NOAA Space Weather Observations Update

Presented to CGMS-53 WG, Space Weather Coordination Group, Agenda Item 3.5

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Coordination Group for Meteorological Satellites

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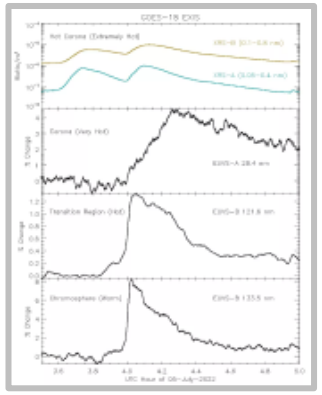
NOAA Space Weather Observations Update

- CCOR-1 launched on GOES-19 on June 25, 2024 and NOAA publicly released the first images from the instruments on October 22, 2024. GOES-19 is planned to become operational on April 4.
- SWFO-L1 is planned to launch in September 2025 and will feature CCOR-2 and numerous other Space Weather instruments including a Solar Wind Plasma Sensor (SWiPS), Suprathermal Ion Sensor(STIS), Magnetometer(MAG).
- The SOL project received Key Decision Point B (KDP-B) approval in December 2024.
- Space Weather Next GEO series requirement and concept definition work is ongoing.

Office of Space Weather Observations (SWO)

Space Weather Follow On Program

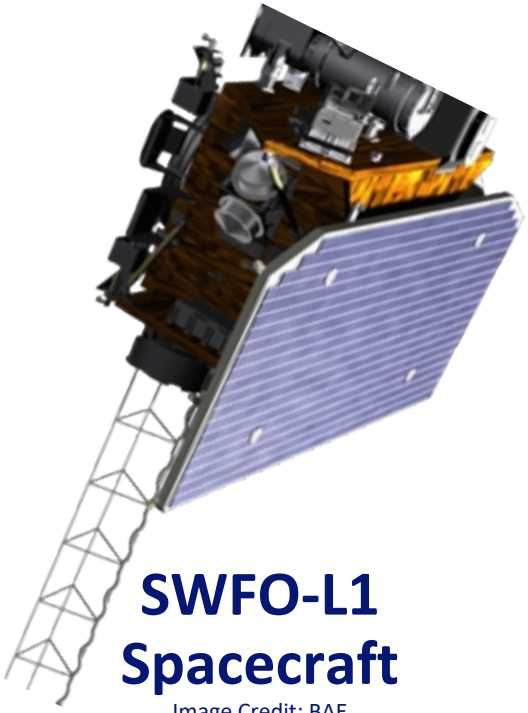
GOES-16 SUVI



GOES-18 EXIS

CCOR-1 integration onto GOES-19
Image Credit: Lockheed Martin

CCOR-2 on SWFO-L1
Together with:
Solar Wind Plasma
Ion Sensor
Magnetometer



SWFO-L1 Spacecraft
Image Credit: BAE

Reaching L1 riding with NASA's IMAP mission
Will become SOL1 once operational

Space Weather Next Program

- Planning for **continuity** and enhanced capability with **observations** from:
  - Solar Observations at L1 (SOL) Series - L1 extended continuity
  - L5 Orbits – ESA Partner
  - Geostationary Orbit
  - Low Earth Orbit
- Development of Space Weather Ground Support Networks

