



NOAA National Centers for Environmental Information (NCEI) Space Weather Follow On (SWFO) Science Center Activities

Robert J. Redmon^{1,3}, Brian Kress^{1,2}, Paul Loto'aniu^{1,2}, Nazila Merati¹, Alessandra Pacini¹, Laurel Rachmeler¹, Josh Riley^{1,2}, Juan Rodriguez^{1,2}, William Rowland¹, Donald Schmit^{1,2}
(¹NOAA/NCEI, ²CU/CIRES, ³noaa.gov/ai) (Contact: Rob.Redmon@noaa.gov) & SWFO Program and Partners)

Abstract

We present an overview and current status of the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) activities for the Space Weather Follow On (SWFO) Program and discuss the importance of SWFO's data products for the Heliophysics community. SWFO Program will ensure continuity of space weather operational data in the solar wind, providing advanced heliospheric observing capabilities from the Lagrange Point L1 and geostationary orbit. The SWFO-L1 spacecraft will be launched in 2025, hosting a Solar Wind Plasma Sensor (SWIPS), a Magnetometer (MAG), a SupraThermal Ion Sensor (STIS) and a Compact Coronagraph (CCOR-2), enabling continuity of Coronal Mass Ejection and solar wind observations from NOAA's Deep Space Climate Observatory (DSCOVR), NASA's Advanced Composition Explorer (ACE) and NASA-ESA Solar and Heliospheric Observatory (SOHO) which are well past their designed lifetime. An additional coronagraph (CCOR-1) will fly on the next Geostationary Operational Environmental Satellite to be launched in 2024 (GOES-U) and will add operational resilience to the CME imagery necessary for space weather monitoring and forecasts. NCEI's primary roles include leading the calibration working group to help ensure performance of the operational products produced by NOAA's Space Weather Prediction Center (SWPC), as well as optimal scientific data stewardship and advanced data services for the research community, through the NCEI SWFO Science Center in development.

SWFO Program Overview

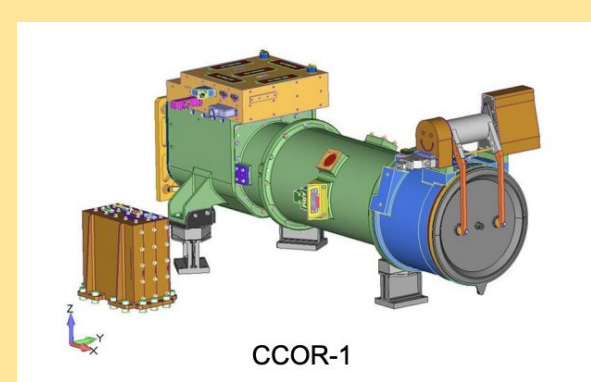
CCOR-1 on GOES-U

Compact Coronagraph (450 - 750 nm)

Launch: Apr 2024

Orbit: GEO (35,786 km)

CCOR-1 (NRL) → Coronal White Light Images
Observational extent: 3.7 - 17 Solar Radii
Spatial Resolution: 50 arcsec.
Latency: 15min | Intensity range: 10^{-11} to 10^{-8} Bsun



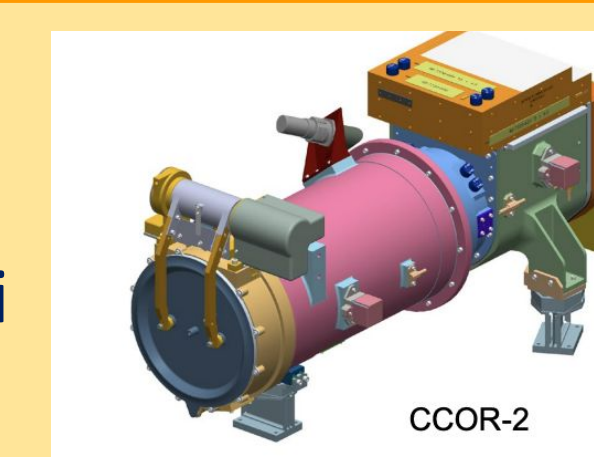
SWFO-L1

Launch: 2025
(IMAP rideshare)

