

Plans and Needs for the Future Observational Infrastructure

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December 5, 2025

Critical Ground- and Space-based Observation Capabilities



GONG – NSF/NSO-NWS

NOAA now supporting operations

Ground-based

Magnetometers – USGS

Critical input to SWPC's geomagnetic storm products

Neutron Monitors – NSF and Academia

Solar Electro-Optical Network (SEON) – USAF



DSCOVR – NOAA

COSMIC-2; RO – TASA & NOAA; Commercial

GOES – NOAA



SW-GEO (Future) – NOAA

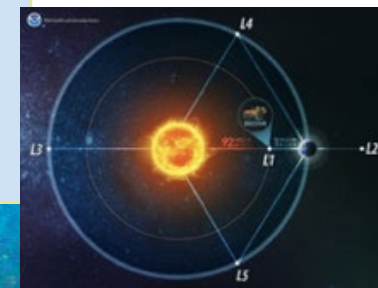
Solar Dynamics Observatory – NASA

Advanced Composition Explorer – NASA

Solar & Heliospheric Observatory mission (SOHO) – NASA-ESA

Space Weather Follow-On and Space Weather Next – NOAA

Vigil L5 – ESA



Spaceborne Space Weather at NOAA



NASA SMS
GOES 1-3



GOES 4-7



GOES 8-12



GOES-NOP



NASA SDO



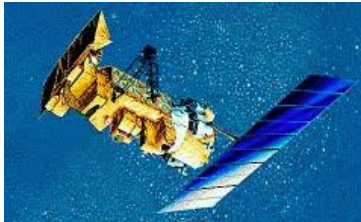
GOES-R Series



Legend:
Historical
Operational
In development



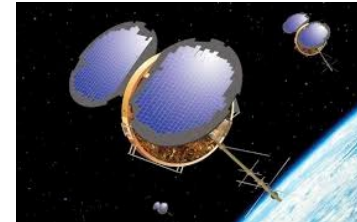
TIROS-N



POES



EUMETSAT Metop



COSMIC-1



COSMIC-2

EPS-SG
Commercial
Sources



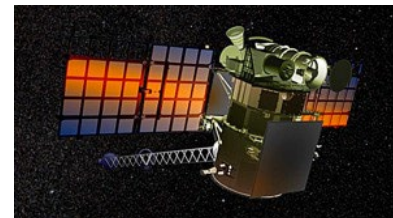