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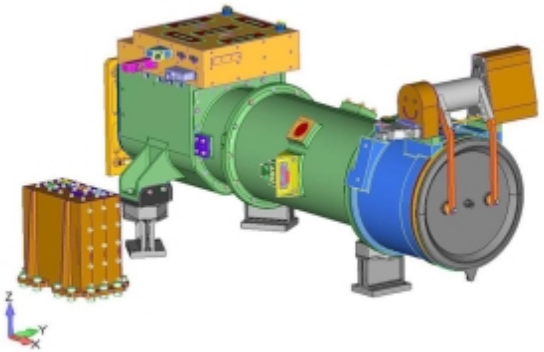
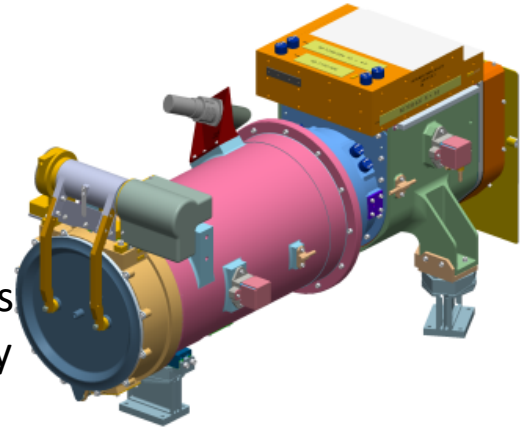
SWFO: State-of-the-Art Heliophysics Instruments



CCOR-1

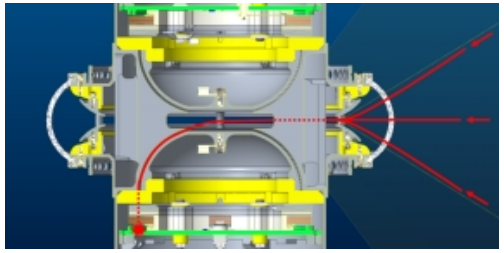
Compact Coronagraphs (CCORs): Developed by Naval Research Lab (NRL), the telescope will be used to observe the solar corona and detect coronal mass ejections (CMEs) and other structures. CCOR-1 will fly on the GOES-U satellite and a nearly identical CCOR-2 on SWFO-L1.



CCOR-2

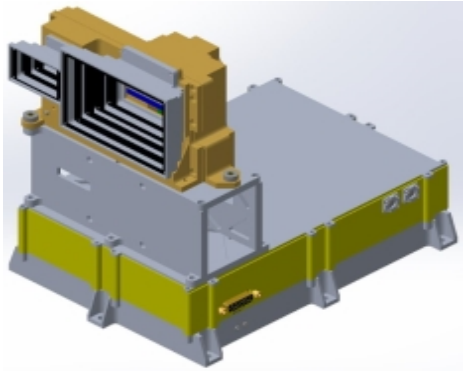
U.S. NAVAL RESEARCH LABORATORY

Solar Wind Plasma Sensor (SWiPS): Built by Southwest Research Institute (SwRI), it will measure properties of the solar wind plasma flowing past SWFO-L1, such as density, velocity, and temperature.



SwRI

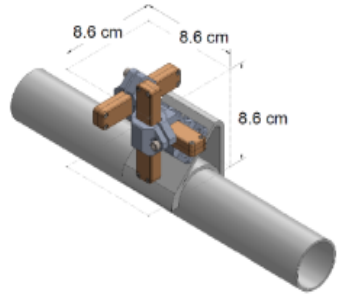
Suprathermal Ion Sensor (STIS): Developed by University of California, Berkeley, it will collect fast ions in the solar wind.



Berkeley UNIVERSITY OF CALIFORNIA

Magnetometer (MAG): Developed by the University of New Hampshire and SwRI, it will measure the magnetic field carried by the solar wind.