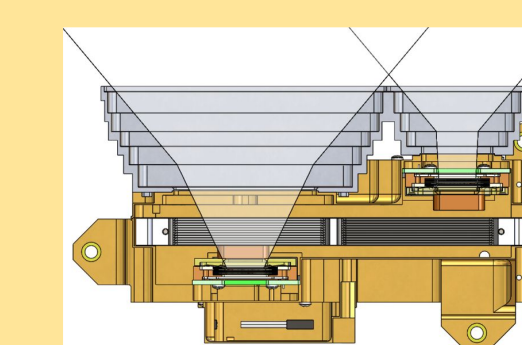
Orbit: Solar: Lagrange 1
(1,500,000 km)

CCOR-2 (NRL) → Coronal White Light Images
Compact Coronagraph (450 - 750 nm)

Latency: 15min. Observational extent: 3.0 - 22 Solar Radii
Spatial Resolution: 70 arcsec.
Intensity range: 10^{-11} to 10^{-8} Bsun

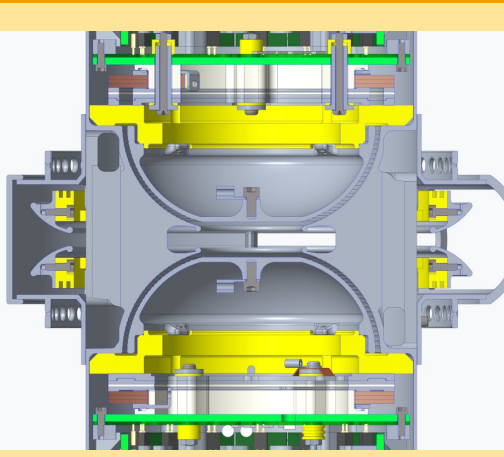


STIS (SSL UC Berkeley) → Suprathermal Ion Sensor
Two telescopes, each a double stack Solid State Spectrometer
Time resolution: 2 sec. (FOV: 80 x 60 deg, 1 look direction)
Observational energy ranges:
Ions: 25 keV to 6 MeV, Electrons: 25 keV to 250 keV



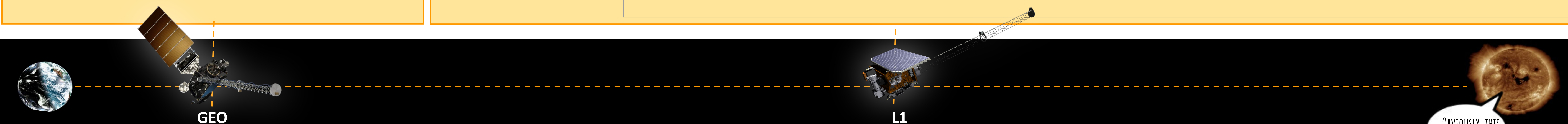
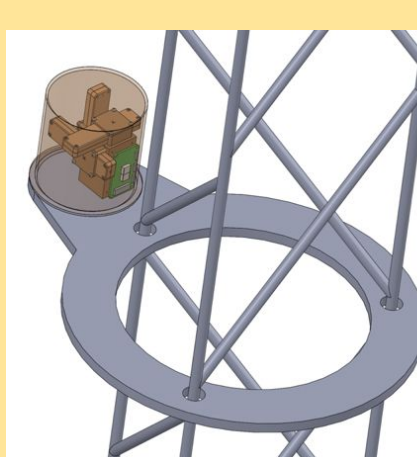
SWIPS (SwRI) → Solar Wind Plasma Sensor
Two identical top-hat Electrostatic Analysers (ESA)

Latency: ≤ 236 sec. Observational ranges (+H):
Velocity: 200-2500 km/s, Density: 0.1-150 cm⁻³
Temperature: 40,000-2,000,000 K (= 3.45 to 172.3 eV).