ESA/NASA SOHO



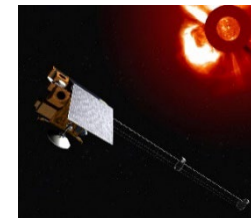
NASA ACE



NASA STEREO



DSCOVR

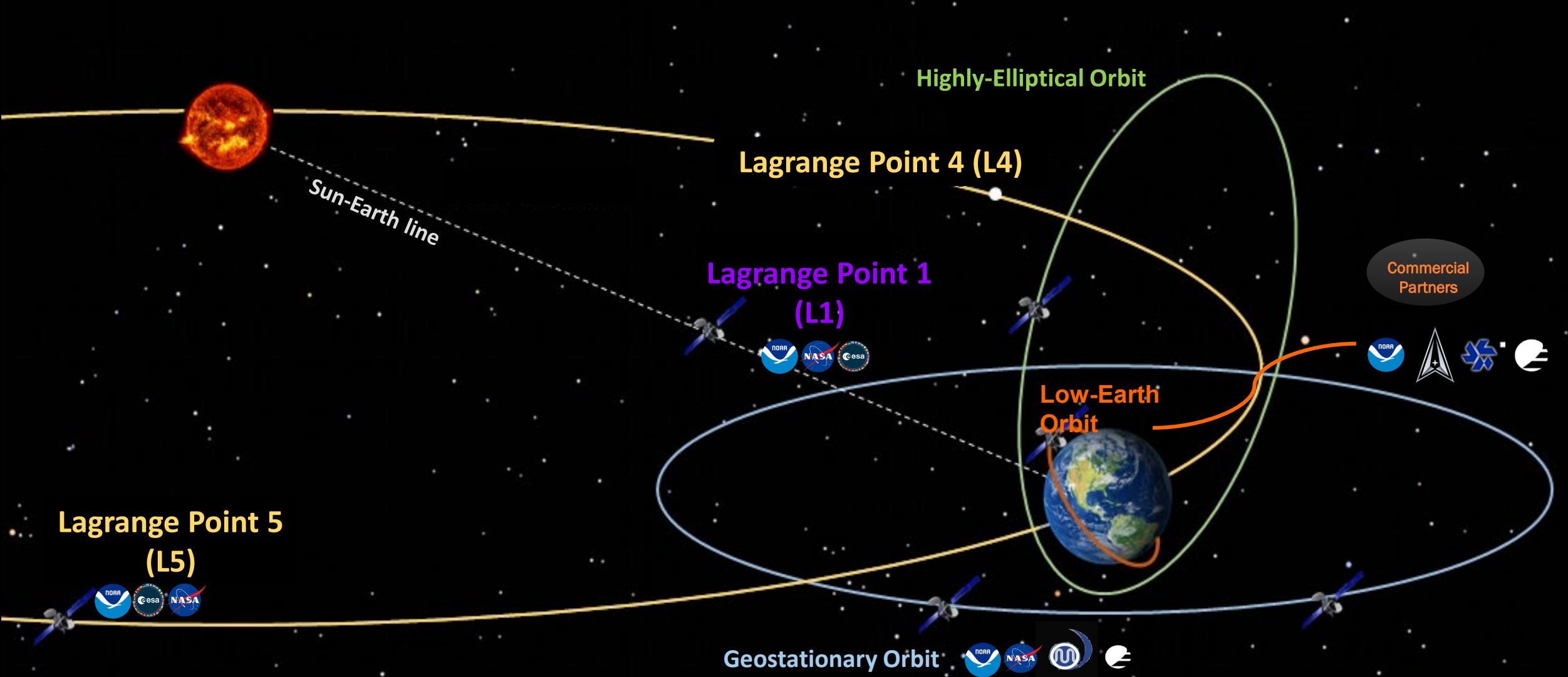


SWFO-L1



SOLAR Series

Multiple orbits to meet mission needs



SWFO-L1 Status

- Mission status
 - SWFO-L1 Observatory Commissioning has commenced
 - All Instruments (CCOR-2, STIS, MAG and SWiPS) are powered on and instrument commissioning has commenced
 - All checkouts and planned activities have been successful
 - Preparing for public data releases
 - L1 Orbit Insertion (6 burns) is planned for January 2026



Ensuring Continuity of Critical Spaceborne Observations

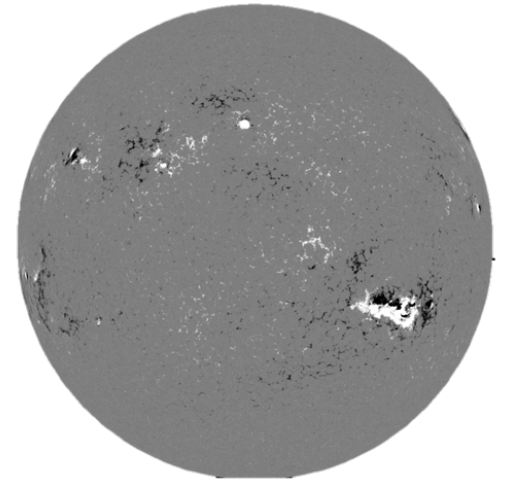


Operational Presence at L1

- SWO is proceeding with the development of SOLAR A and B missions

Magnetograph Imager

- NOAA relies on NASA HMI (magnetograph) instrument on SDO, operating well beyond planned mission lifetime (now 15+ years); there is no direct follow-on to HMI



Space Weather Observations from GEO

- SWO is examining trades to sustain observations from a GEO orbit to support user needs for monitoring space weather disturbances
- Trades include GOES-17 life extension

