

Space Weather Follow On: Release of CCOR-1 Imagery and Readiness for the SWFO-L1 Launch

Space Weather Workshop 2025
March 18, 2025

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(1) CU/CIRES and NOAA SWPC

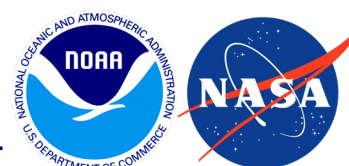
(2) NOAA Space Weather Observations (SWO)

Acknowledgments: Team members from GOES-R, NASA/GSFC, NCEI, NRL, OCS, OSPO, SWPC, and our academia/industry partners



The Compact Coronagraph 1 (CCOR-1)

NOAA's first operational coronagraph, built by the Naval Research Lab, flying at GEO on the GOES-19 satellite.



Milestones

- Launch: June 25, 2024
- First light: September 19, 2024
- Beta Validation Review: Jan 30
- Provisional Val. Rev: Feb 24
- SWPC image release: Feb 25
- NCEI image archive: Mar 5

Other Key Information

- FOV: $3.7 - 17 R_{\text{Sun}}$
- Time resolution: 15 min
- Products: FITS, JPEGs, MP4s

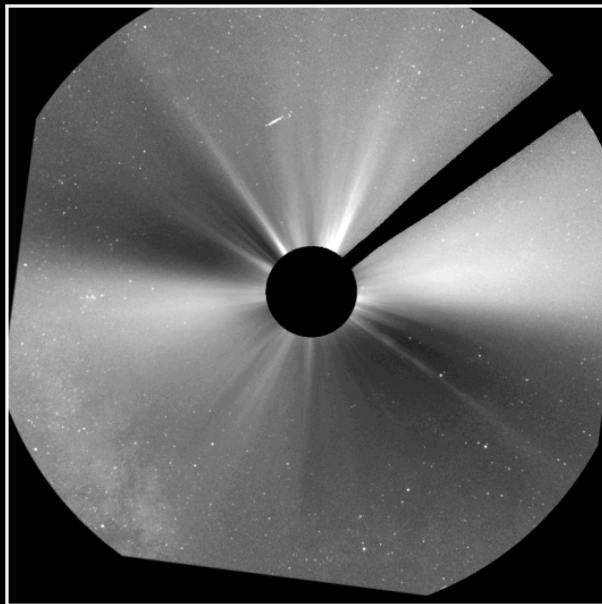
- For RT images (SWPC):
<https://www.swpc.noaa.gov/products/ccor-1-coronagraph-experimental>



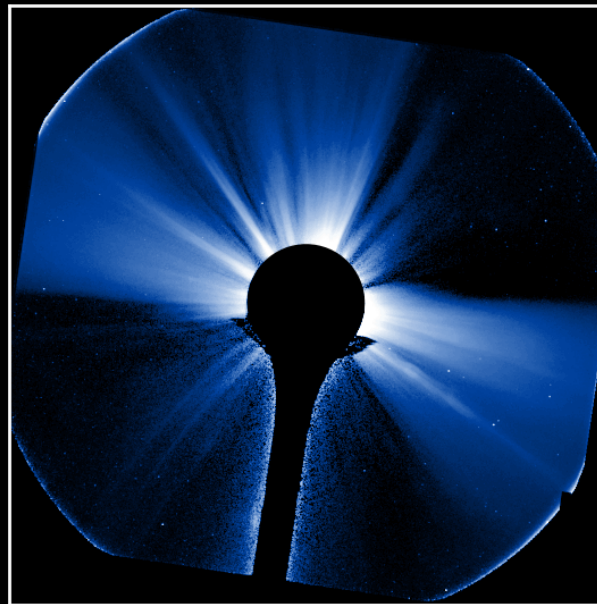
- For documentation (SWO):
<https://www.nesdis.noaa.gov/our-satellites/future-programs/swfo/swfo-data-products-and-science>



LASCO/C3
2024-12-17 00:06:08



GOES-19/CCOR-1
2024-12-17 00:00:20

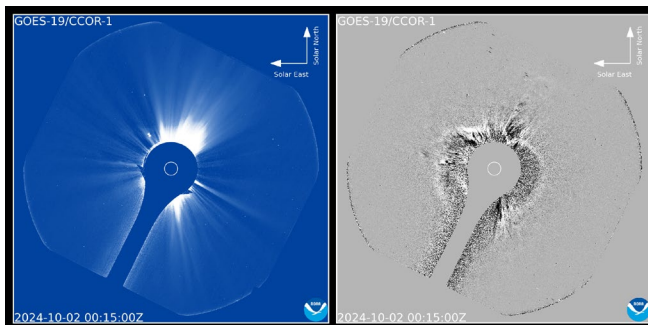


Selected Product Improvements

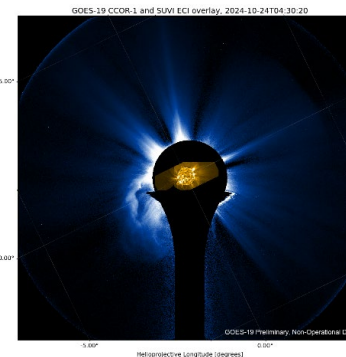
- Data latency: 30 min req./<25 perf.
- Angular resolution: 50 arcsec
- Dynamic range: $10^{-11} - 10^{-8} B_{\text{sun}}$
- Pointing accuracy: ~ 0.5 pixel
- Few/no SEP spots – no “snow”
- Colortable (forecaster feedback)

Observations

- CCOR-1 has recorded numerous CMEs (including the October 2024 events), streamers, several shocks, and other structures.
- It has also observed celestial objects such as planets, the Moon, and comets ranging from intense (T-Atlas C/2023 A3; C/2024 S1) to extremely faint.