University of New Hampshire



SwRI

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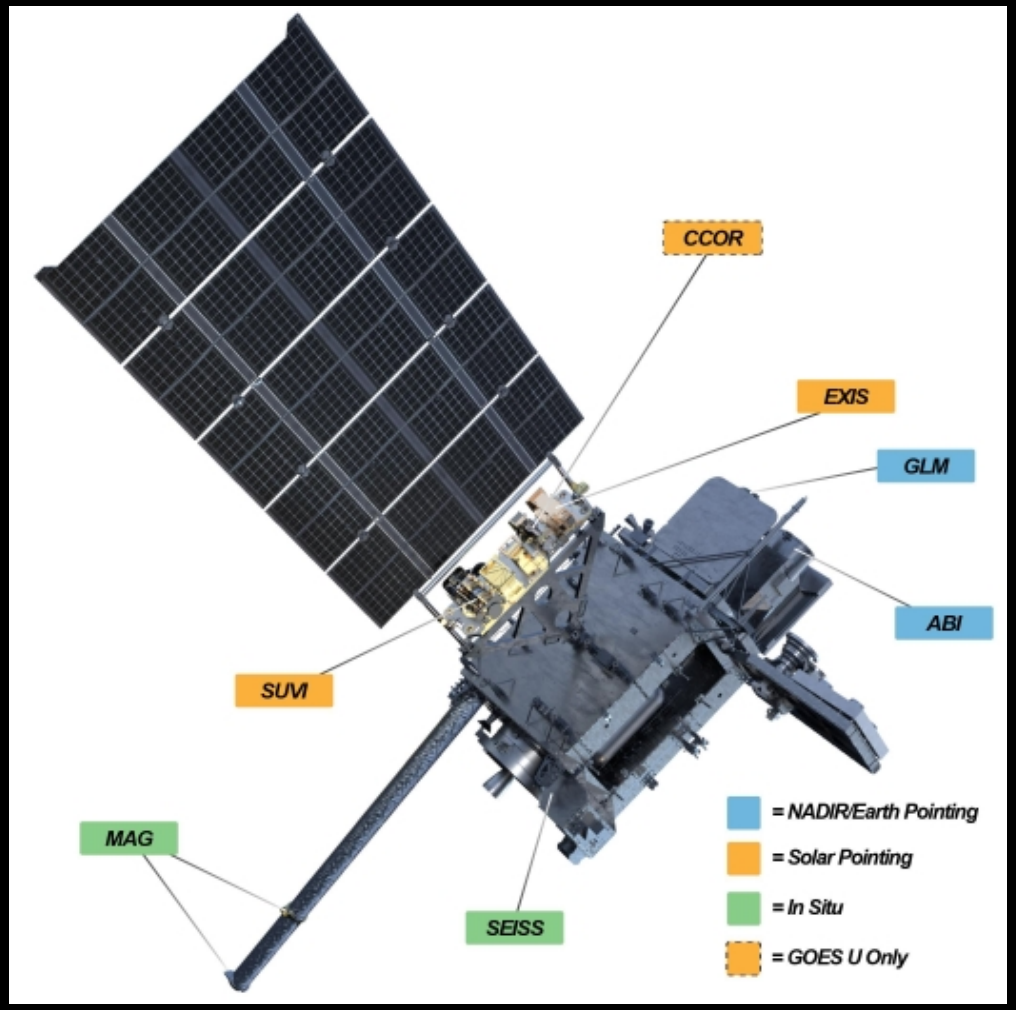
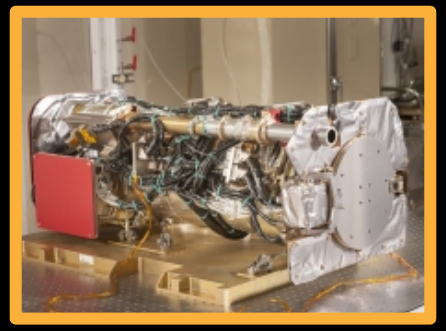
GOES-19 spacecraft hosts NOAA's first operational coronagraph

