NOAA Cloud Access to GOES-19 Data

The National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellite 19 (GOES-19) is the fourth and final satellite in the Geostationary Operational Environmental Satellites (GOES) – R Series, the Western Hemisphere's most sophisticated weather-observing and environmental monitoring system. The GOES-R Series provides advanced imagery and atmospheric measurements, real-time mapping of lightning activity, and space weather observations. As a part of the Space Weather Follow On (SWFO) Mission, the GOES-19 spacecraft contains a Compact Coronagraph-1 (CCOR-1) instrument that produces 96 files per day per level in the FITS format. These data are produced by the CCOR-1 instrument aboard the GOES-19 spacecraft. The instrument observes broadband optical light that is scattered from coronal electrons and heliospheric dust. The spacecraft also produces daily auxiliary (telemetry and attitude) files in NetCDF4 format.

NOAA GOES-19 Spacecraft

The data from the CCOR-1 instrument are freely available on Amazon S3 for anyone to use.

Accessing GOES-19 Data on AWS

The availability of GOES-R and SWFO Mission data on AWS is the result of the NOAA Big Data Project (BDP) to explore the potential benefits of storing copies of key observations and model outputs in the Cloud to allow computing directly on the data without requiring further distribution. Such an approach could help form new lines of business and economic growth while making NOAA's data more easily accessible to the American public.

This page includes information on data structure; you can find much more detailed information about GOES-R Series data from NOAA.

More information on the Compact Coronagraph instrument

More information on the GOES-19 Auxiliary Products

Examples of how to access the objects via the AWS CLI can be seen below.

aws s3 ls noaa-nesdis-swfo-ccor-1-pds --no-sign-request

aws s3 cp s3://noaa-nesdis-swfo-ccor-1-pds/SWFO/GOES-19/CCOR-1/ccor1-l3/<Year>/<Month>/<Day>/<Filename> . --no-sign-request

Data will be moved to different Amazon S3 storage classes on a schedule. It will start in Standard and move to Infrequent Access after 30 days.

NOAA Cloud Access to GOES-19 CCOR-1 Data

About the Data
All CCOR-1 files from GOES-19 are provided in FITS format. The auxilliary data from the GOES-19 spacecraft are provided in the NetCDF4 format. The GOES-19 data is hosted in the `noaa-nesdis-swfo-ccor-1-pds` Amazon S3 bucket in the us-east-1 AWS region. Individual files are available with the following schema:

CCOR-1 Data Access

*SWFO/GOES-19/CCOR-1/**<Product>**/**<Year>**/<**Month**>/**<Day>**/**<Filename>***

where:

- **<Product>** is the product generated from one of the sensors aboard the satellite (e.g.)
  - ccor1-l0a - Compact Coronagraph-1 Operational Level 0a Data
  - ccor1-l0b - Compact Coronagraph-1 Operational Level 0b Data
  - ccor1-l1a - Compact Coronagraph-1 Operational Level 1a Data
  - ccor1-l1b - Compact Coronagraph-1 Operational Level 1b Data
  - ccor1-l2 - Compact Coronagraph-1 Operational Level 2 Data
  - ccor1-l3 - Compact Coronagraph-1 Operational Level 3 Data
  - ccor1-dm_science - Compact Coronagraph-1 Retrospective Daily Mediam Data
  - ccor1-mm_science - Compact Coronagraph-1 Retrospective Monthly Minimum Data
  - ccor1-l1a_science - Compact Coronagraph-1 Retrospective Level 1a Data
  - ccor1-l1b_science - Compact Coronagraph-1 Retrospective Level 1b Data
  - ccor1-l2_science - Compact Coronagraph-1 Retrospective Level 2 Data
  - ccor1-l3_science - Compact Coronagraph-1 Retrospective Level 3 Data
- **<Year>** is the year the FITS file was created
- **<Month>** is the numerical month of the year (1-12)
- **<Day>** is the numerical day of the year (1-31)
- **<Filename>** is the name of the file containing the data. These are compressed and encapsulated using the FITS standard.

