



# GOES-R and GeoXO

QUARTERLY NEWSLETTER ■ JULY-SEPTEMBER 2022 ■ ISSUE 39

## A Note from Pam Sullivan, GOES-R/GeoXO System Program Director:



Congratulations to the team for completing GOES-18 post-launch testing and preparing the satellite for early operations! Our mission operations team completed

a successful GOES-17/18 “interleave” period, delivering operational GOES-18 Advanced Baseline Imager (ABI) data to forecasters during the “warm” periods that degrade some GOES-17 (GOES West) imagery. GOES West data users have expressed appreciation for this novel solution to get them the GOES-18 ABI data early and shared how it has helped them with forecasts and warnings. GOES-18 has been handed over to NOAA’S Office of Satellite and Product Operations, and after additional product testing, it will go into operational service as GOES West in January 2023. GOES-U is fully integrated and beginning environmental testing. And GeoXO is moving full steam ahead toward Milestone 2 after completing the System Requirements Review in August. Our team continues to meet the mission and deliver life-saving technology and science to the nation.

## GOES-R PROGRAM HIGHLIGHTS

**NASA handed GOES-18 over to the NOAA Office of Satellite and Product Operations (OSPO) operations team** following the completion of post-launch testing and successful Post-Launch Acceptance and Handover Readiness Reviews. The Handover Readiness Review certified that OSPO is ready to assume operational responsibility for the satellite. GOES-18 will undergo additional testing of its data products before going into service as NOAA’s operational GOES West satellite in January 2023.



GOES-R system program director Pam Sullivan presents Greg Marlow, NOAA OSPO director, with a GOES-T poster to commemorate the satellite handover. Photo credit: NOAA

**Though GOES-18 is not yet officially operational, the new satellite is positioned to help forecasters during the height of the 2022 Pacific hurricane season.** NOAA is making GOES-18 ABI data available during the “warm” periods that degrade some GOES-17 (GOES West) imagery during the height of hurricane season. NOAA implemented a unique solution to mitigate the loss of GOES-17 imagery by delivering GOES-18 ABI data to GOES West data users through an operational data “interleave.” GOES-18 is now located in

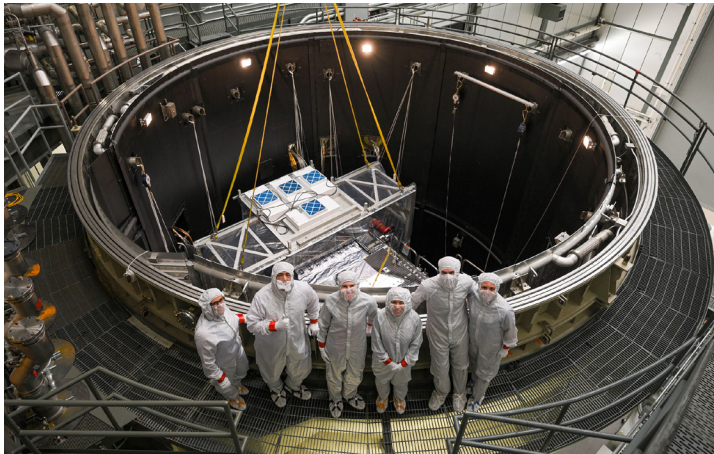
## DID YOU KNOW:

The Atlantic Ocean went without a named storm for nearly two months, from July 6 through Aug. 21, 2022. [August passed without a named storm for the first time since 1997.](#)

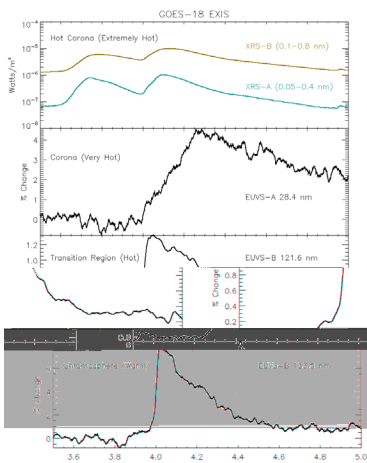
## GOES-R PROGRAM HIGHLIGHTS (CONTINUED)

the west orbital slot (137.0 degrees west), 0.3 degrees away from GOES-17 at 137.3 degrees west. From Aug. 1 through Sept. 8, 2022, the operational GOES-17 GOES Rebroadcast service was populated with an “interleave” of GOES-18 Advanced Baseline Imager (ABI) data (replacing the GOES-17 ABI data) and GOES-17 Geostationary Lightning Mapper (GLM) and space weather data. The second period of data interleave is planned for Oct. 13 to Nov. 16, 2022. See the [GOES-18 Transition to Operations webpage](#) for additional information.