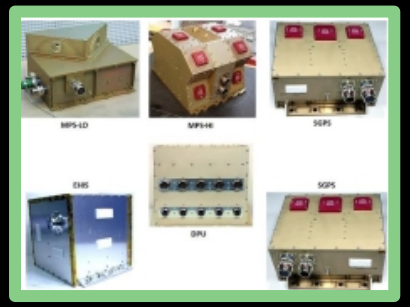


Rendering of the GOES-19 satellite



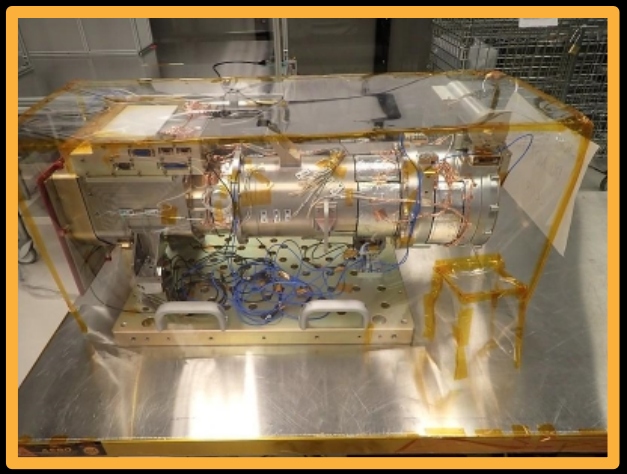
Solar Ultraviolet Imager (SUVI)