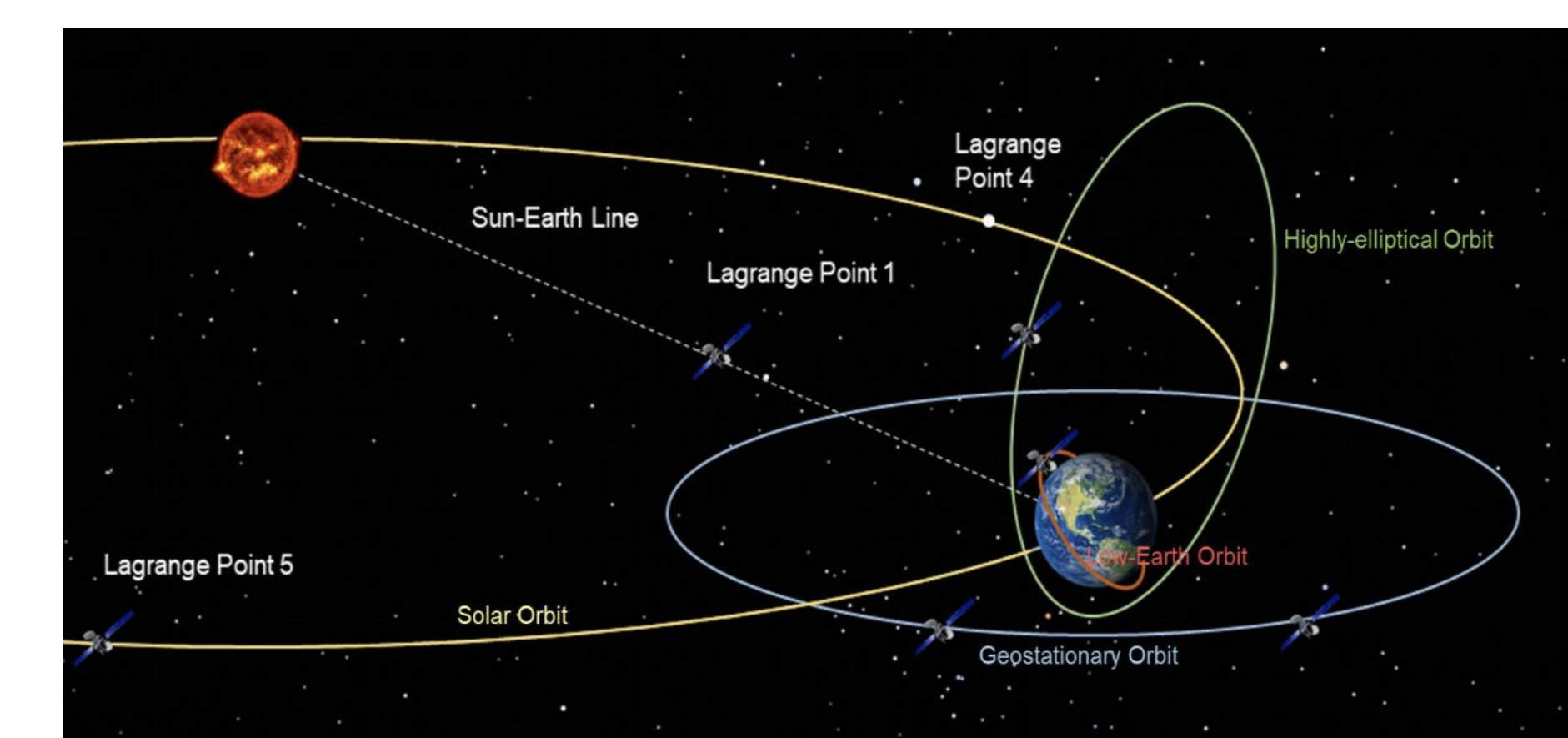
MAG (SwRI/UNH) → Interplanetary Magnetic Field
Two triaxial fluxgate magnetometers (~ 5m and ~ 6.6m boom)

Latency: ≤ 230 s. Observational range (per axis): ± 250 nT
Accuracy: |B| ≤ 100 nT: ≤ ± 0.5 nT; |B| > 100 nT: < ± 0.5%