Need for a Ground-Based Version of CGMS



The Coordination Group
for Meteorological Satellites



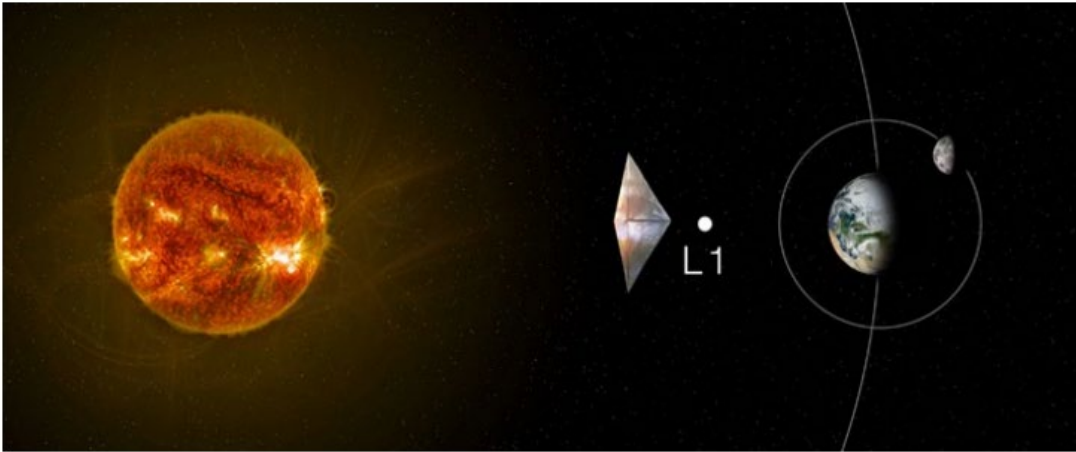
Needs to protect Cis-Lunar Space Environment

- Continue the critical observations
 - GONG is necessary for mag
- Transition experimental and research efforts into operational streams
- Support for non-POR observations difficult without capability improvement
 - Need to fully utilize current observations as part of the warning system as reflected in requirements
 - Assimilation – assimilation – assimilation
- Improve accuracy and lead time of storm predictions
 - Addition of L5 will help
 - Opportunity for Sub-L1 solar sail mission

Improve Lead Time - Solar Sails

- Operational improvement will be realized by repositioning solar wind satellites from the Sun-Earth L1 point (0.99AU) to 0.98AU to improve the lead time for geomagnetic storm warnings
- Geomagnetic storm warnings are based on in-situ measurements, their lead time has not improved in decades
- Warning time can only be lengthened by stationing closer to the sun with advanced propulsion
- Future requirements may potentially be for much more challenging duty stations, much closer to the sun, when the appropriate applied research missions have been flown
- **Solar sails are the immediate technology priority to reduce lead time**

A GEN1 flight mission - Overview



Development has been supported by NASA and NOAA. Mission can manifest as a secondary payload for launch to an L1 trajectory as soon as 2029. After ejection from the launch vehicle, the spacecraft will travel towards a sail-enabled, non-Keplerian sub-L1 halo orbit.

