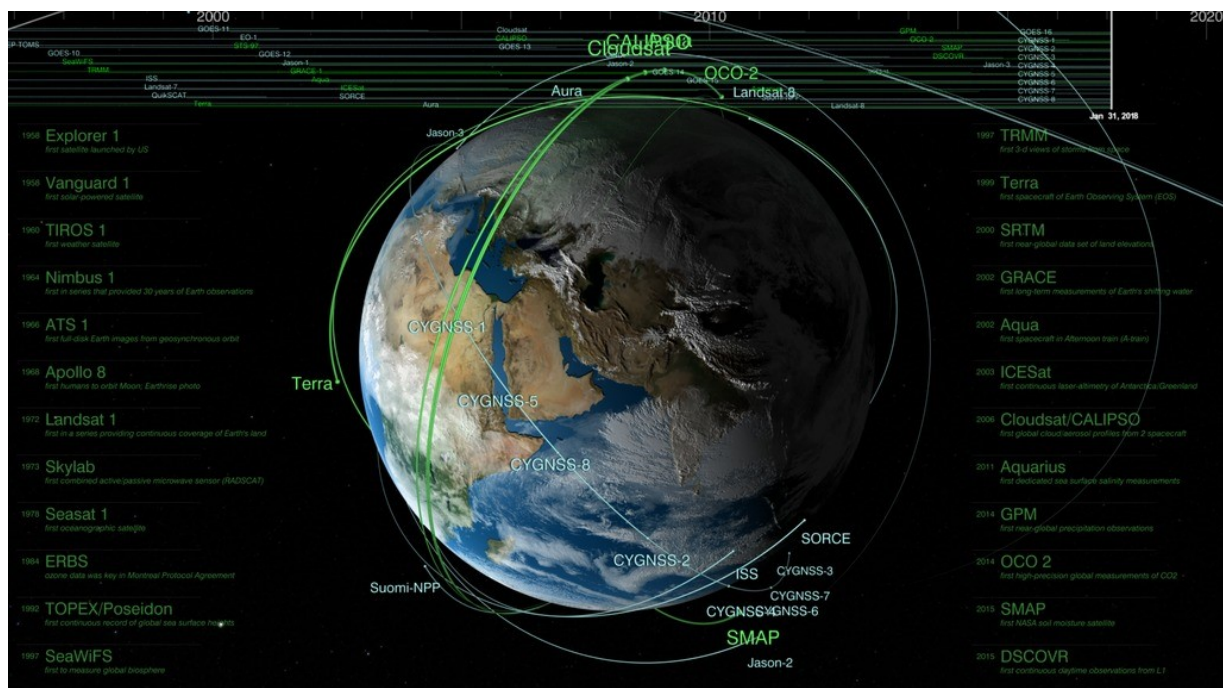**Earth** (/cgi-bin/search.cgi?category=Earth)   **ID: 4600**

Sixty Years of Earth Observations: from Explorer-1 (1958) to CYGNSS (2017)

Visualizations by Greg Shirah (/cgi-bin/search.cgi?person=66) Released on   5
January 31, 2018

Earth observing spacecraft from Explorer-1 to CYGNSS
This video is also available on our YouTube channel
(https://www.youtube.com/watch?v=WalDqhWvcJc).

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January 31 2018 marks the 60th anniversary of the launch of the Explorer-1 spacecraft and 60 years of Earth observations from space. This visualization shows the orbits of NASA-related near-Earth science missions from the launch of Explorer-1 in 1958 through 2017. These missions include both NASA-run missions as well as missions run by organizations that NASA has partnered with. Twenty-four of these missions are called out as "firsts" in various ways.

Here's a link to a version on youtube (https://youtu.be/WalDqhWvcJc)