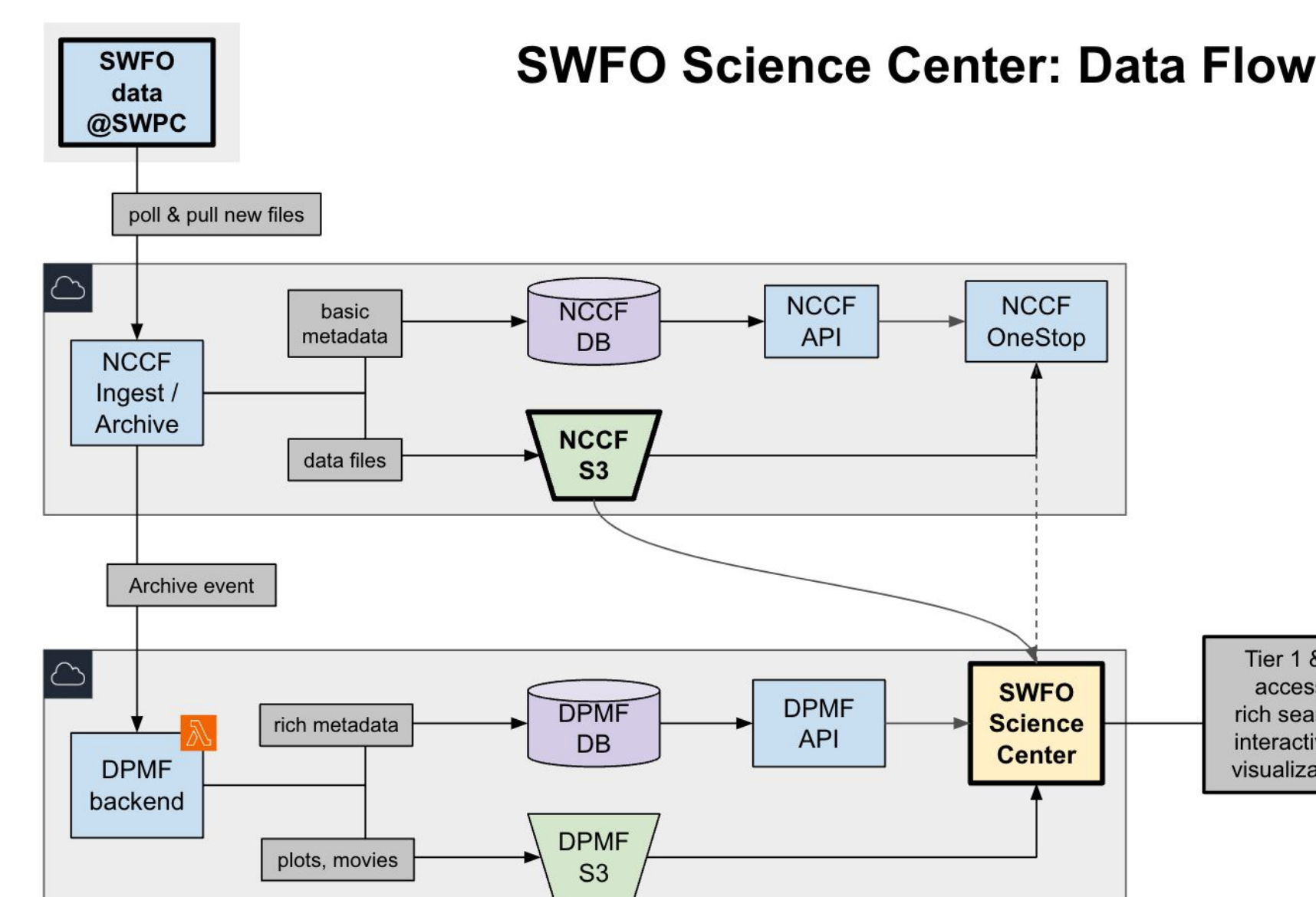
Relevance for Heliophysics Community

SOHO/LASCO ⇒ CCORs
(SWPC geomagnetic storm watches, SWPC CME analysis Tool, WSA-ENLIL prediction model)
DSCOVR/MAG or ACE/MAG ⇒ MAG
(SWPC geomagnetic storm warnings, Geospace Model, Ovation Model)
DSCOVR/FC or ACE/SWEPAM ⇒ SWIPS
(SWPC geomagnetic storm warnings, Geospace Model, Ovation Model)
ACE/EPAM ⇒ STIS ion fluxes
(SWPC improved timing of geomagnetic storm onset)
ACE/EPAM ⇒ STIS electron flux
(SWPC earlier warning of Solar Radiation Storms)

