NOAA's Current and Future Space Weather Architecture

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NOAA
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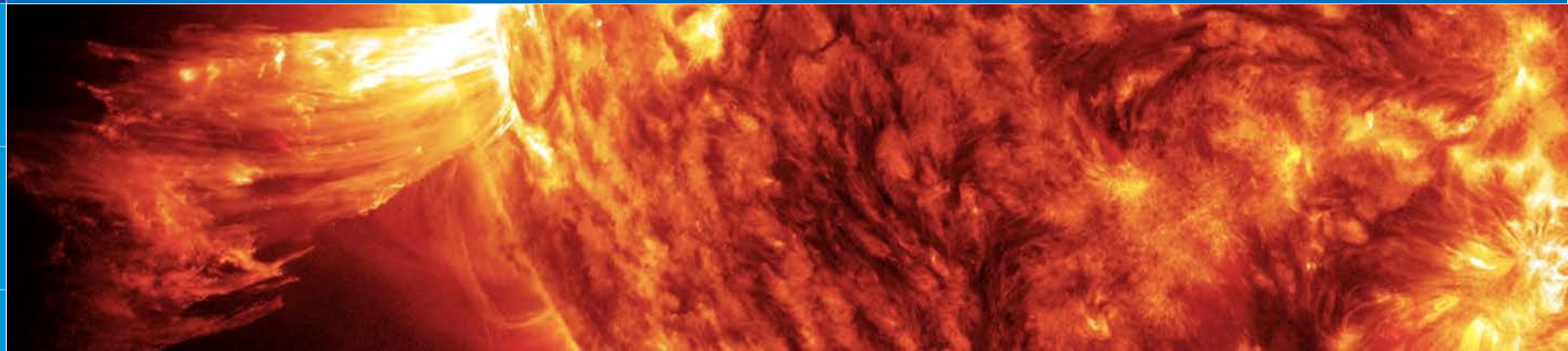
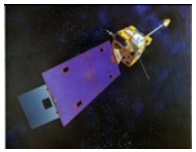