Mission Objectives

1. **Demonstrating Navigation with a Solar Sail Propulsion System:**

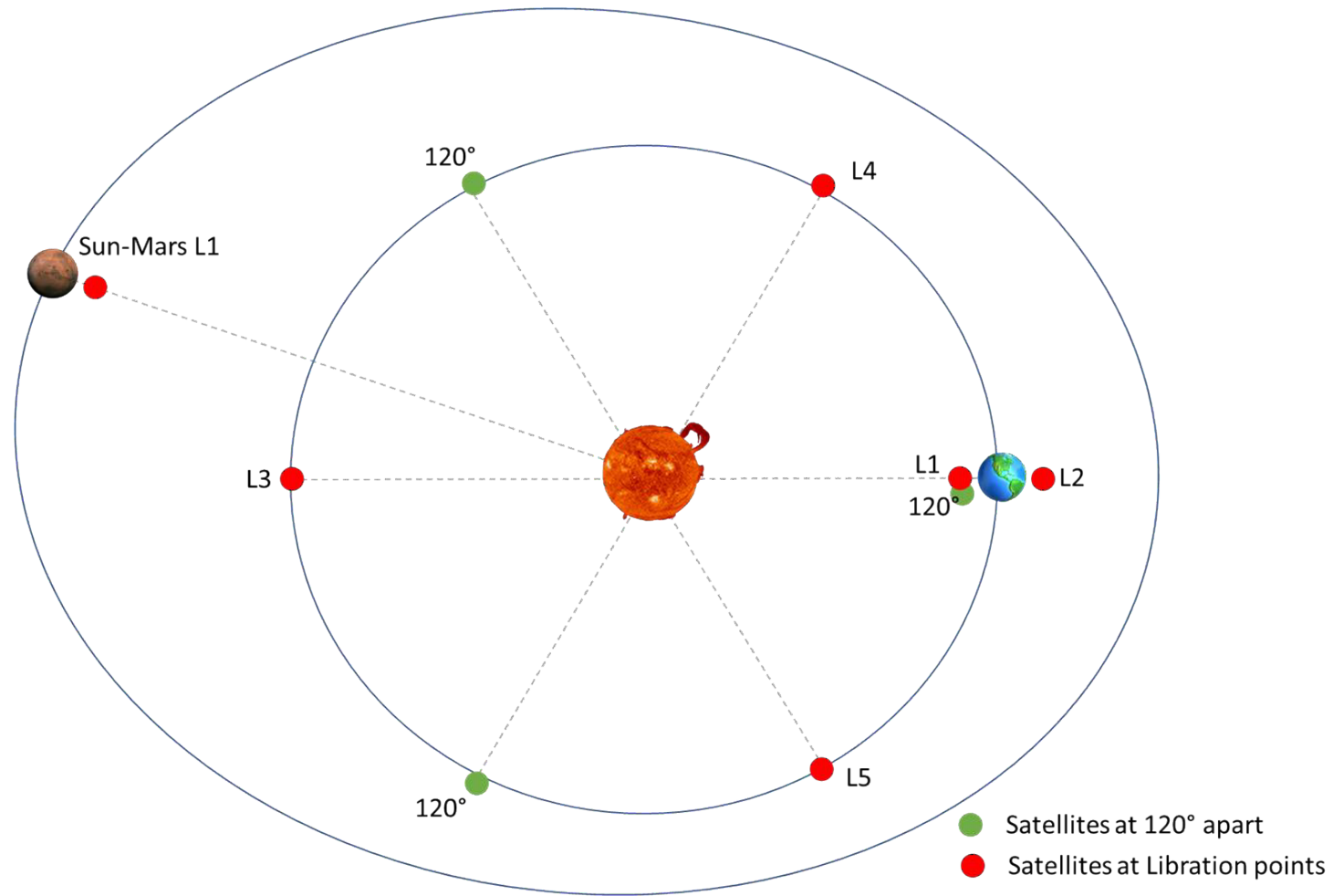
This objective will demonstrate the use of solar sails as a means of propulsion. The mission will demonstrate how a solar sail can be controlled and maneuvered for navigation.

2. **Verifying Performance of a Magnetometer on a Solar Sail Spacecraft:**

This objective will verify how the magnetometer works in the space environment aboard a solar sail spacecraft.

**This mission validates all core technologies required for current mission objectives
AND demonstrates full scalability to GEN2 sail sizes.**

Needs for Exploration



MARS observational infrastructure

- Baseline:
 - Solar photospheric magnetic field maps
 - Solar soft X-ray fluxes and flare location
 - Energetic ion and electron spectra and fluxes
- Enhanced:
 - White-light coronal imaging
 - In-situ magnetic field
 - Solar wind plasma properties
 - Space-based radio measurements
- Comprehensive
 - Solar EUV imager
 - Heliospheric imager
 - EUV/FUV solar spectral irradiance
 - Intravehicle dosimeter

SWFO-L1 Launch
Kennedy Space Center
09/24/25
7:32 AM