The following missions are highlighted in green as "firsts":
- **Explorer-1** (https://www.nasa.gov/mission_pages/explorer/index.html) first satellite launched by US
- **Vanguard-1** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1958-002B) first solar-powered satellite
- **Tiros-1** (https://science.nasa.gov/missions/tiros) first weather satellite
- **Nimbus-1** (https://science.nasa.gov/missions/nimbus) first in series that provided 30 years of Earth observations
- **ATS-1**: Applications Technology Satellite (https://science.nasa.gov/missions/ats) first full-disk Earth images from geosynchronous orbit
- **Apollo-8** (https://www.nasa.gov/mission_pages/apollo/missions/apollo8.html) first humans to orbit Moon; Earthrise photo
- **Landsat-1** (https://landsat.gsfc.nasa.gov/landsat-1/) first in a series providing continuous coverage of Earth's land
- **Skylab** (https://www.nasa.gov/mission_pages/skylab) first combined active/passive microwave sensor (RADSCAT)
- **Seasat-1** (https://science.nasa.gov/missions/seasat-1/) first oceanographic satellite
- **ERBS**: Earth Radiation Budget Satellite (https://science.nasa.gov/missions/erbs/) ozone data was key in Montreal Protocol Agreement
- **TOPEX/Poseidon**: Ocean Topography Experiment (https://science.nasa.gov/missions/topex-poseidon/) first in a series providing continuous record of global sea levels
- **SeaWiFS**: Sea-Viewing Wide Field-of-View Sensor (https://science.nasa.gov/missions/seawifs/) first to measure global biosphere
- **TRMM**: Tropical Rainfall Measuring Mission (https://science.nasa.gov/missions/trmm/) first 3-d views of storms from space
- **Terra** (https://science.nasa.gov/missions/terra/) first spacecraft of Earth Observing System (EOS)
- **SRTM**: Shuttle Radar Topography Mission (https://science.nasa.gov/missions/srtm/) first near-global data set of land elevations
- **GRACE**: Gravity Recovery and Climate Experiment (https://science.nasa.gov/missions/grace/) first mission to map Earth's gravity field over time
- **Aqua** (https://science.nasa.gov/missions/aqua/) first spacecraft in Afternoon train (A-train)
- **ICESat**: Ice, Cloud,and land Elevation Satellite (https://science.nasa.gov/missions/icesat/) first continuous laser-altimetry of Antarctic/Greenland ice sheets
- **CALIPSO**: Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (https://science.nasa.gov/missions/calipso/) first global survey of cloud and aerosol profiles from 2 spacecraft
- **Cloudsat** (https://science.nasa.gov/missions/cloudsat/) synergistic cloud observations from 2 spacecraft
- **Aquarius** (https://science.nasa.gov/missions/aquarius/) first dedicated sea surface salinity measurements
- **GPM**: Global Precipitation Measurement (https://science.nasa.gov/missions/gpm/) first near-global precipitation observations

- **OCO-2**: Orbiting Carbon Observatory-2 (https://science.nasa.gov/missions/oco-2) first high-precision global measurements of CO_2
- **SMAP**: Soil Moisture Passive Active (https://science.nasa.gov/missions/smap/) first NASA soil moisture satellite
- **DSCOVR**: Deep Space Climate Observatory (https://science.nasa.gov/missions/dscovr/) first continuous daytime observations from L1

Other missions that are not highlighted:
- **CYGNSS-1-8**: Cyclone Global Navigation Satellite System 1 (https://science.nasa.gov/missions/cygnss/)
- **Aura** (https://science.nasa.gov/missions/aura/)
- **GOES 1 - 16**: Geostationary Operational Environmental Satellites (https://science.nasa.gov/missions/goes/)
- **ISS**: International Space Station (https://www.nasa.gov/mission_pages/station/main/index.html)
- **Jason 2** (https://sealevel.jpl.nasa.gov/missions/ostmjason2/)
- **Jason 3** (https://sealevel.jpl.nasa.gov/missions/jason3/)
- **LAGEOS**Laser Geodynamic Satellite (https://ilrs.cddis.eosdis.nasa.gov/missions/satellite_missions/current_missions/lag1_general.html/)
- **Landsat 7** (https://science.nasa.gov/missions/landsat-7)
- **Landsat 8** (https://science.nasa.gov/missions/ldcm/)
- **QuikSCAT**Quick Scatterometer (https://science.nasa.gov/missions/quikscat)
- **SORCE**: Solar Radiation and Climate Experiment (https://science.nasa.gov/missions/sorce/)
- **Suomi NPP**: Suomi National Polar-orbiting Partnership (https://science.nasa.gov/missions/suomi-npp/)
- **Explorer-3** (https://www.jpl.nasa.gov/missions/explorer-3/)
- **Explorer-4** (https://www.jpl.nasa.gov/missions/explorer-4/)
- **Explorer-6** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1959-004A)
- **Explorer-7** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1959-009A)
- **Explorer-8** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1960-014A)
- **Explorer-9** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1961-004A)
- **Explorer-12** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1961-020A)
- **Nimbus-2** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1966-040A)
- **Nimbus-3** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1969-037A)
- **Nimbus-4** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1970-025A)
- **Nimbus-5** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1972-097A)
- **Nimbus-6** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1975-052A)
- **Nimbus-7** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1978-098A)
- **CINDI>**: Coupled Ion-Neutral Dynamics Investigation (https://nssdc.gsfc.nasa.gov/nmc/experimentDisplay.do?id=2008-017A-03)
- **Vanguard-2** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1959-001A)
- **Vanguard-3** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1959-007A)
- **SMS-1**: Synchronous Meteorological Satellite-1 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1974-033A)
- **SMS-2**: Synchronous Meteorological Satellite-2 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1975-011A)