Magnetometer (MAG) Sensor

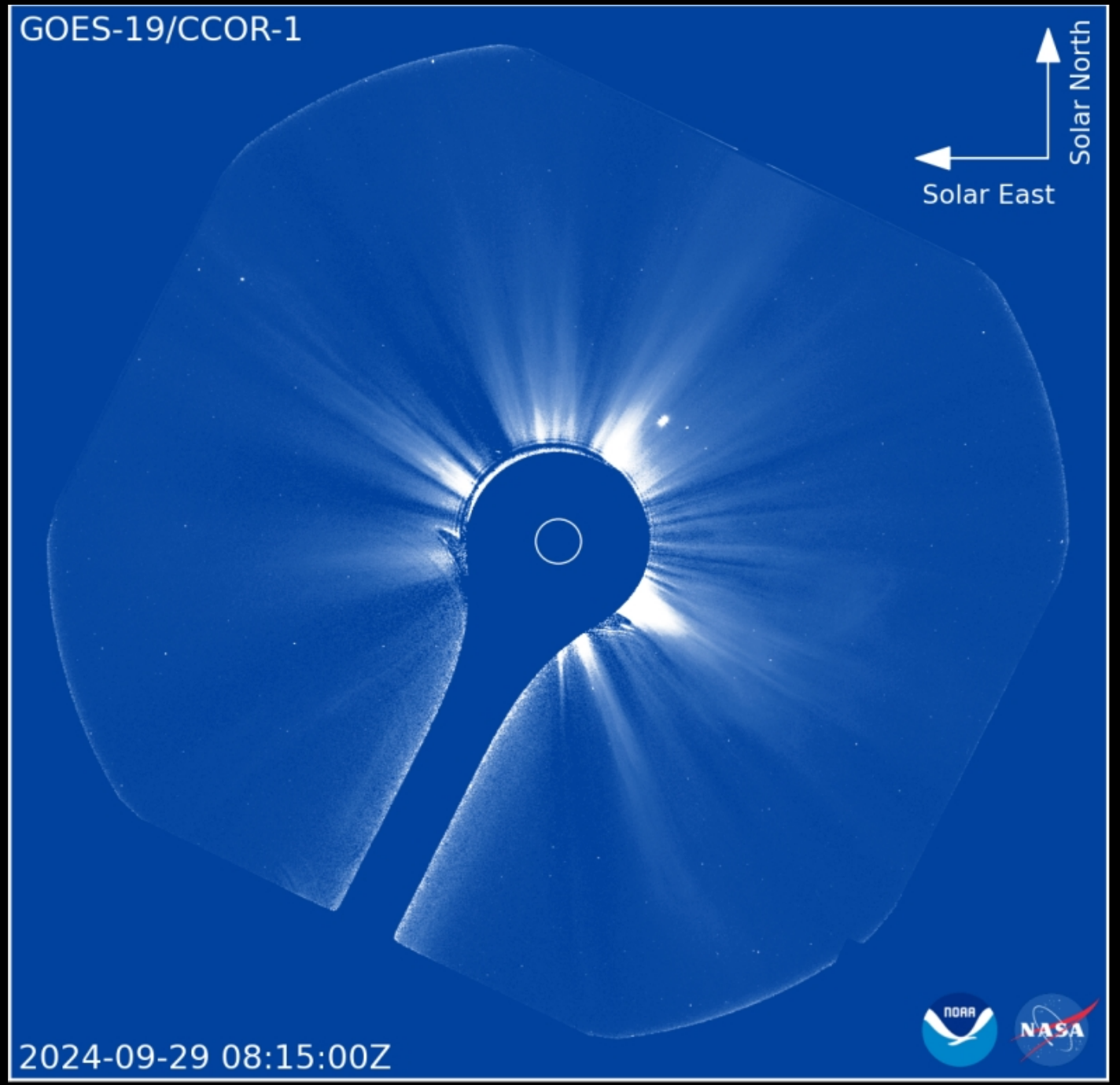


Space Environment In-Situ Suite (SEISS)

Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS)



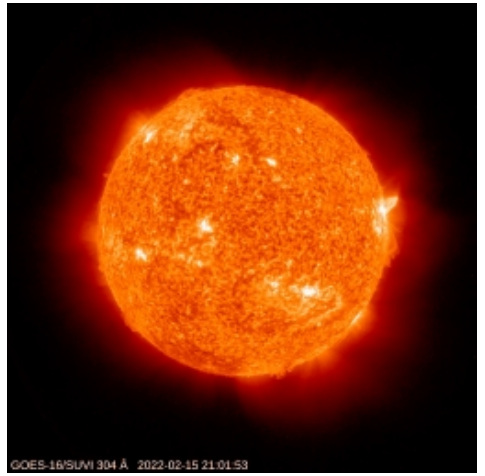
Compact Coronagraph (CCOR)


GOES-19/CCOR-1
Solar North
Solar East
NOAA
NASA
2024-09-29 08:15:00Z

Space Weather Next (SW Next) Program

SW Next will **maintain and extend** space weather observations from a range of different observing points, selected to most efficiently provide the comprehensive knowledge of the Sun and the near-Earth space environment.

✓ Planning for **continuity of observations** from:
- L1 and L5 orbits
- Geostationary orbit
- Low Earth orbit
- Space Weather ground support networks



✓ **Pre-formulation underway**
- GEO Series requirement and concept definition work is ongoing
- L5 Project preparing for System Requirement Review

✓ **Project formulation**
- SOL Project received Key Decision Point B (KDP-B) approval in December 2024

✓ **Development** of Ground Services underway

✓ **Engaging stakeholders** through user outreach, partnerships, and market research