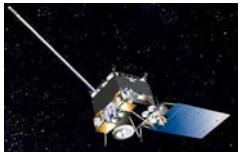
Spaceborne Space Weather at NOAA

NASA SMS
GOES 1-3

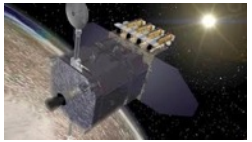
GOES 4-7



GOES 8-12

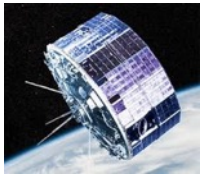


GOES-NOP Series

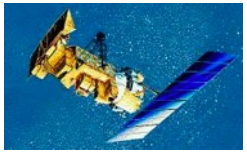


NASA SDO

GOES-R Series

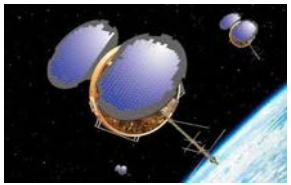


TIROS-N



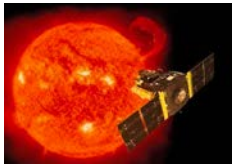
POES

EUMETSAT Metop

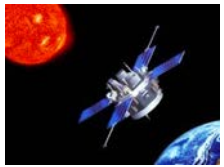


COSMIC-1

COSMIC-2

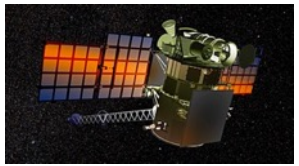


ESA/NASA SOHO

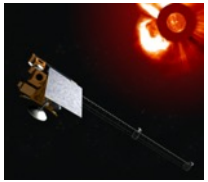


NASA ACE

NASA STEREO

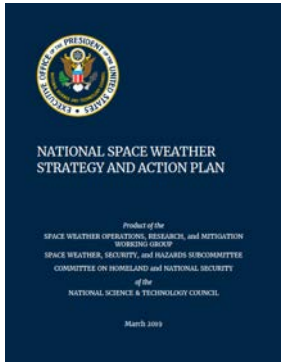


DSCOVR



SWFO-L1

Space Weather as a National Priority

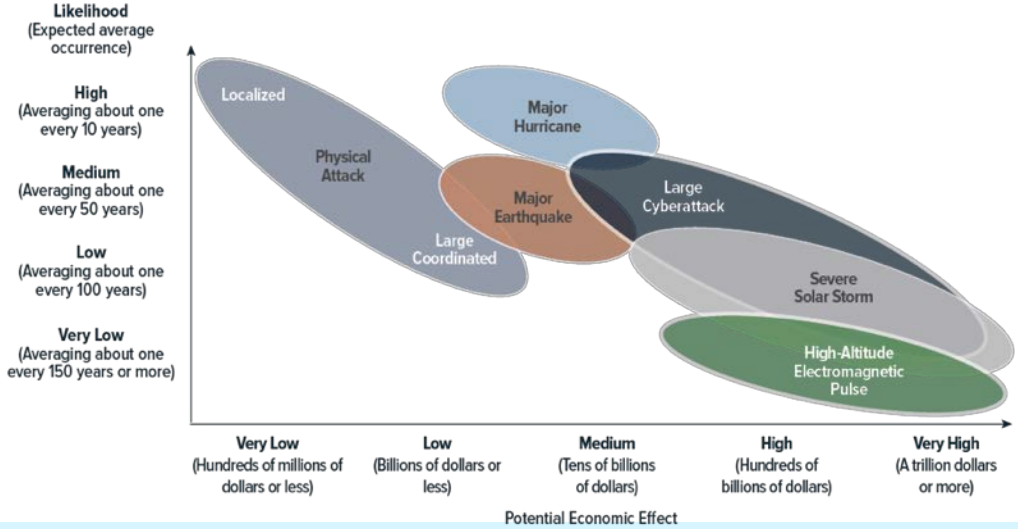


2019 Space Weather Strategy and Action Plan

Space Weather Operations, Research, Mitigation Working Group, National Science & Technology Council