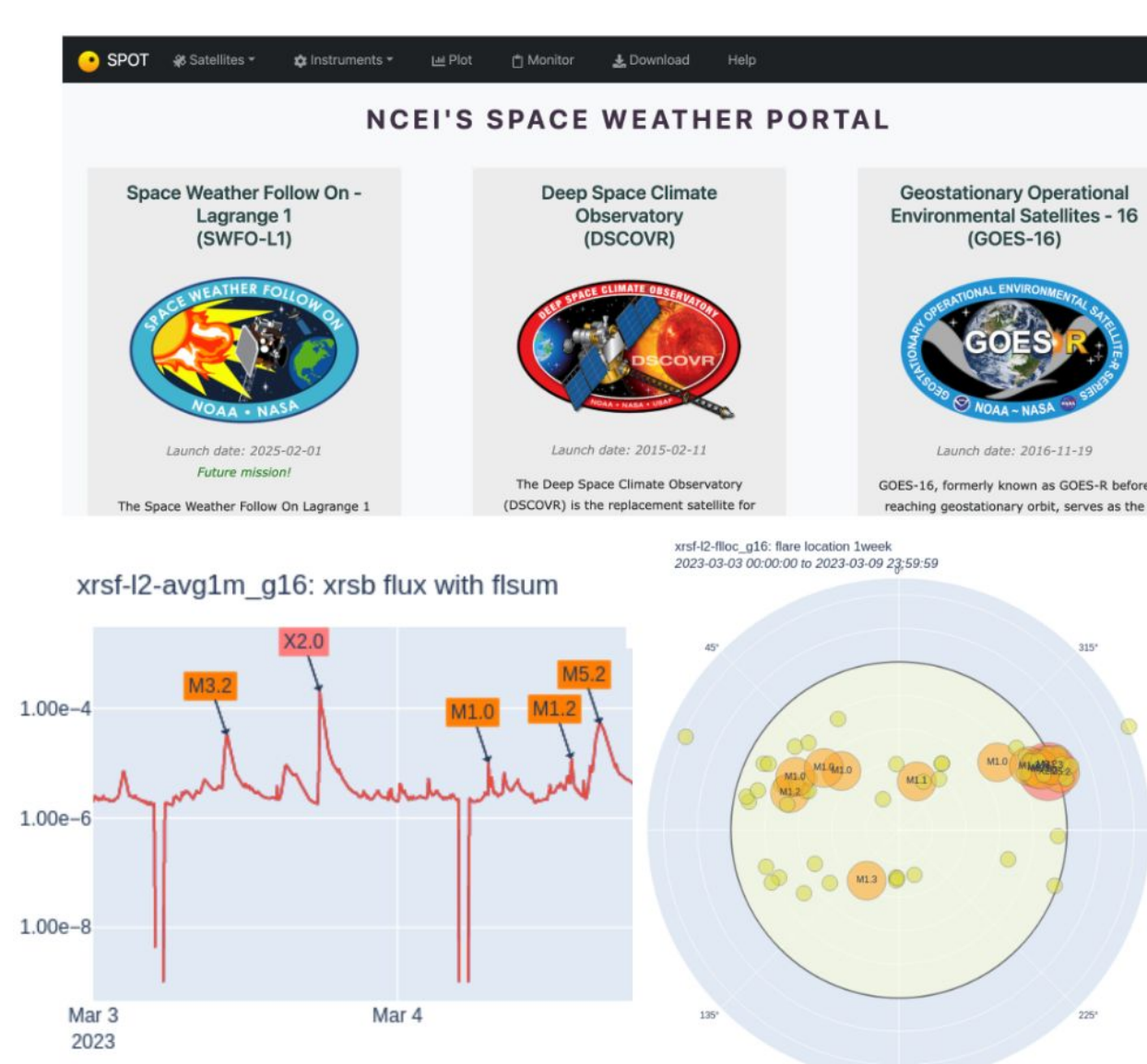


The SWFO Program is one of two major programs within NOAA/NESDIS/Space Weather Observations. It is setting a precedent for the more comprehensive Space Weather Next (SWNext) Program which is envisioned to provide solar, heliospheric, and other measurements in the late 2020s timeframe. NOAA's SWNext Program, is NOAA's response to the [2020 PROSWIFT Act](#).