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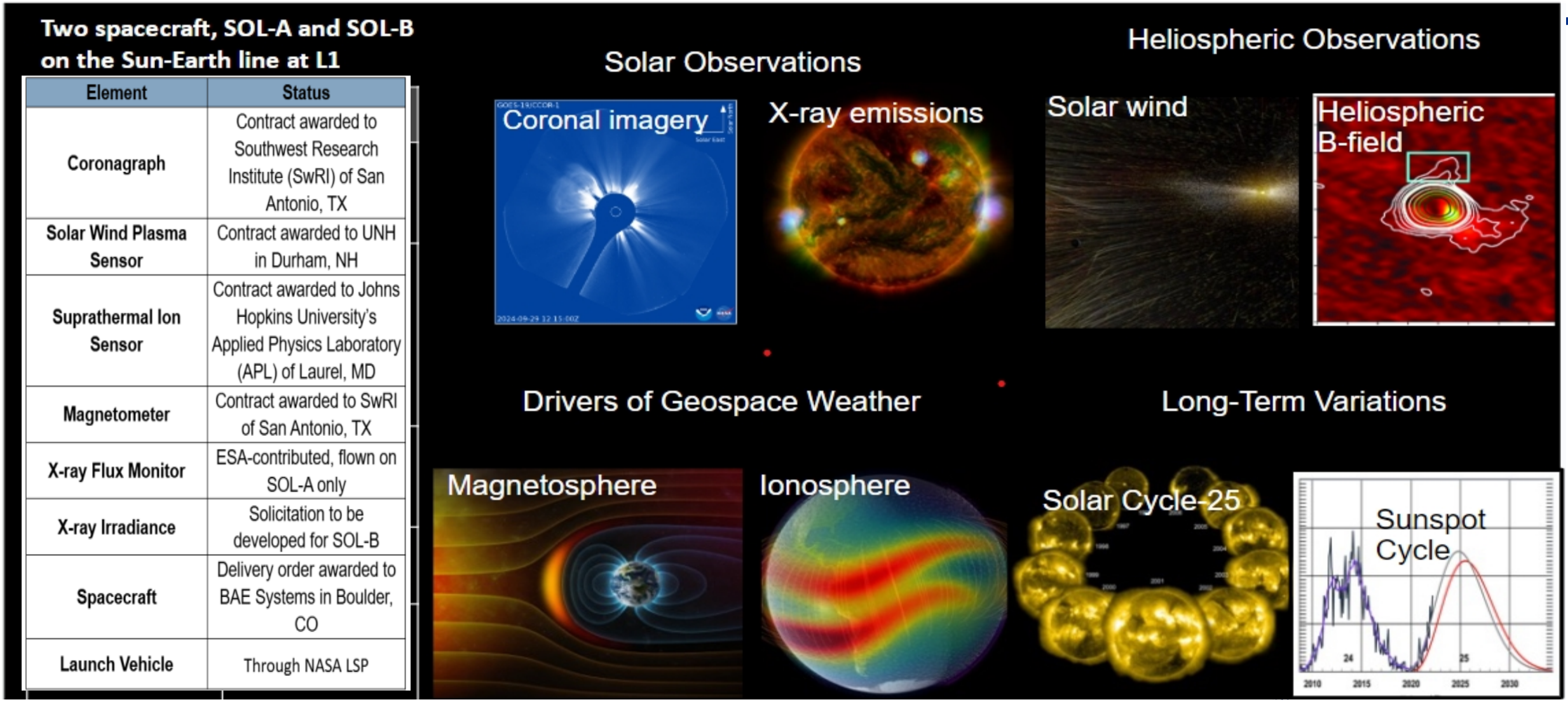
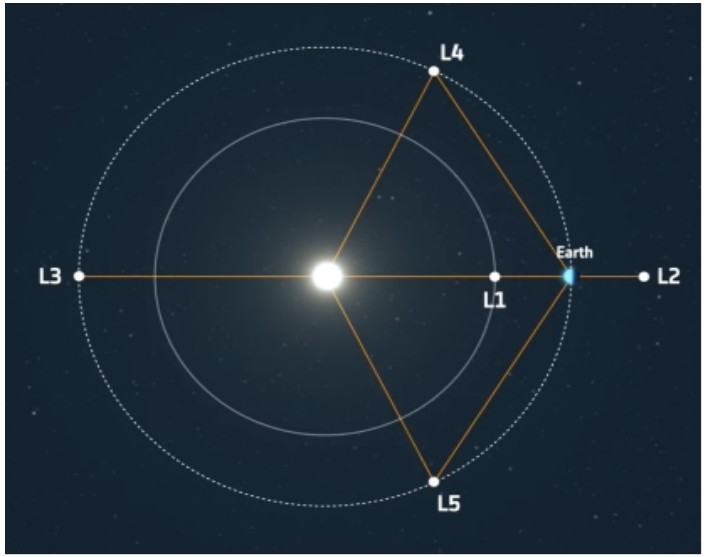
SOL-A and SOL-B will become SOL-2 and SOL-3 and sustain SWFO-L1 (becomes SOL-1) observations and address critical NWS space weather needs