2020 Enhancing the Security of the North American Electric Grid

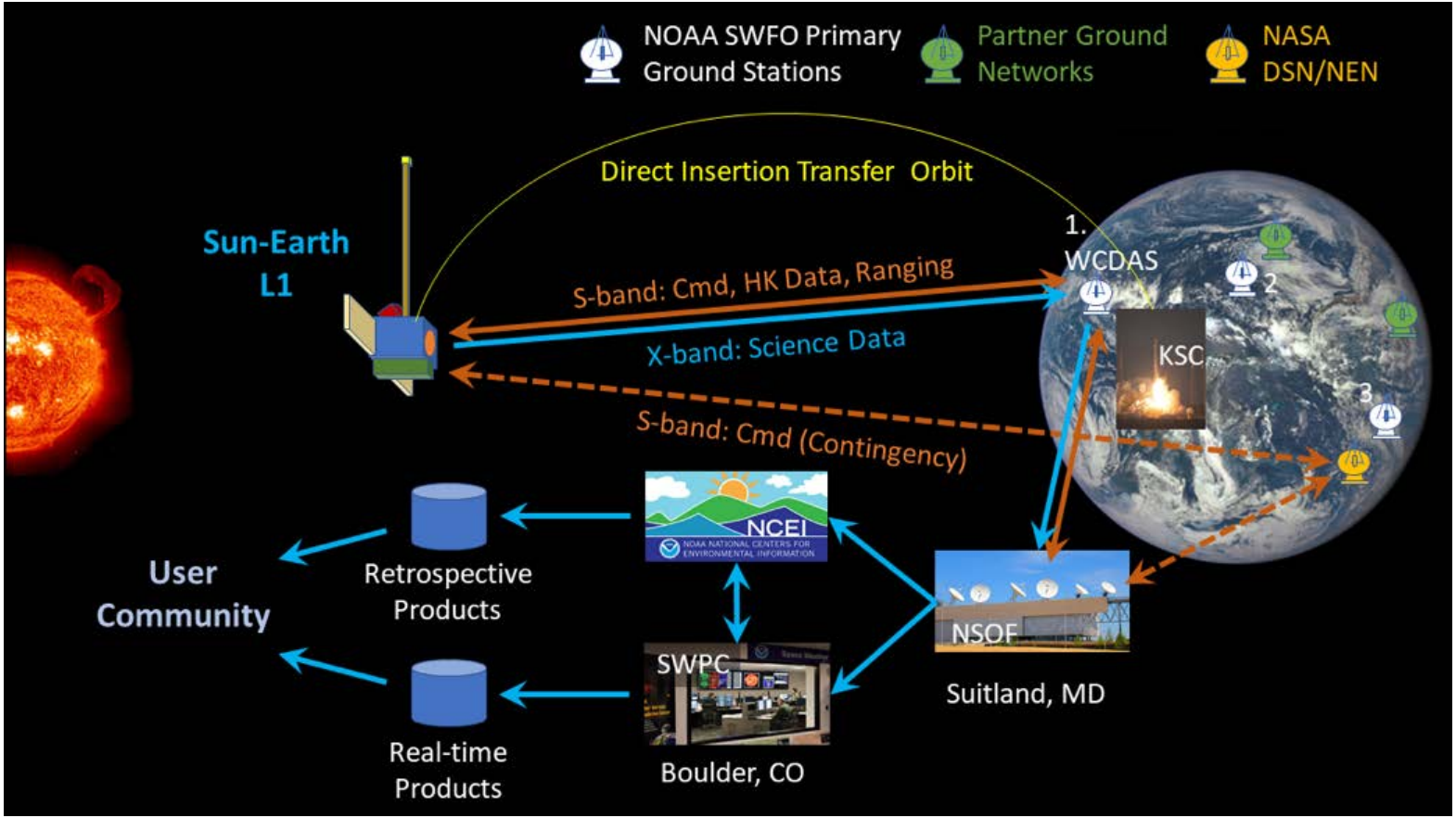
Congressional Budget Office



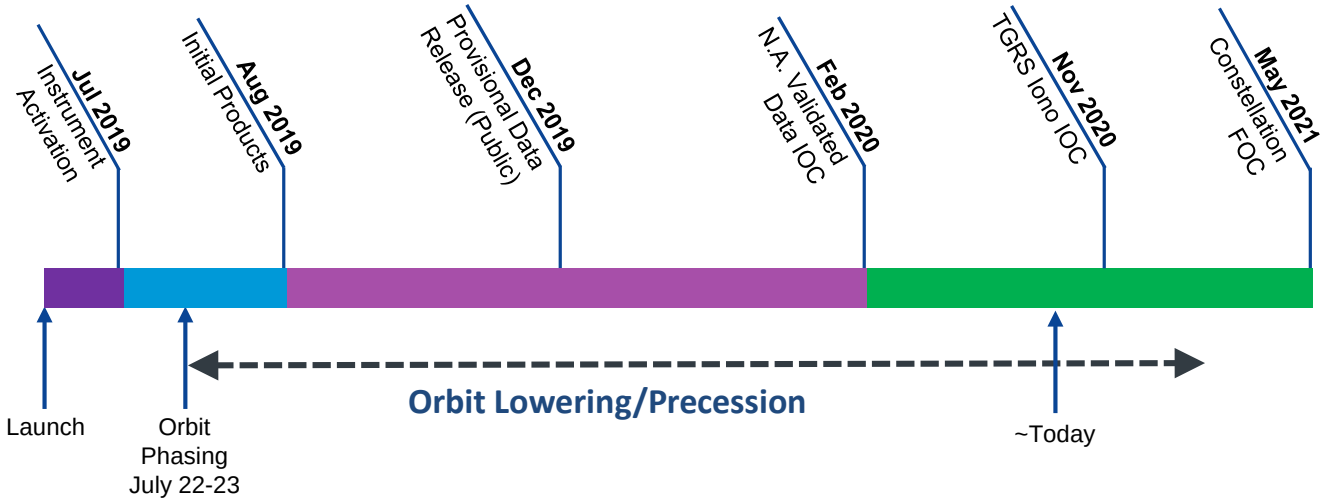
NOAA in the last 2 years (& since June)…