A **<Filename>** is delineated by underscores '_' and looks like this:

Operational CCOR-1 Example: CCOR1_1A_20250101T001520_V00_NC.fits

Retrospective CCOR-1 Example: sci_ccor1-l1a_g19_s20250101T000020Z_e20250129T000048Z_p20250130T080704Z_pub.fits

Operational Data Products:
CCOR1_[**level**]_[**date**]_[**version**]_[**sucode**].fits
- **level**:
  - The data product level
  - Options: `0A`,`0B`,`1A`,`1B`,`2`,`3`
- **date**:
  - The UTC datetime of the observation.
  - Format is: [yyyy][mm][dd]T[hh][mm][ss]
- **version**:
  - The two-digit processing software version number.
  - Examples: `V00`,`V01`

- **sucode**:
  - A description of the image type, followed by the "combination" code which is either "0" for a complete image, or "1" or "2" for the first or second part of a combined image. A combined image (the result of Level 0b processing) will have a "C" in this location.
  - Examples: `N1`,`T2`,`B0`,`0C`

Retrospective Data Products:
sci_ccor1-[level]_g19_[startDate]_[endDate]_[processDate]_pub.fits

- **level**:
  - The data product level
  - Options: `l1a`,`l1b`,`l2`,`l3`
- **startDate**:
  - The starting UTC datetime of the observation.
  - Format is: s[yyyy][mm][dd]T[hh][mm][ss]
  - 4 digit year
  - 2 digit month
  - 2 digit day
  - 2 digit hour
  - 2 digit minute
  - 2 digit second
- **endDate**:
  - The ending UTC datetime of the observation.
  - Format is: e[yyyy][mm][dd]T[hh][mm][ss]
  - 4 digit year
  - 2 digit month
  - 2 digit day
  - 2 digit hour
  - 2 digit minute
  - 2 digit second
- **processDate**:
  - The processing UTC datetime.
  - Format is: p[yyyy][mm][dd]T[hh][mm][ss]
  - 4 digit year
  - 2 digit month
  - 2 digit day
  - 2 digit hour
  - 2 digit minute
  - 2 digit second

GOES-19 Auxiliary Data Access

SWFO/GOES-19/auxiliary/<Product>/<Year>/<Month>/<Filename>

where:

- **<Product>** is the product generated from one of the sensors aboard the satellite (e.g.)
  - orb-pr - GOES-19 Spacecraft Ephemeris Data
  - pkt-l0 - GOES-19 L0 Packet Data
  - sc-att - GOES-19 Spacecraft Attitude Data
- **<Year>** is the year the netCDF4 file was created
- **<Month>** is the numerical month of the year (1-12)
- **<Filename>** is the name of the file containing the data. These are compressed and encapsulated using the NetCDF4 standard.

NOAA Cloud Access to GOES-19 CCOR-1 Data

A **<Filename>** is delineated by underscores '_' and looks like this:

oe_orb-pr_g19_s20250101T000000Z_e20250101T235959Z_p20250102T020000Z_pub.nc.gz

Operational Data Products:
oe_[**dsn**]_g19_[**startDate**]_[**endDate**]_[**processDate**]_pub.nc.gz

- **dsn**:
  - The data short name
  - Options: `orb-pr`,`sc-att`,`pkt-l0`
- **startDate**:
  - The starting UTC datetime of the observation.
  - Format is: s[yyyy][mm][dd]T[hh][mm][ss]
  - 4 digit year
  - 2 digit month
  - 2 digit day
  - 2 digit hour
  - 2 digit minute
  - 2 digit second
- **endDate**:
  - The ending UTC datetime of the observation.
  - Format is: e[yyyy][mm][dd]T[hh][mm][ss]
  - 4 digit year
  - 2 digit month
  - 2 digit day
  - 2 digit hour
  - 2 digit minute
  - 2 digit second
- **processDate**:
  - The processing UTC datetime.
  - Format is: p[yyyy][mm][dd]T[hh][mm][ss]
  - 4 digit year
  - 2 digit month
  - 2 digit day
  - 2 digit hour
  - 2 digit minute
  - 2 digit second