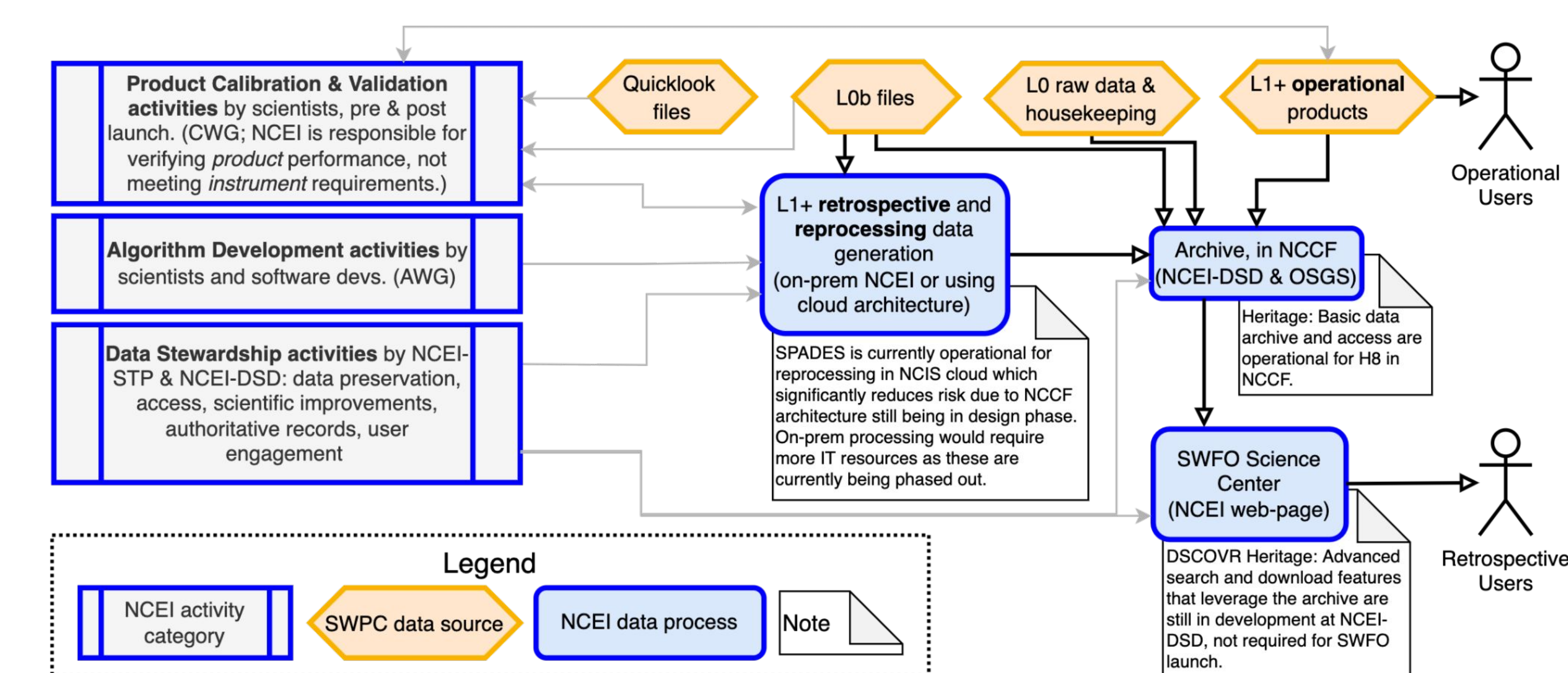
SWFO Science Center Data Flow



Our SWFO Science Center portal will empower the worldwide community's discovery, access and use of SWFO data. It will extend and benefit from the heritage of both the NCEI [DSCOVR web portal](#) (www.ngdc.noaa.gov/dscovr) and the NCEI Solar Terrestrial Physics (STP) section's Data Processing Management Framework (DPMF), developed originally to support DSCOVR and GOES-R space weather products.



Roles of NOAA/NCEI for SWFO Products



SWFO Program Current Status

The instruments are built and being tested (integrated into GOES-U for CCOR-1). The product pipelines are currently in late stages of development by a combination of instrument builders, NCEI, and SWPC. Products have been defined, pipelines have been prototyped, operational and official science/retrospective pipelines are maturing. Public data portal (SWFO Science Center) is in prototype/development phase at NCEI.

Acknowledgments

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NOAA | NESDIS | National Centers for Environmental Information (NCEI)

<https://www.nesdis.noaa.gov/news/space-weather-follow-program>