- Established the baseline operational Space Weather Follow On (SWFO) Program
  - Secured funding in the NOAA budget for L1 coverage
  - Begun flight fabrication of the Compact CORonagraph (CCOR) with NRL
  - Secured funding in the NOAA budget for CCOR on GOES-U
  - Established a joint project office with NASA for SWFO
  - Established an agreement with the NASA IMAP mission for a rideshare for SWFO-L1
  - **Let contracts out for instruments and spacecraft for SWFO-L1**
  - Formulated arrangements with ESA for data sharing with the L5 mission
  - Negotiating with ESA for instrument exchanges
- Launched the COSMIC-2 mission with Taiwan
  - **4 satellites now in final orbit**
- **NOAA/NESDIS Formulating a Space Weather Program**

SWFO Mission Architecture



COSMIC -2 Schedule



- Launch and early orbit operations
- Checkout and commissioning
- Weather Cal/Val
- Weather Operations

N.A. = Neutral Atmosphere
Iono = Ionosphere
IOC = Initial Operational Capability
FOC = Full Operational Capability

Pillars of NESDIS Observing System Implementation

Integrated, Adaptable and Affordable: Orbits, Instruments & Systems

GEO

Continuous real-time observations supporting warnings and watches of severe weather and hour-by-hour changes. High-inclination orbits to observe northern latitude & polar regions.

LEO

Miniaturized instruments on small, affordable and proliferated satellites and partner data improving forecasts through better and additional data. Better precipitation forecasts, wave height predictions, ocean currents, and more.

Space Weather

Reliably monitoring space weather from L1, GEO and LEO can protect the nation's valuable, vulnerable infrastructure. New capabilities at L5 and HEO can provide additional insight and improve forecasts.