- **EO-1**: Earth Observing mission 1) (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=2000-075A)
- **EUVE**: Extreme-Ultraviolet Explorer (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1992-031A)
- **Jason-1** (https://nssdc.gsfc.nasa.gov/nmc/experimentDisplay.do?id=2001-055A-01)
- **Landsat-2** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1975-004A)
- **Landsat-3** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1978-026A)
- **Landsat-4** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1982-072A)
- **Landsat-5** (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1984-021A)
- **UARS**: Upper Atmosphere Research Satellite (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1991-063B)
- **EP-TOMS**: Earth Probe Total Ozone Mapping Spectrometer (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1996-037A)
- **TIROS-2**: Television and InfraRed Observation Satellite-2 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1960-016A)
- **TIROS-3**: Television and InfraRed Observation Satellite-3 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1961-017A)
- **TIROS-4**: Television and InfraRed Observation Satellite-4 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1962-002A)
- **TIROS-5**: Television and InfraRed Observation Satellite-5 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1962-025A)
- **TIROS-6**: Television and InfraRed Observation Satellite-6 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1962-047A)
- **TIROS-7**: Television and InfraRed Observation Satellite-7 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1963-024A)
- **TIROS-8**: Television and InfraRed Observation Satellite-8 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1963-054A)
- **TIROS-9**: Television and InfraRed Observation Satellite-9 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1965-004A)
- **TIROS-10**: Television and InfraRed Observation Satellite-10 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1965-051A)
- **TIROS-M**: Television and InfraRed Observation Satellite-N (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1970-008A)
- **TIROS-N**: Television and InfraRed Observation Satellite-M (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1994-089A)
- **ATS-2**: Applications Technology Satellite-2 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1967-031A)
- **ATS-3**: Applications Technology Satellite-3 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1967-111A)
- **ATS-4**: Applications Technology Satellite-4 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1968-068A)
- **ATS-6**: Applications Technology Satellite-6 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1974-039A)
- **DE-1**: Dynamics Explorer-1 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1981-070A)
- **DE-2**: Dynamics Explorer-2 (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1981-070B)

- **STS-2**: Space Shuttle Office of Space and Terrestrial Application
  (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1981-111A)
- **SAGE**: Stratospheric Aerosol and Gas Experiment
  (https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1979-013A)


Also included:
- Stars
- Moon
- Sun
- Earth
- L1: Sun-Earth Lagrange Point-1

NOTES:
The clouds used in this version are from a high resolution GEOS model run at 10 minute time steps interpolated down to the per-frame level.

