L1 TRAJECTORY TO L1



Cruise Phase

Earth SOI Exit

1.5 million km

Earth centered orbit transfer



PSLV