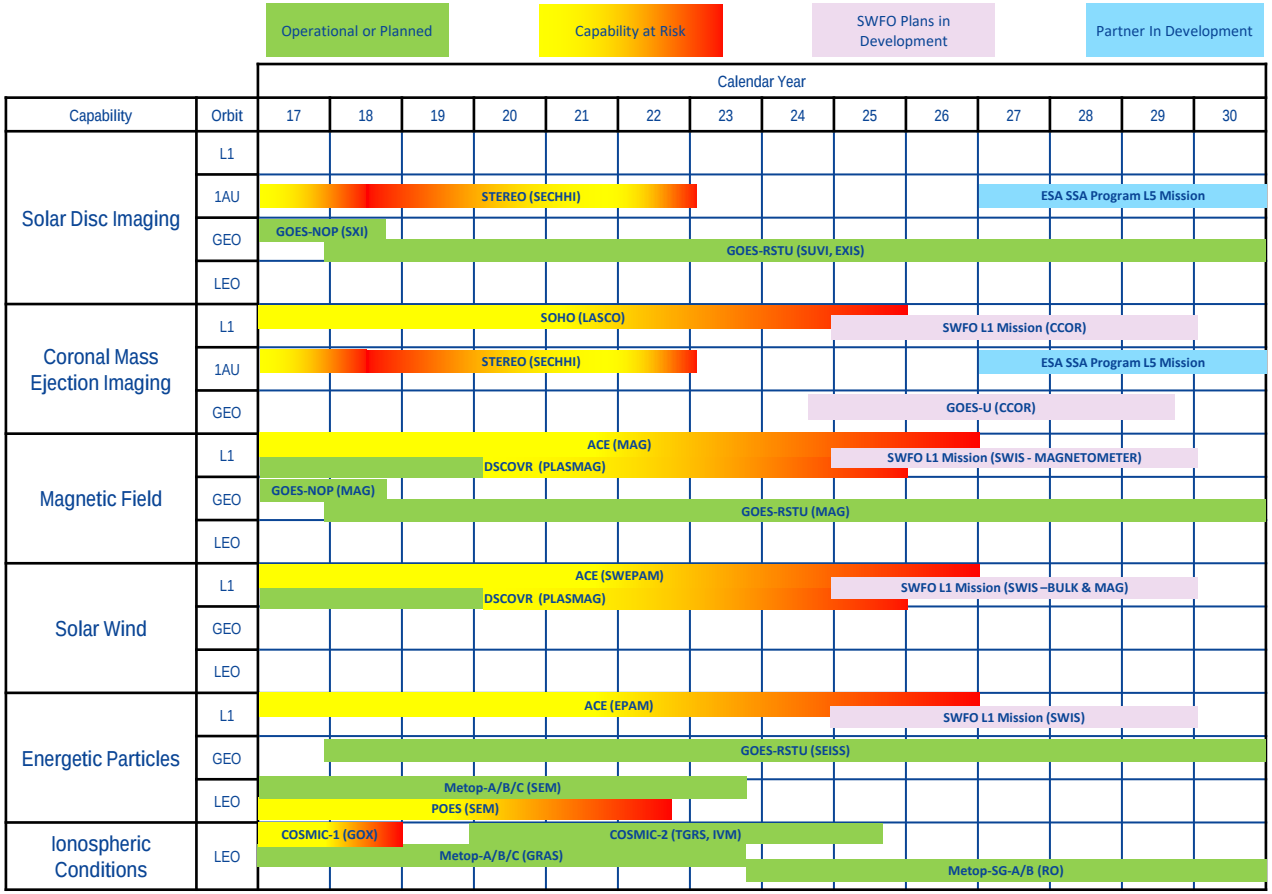
Common Ground Services

Secure ingest of data in different formats from different partners requires a flexible, scalable platform. Common Services approach integrates Cloud, AI and machine-learning capabilities to verify, calibrate and fuse data into new and better products and services.

NOAA/NESDIS Formulating a Space Weather Program

- Diverse observing requirements must be made from diverse vantage points (LEO, GEO, Sun-Earth line, L1 and off the Sun-Earth line)
- Continuity and anticipated product improvement need dates are varied:
  - Long Lead Instrumentation
  - Next Generation L1 & off-Sun-Earth-axis
  - Space Weather Ground Operations
  - Geostationary Observations
  - Tundra/High Elliptical Orbit Observations
  - Low Earth Orbit Observations
- Program formulation will initialize a loosely coupled program with an initial set of projects.
- As new project requirements and concepts are identified through user engagement, approved by NESDIS, and matured by the program, they will be instantiated as projects within the portfolio.