Regular/differenced images of CMEs, Mercury, and the Moon



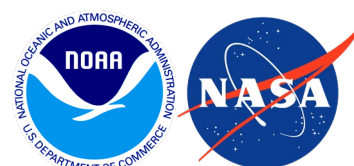
CCOR-1 & SUIV superposition



CMEs, earthshine effect, and comet C/2024 S1

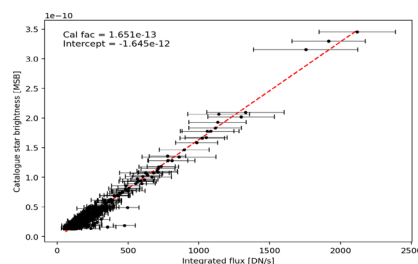


SWFO Program: Continuing to Develop CCOR-1 Products and the SWFO-L1 Mission

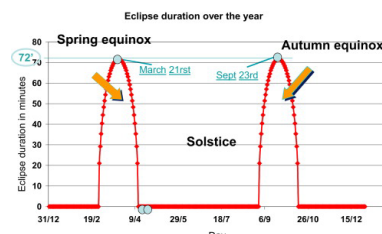


CCOR-1 Calibration and Validation

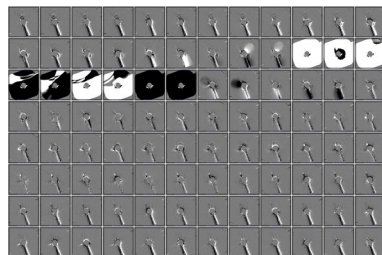
- Cal/Val remains crucial during commissioning and through the operational phase. The National Centers for Environmental Information (NCEI) is leading that work in collaboration with NRL and SWPC.
- The three teams develop algorithms and cal/val tools in close collaboration.



Photometric calibration



Eclipse seasons: max: ~70 minutes

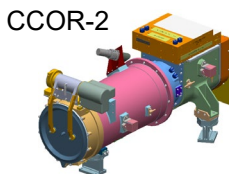


Thumbnails: earthshine at equinox

SWFO-L1: A New Observatory at Lagrange 1

- SWFO-L1 has been developed with the goal of replacing and expanding the functions of ACE and DSCOVR for SWPC.
- It carries a second coronagraph (CCOR-2) and sensors for plasma (density, velocity), particles (suprathermals), and interplanetary magnetic field
- It was built, integrated, and tested by BAE in Boulder, CO, and following tests, it was placed in storage earlier in March.
- Its launch is planned for September 23, 2025 as a rideshare with NASA's IMAP and Carruthers missions.

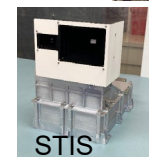
CCOR-2



SWFO-L1@BAE



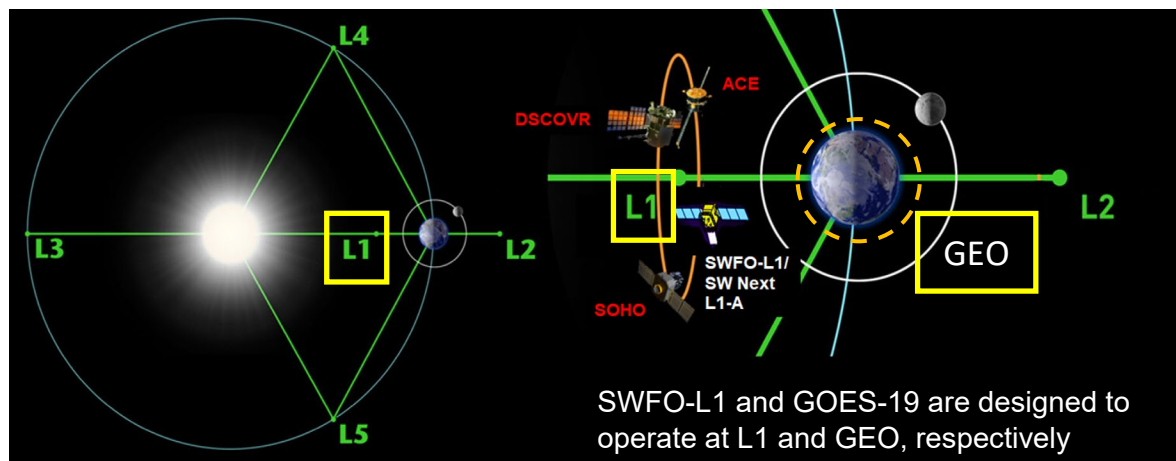
MAG



STIS



SWIPS



SWFO-L1 and GOES-19 are designed to operate at L1 and GEO, respectively