There are 3 clocks (date/time) driving different aspects of this visualization:
- the progession of the orbits as they move around the Earth
- the timeline at the top which also drives the exposure of orbits
- Apollo-8 and the moon
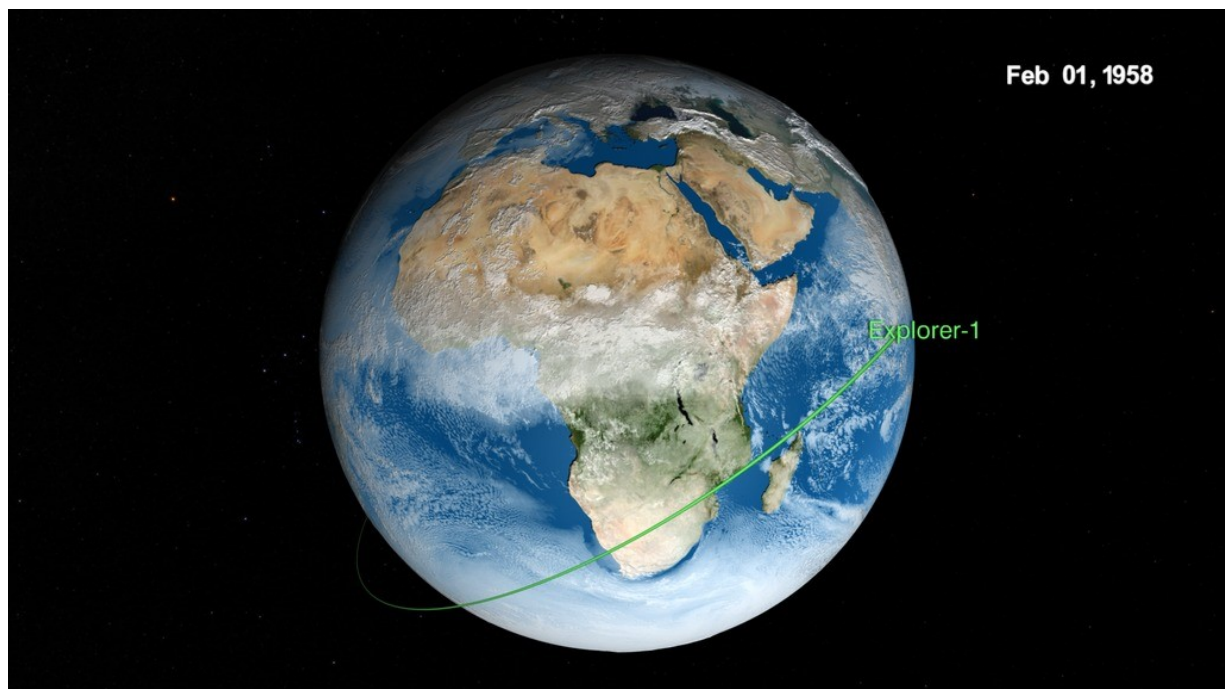
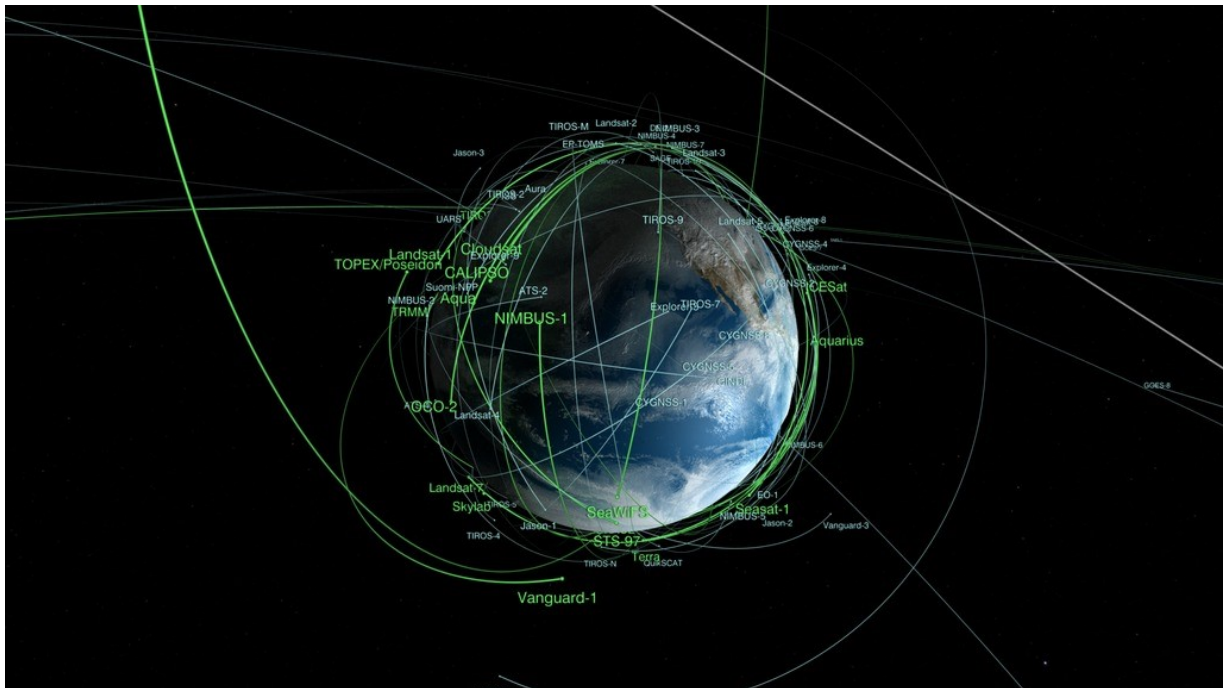Earth observing spacecraft from Explorer-1 to CYGNSS (without timeline at the top or text explaining the "firsts")
This video is also available on our YouTube channel (https://www.youtube.com/watch?v=Hag9Gc7P8K0).
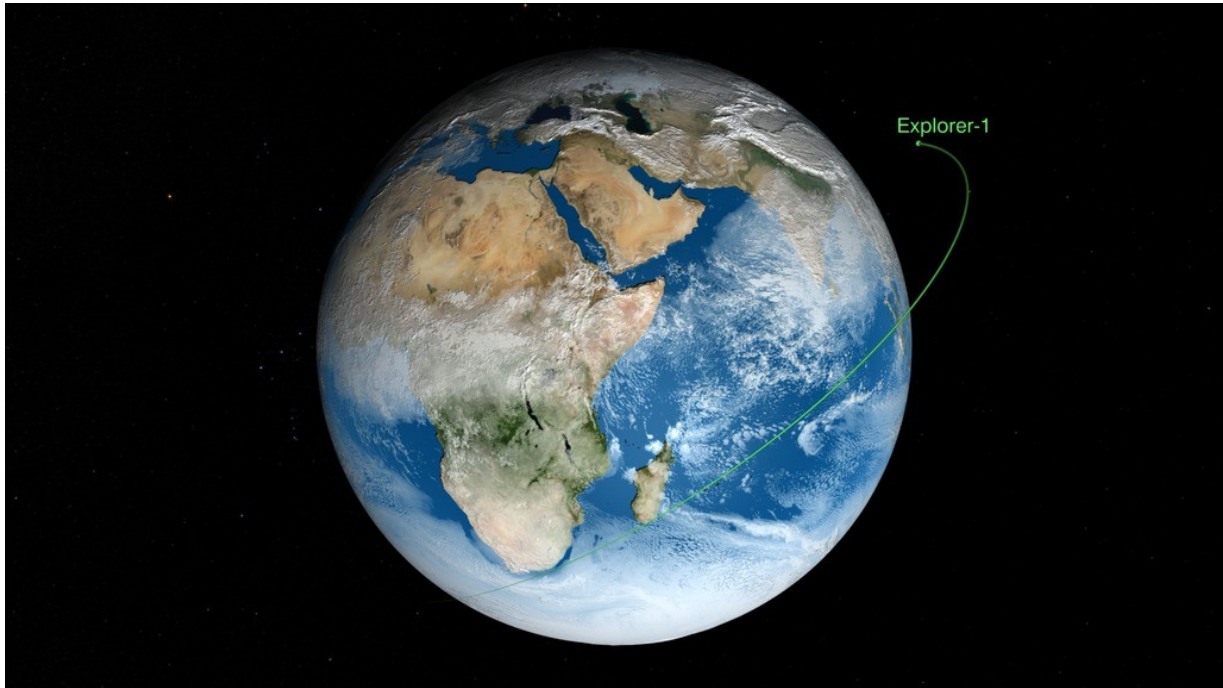
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Explorer-1 only - this version is the full camera path of the previous versions, but only showing Explorer-1 (and Apollo-8). This is intended to provide video editors extra footage showing Explorer-1.
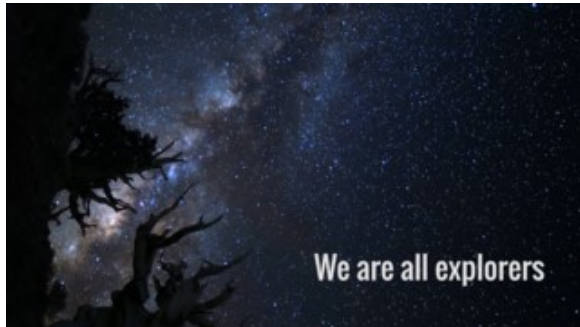
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Earth observing spacecraft with all spacecraft shown from Explorer-1 to CYGNSS. This is intended to provide video editors extra footage showing all Earth observing spacecraft.

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Used Elsewhere In

(/12837)
Explorer 1: Celebrating 60 Years of America in
Space (/12837)

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Ernie Wright (/cgi-bin/search.cgi?person=1059) (USRA): Visualizer
Tom Bridgman (/cgi-bin/search.cgi?person=12) (GST): Visualizer
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Space-Track Two-Line Elements (/cgi-bin/search.cgi?dataset=753)
GEOS-5 Atmospheric Model (/cgi-bin/search.cgi?dataset=665)
JPL/Horizon Orbital Ephemerides (/cgi-bin/search.cgi?dataset=597)
Hipparcos/Telescope/Tycho 2 Catalogue (/cgi-bin/search.cgi?dataset=550)
CelesTrak Spacecraft Orbit Ephemeris (/cgi-bin/search.cgi?dataset=454)
GTOPO30 Topography and Bathymetry (/cgi-bin/search.cgi?dataset=274)
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