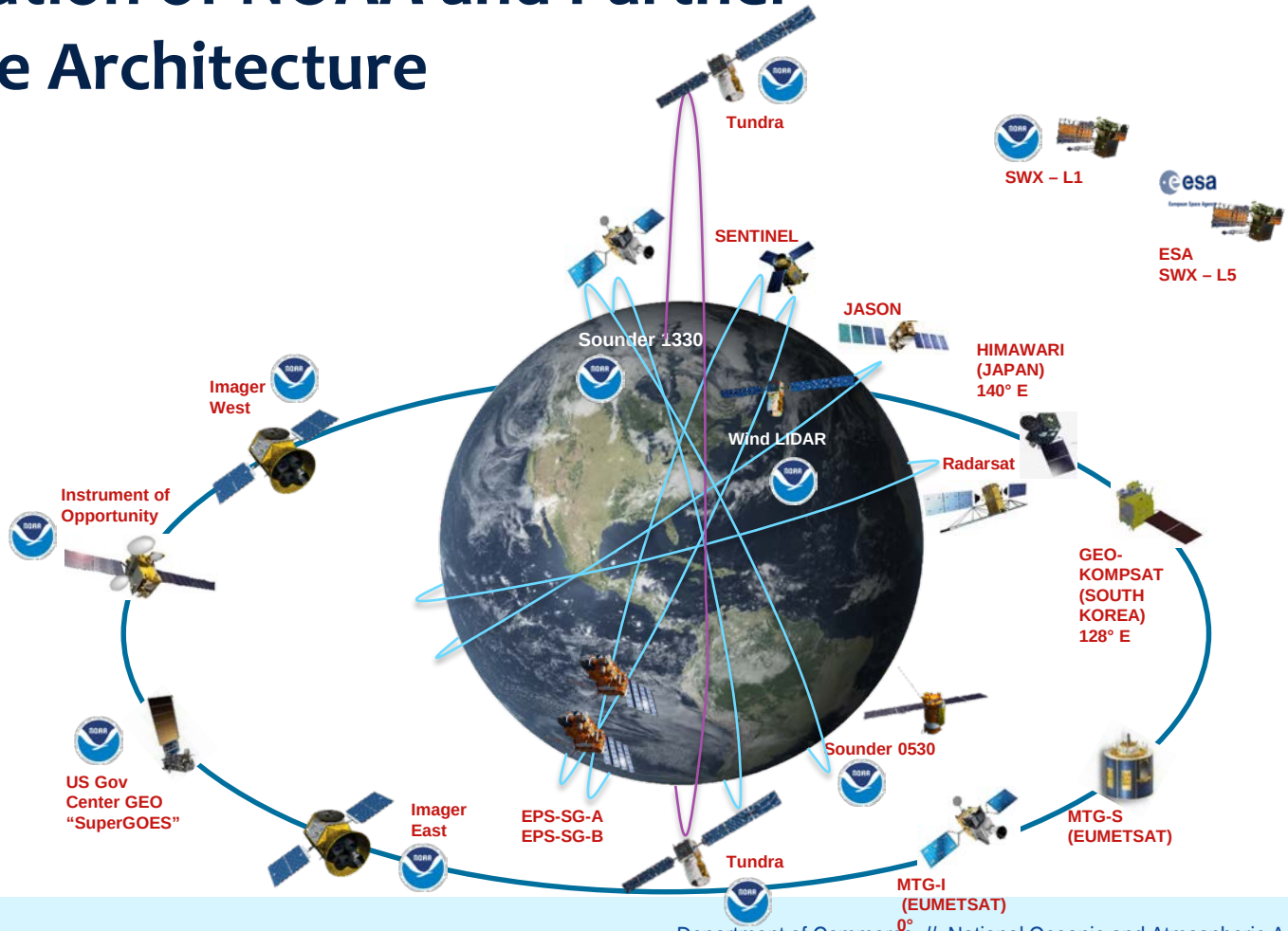
Space Weather is Inherently Disaggregated



Requirements definition approach

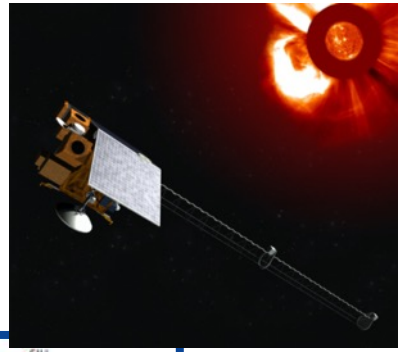
- Requirements Working Group established May 2020, continues through next year
- Start with Program of Record (POR) 2025 – continuity of observations
- Identify and vet architectures that achieve the 2018 NSOSA/SPRWG unmet requirements
- Address POR capabilities at Geostationary Orbit
- Address SPRWG new capabilities at Tundra
- Canvas emerging space weather operational needs with user engagement efforts in cooperation with SWPC and OSTP/SWORM