Two spacecraft, SOL-A and SOL-B on the Sun-Earth line at L1

Element	Status
Coronagraph	Contract awarded to Southwest Research Institute (SwRI) of San Antonio, TX
Solar Wind Plasma Sensor	Contract awarded to UNH in Durham, NH
Suprathermal Ion Sensor	Contract awarded to Johns Hopkins University's Applied Physics Laboratory (APL) of Laurel, MD
Magnetometer	Contract awarded to SwRI of San Antonio, TX
X-ray Flux Monitor	ESA-contributed, flown on SOL-A only
X-ray Irradiance	Solicitation to be developed for SOL-B
Spacecraft	Delivery order awarded to BAE Systems in Boulder, CO
Launch Vehicle	Through NASA LSP



NOAA provision of a Compact Coronagraph (CCOR-3) to ESA's Vigil mission to L5



- CCOR-3 is **being built by Naval Research Laboratories (NRL)** as a near-copy of the CCOR-2, which is to fly on SWFO-L1.
- There is an agreement **to exchange data** from all SWFO and Vigil instruments
- **The L5 Project will manage the CCOR-3** development effort, the integration of the instrument into the ESA mission, and the development of data services.
- Launch (planned) for **2031**
- The first of its kind, Vigil will keep constant watch of the Sun where it can **see the 'side' of the Sun and observe activity on the surface of the Sun days before it rotates into view from Earth.**

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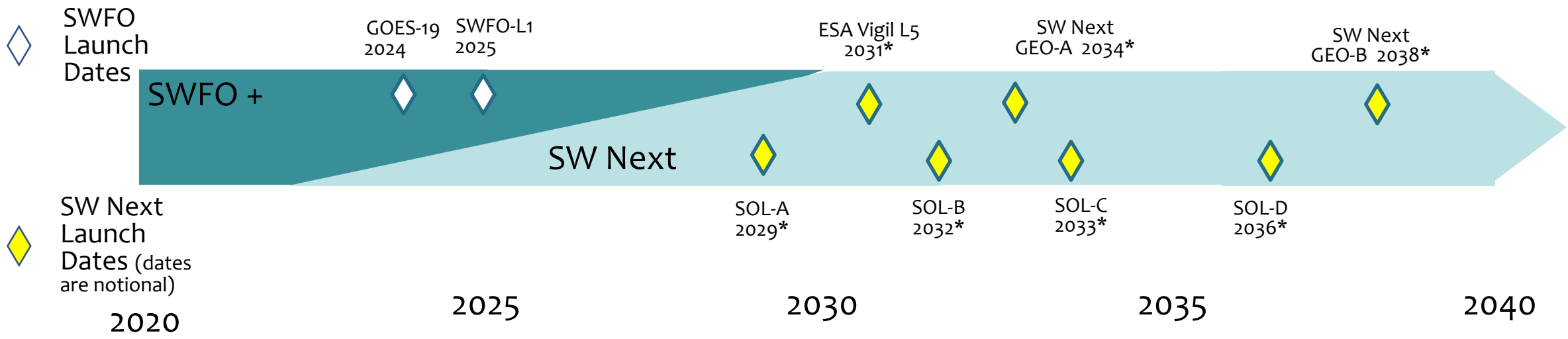
NOAA Space Weather Fly Out Chart*



- *Current **notional, unofficial** flyout chart of our planned SWO architecture
- The SOL-A launch is planned to overlap with SWFO for calibration and validation
- Planned architecture supports resiliency of observations at L1 and at GEO for critical observations

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Thank you for your attention

If you have any questions, contact me at
james.spann@noaa.gov

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