Evolution of NOAA and Partner Space Architecture

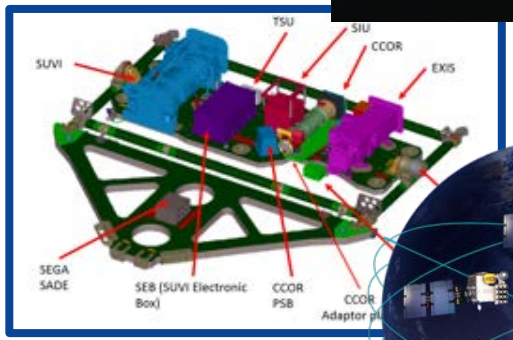


Starting Point – 2025 Program of Record

2025 NOAA Space Weather
Observing Program of Record
Starting point for Infrastructure Workshop

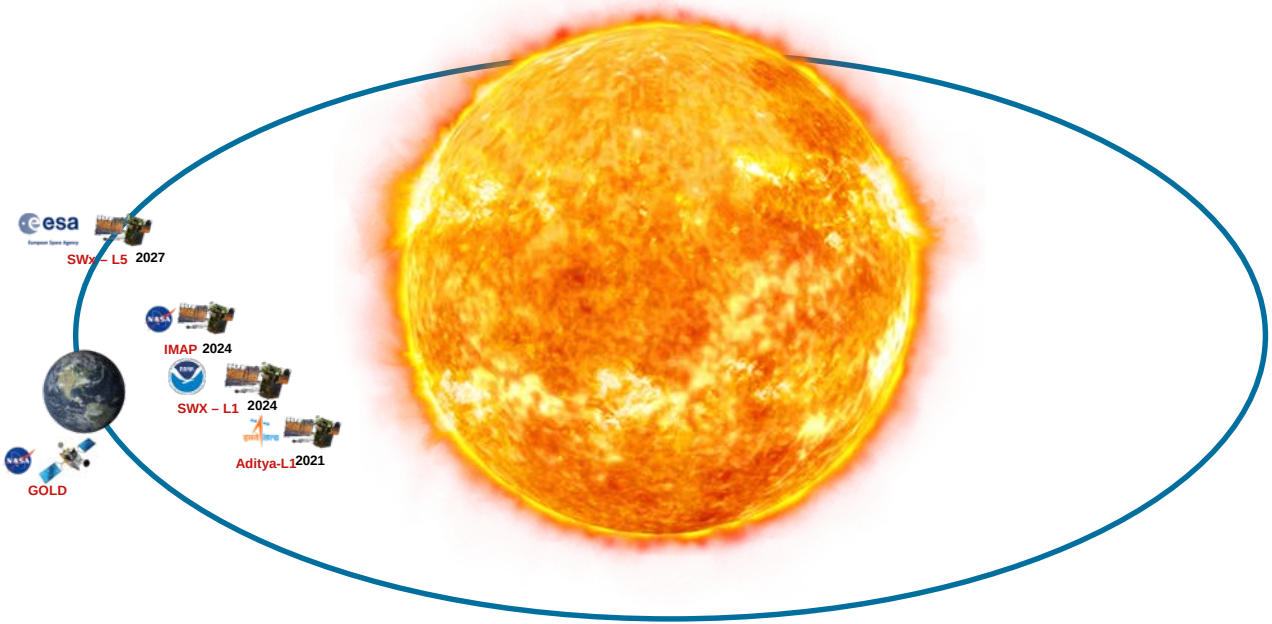


- SWFO – L1
- GOES–East, GOES–West (CCOR1 on 1)
- COSMIC-2
- GOLD
- Metop – C, SG A1, SG B1
- *ESA – L5 (2027)*



What's next for 2030 and beyond?

Evolution of Space Weather Architecture



NOAA

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Thank you!