**The GOES-U satellite began thermal vacuum (TVAC) testing on Sept. 17, 2022**, following a successful Pre-Environmental Review in July and Key Decision Point D and TVAC Test Readiness Reviews in August. TVAC testing subjects the satellite to a vast range of temperatures, with some parts reaching as high as 188 degrees Fahrenheit and others dropping as low as minus 67 degrees Fahrenheit. This testing simulates the extreme temperatures of launch and the space environment and is the beginning of a set of rigorous tests to ensure the satellite can withstand the harsh conditions of launch and orbit.



GOES-U is lowered into the thermal vacuum chamber at the Lockheed Martin facility in Littleton, Colorado. Photo credit: Lockheed Martin

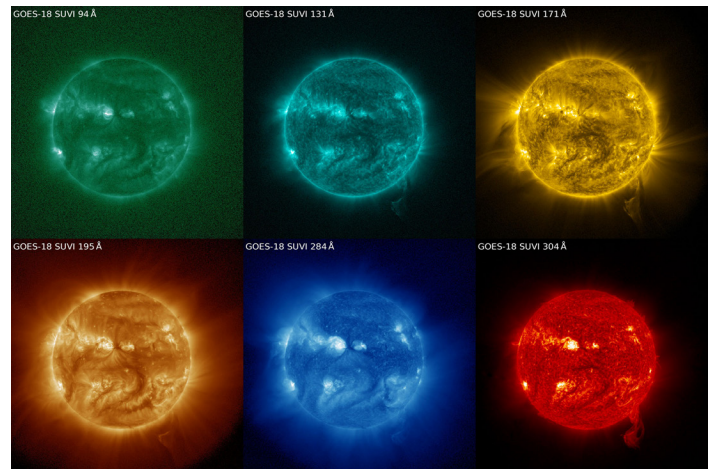


First public GOES-18 EXIS data. Image credit: NOAA/NASA

**NOAA released the first data from the GOES-18 Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS) on July 13, 2022.** [On July 5, EXIS observed a pair of moderate flares that erupted on the sun between 3:30 and 4:30 UTC.](#) The two flares appeared differently near Earth and demonstrate why EXIS observes light from the sun at multiple wavelengths. EXIS, with its multiple

sensors, can observe and quantify the difference between the light from solar flares and help determine in real-time whether flares will affect us on Earth.

**NOAA shared the first imagery from the GOES-18 Solar Ultraviolet Imager (SUVI) on July 19, 2022.** The sun’s 11-year activity cycle is ramping back up, meaning phenomena such as coronal mass ejections (CMEs) and solar flares are increasing in frequency. [GOES-18’s SUVI captured a CME on July 10, 2022.](#) Depending on the size and the trajectory of solar eruptions, the possible effects on near-Earth space and Earth’s magnetosphere can cause geomagnetic storms, which can disrupt power utilities and communication and navigation systems. These storms may also cause radiation damage to orbiting satellites and the International Space Station.



First public GOES-18 SUVI imagery. Image credit: NOAA/NASA

**Five GOES-18 data products were validated at the beta maturity level**, including EXIS, Goddard Magnetometer (GMAG), Space Environment In-Situ Suite (SEISS), SUVI, and GLM level 1b data. Beta-validated products may still contain significant errors and are not optimized for operational use. They are intended to help users gain familiarity with data formats and parameters.

**Several GOES-18 data products were provisionally validated.** The GOES-18 ABI level 1b and cloud and moisture imagery data were provisionally validated on July 28, 2022, followed by the clear sky mask product on Sept. 28. On Sept. 13, SEISS Solar and Galactic Proton Sensor data achieved provisional validation, followed by the GMAG data product on Sept. 16. Provisionally-validated data are ready for operational use, but are not fully validated.

**The first GOES-U end-to-end (ETE) test was conducted on Aug. 29-31, 2022.** ETE tests validate the compatibility between the flight and ground segments in a mission operations context. During ETE #1, the operations team

## GOES-R PROGRAM HIGHLIGHTS (CONTINUED)

located at the NOAA Satellite and Operations Facility in Suitland, Maryland, transmitted operational command sequences to the GOES-U spacecraft and instruments, located at the Lockheed Martin facility in Littleton, Colorado, and validated the responses.

**NOAA received proposals for the Geostationary Ground Sustainment Services (GGSS) contract in July and is evaluating the proposals.** The GGSS contract will extend the life of the GOES-R Series ground system and will improve

its capabilities, reliability and robustness. NOAA plans to award the contract by May 2023.

**In August 2022, the GOES-R ground system completed hardware installation in the Wallops Command and Data Acquisition Station satellite operations zone (SOZ) operational environment and also completed SOZ active directory testing at the factory.** This is part of the effort to replace IBM servers with Dell servers to meet a NOAA IT Security requirement.

## GeoXO PROGRAM HIGHLIGHTS

**On July 26, 2022, NASA awarded GeoXO Spacecraft Phase A Study contracts to Lockheed Martin Space of Littleton, Colorado, and Maxar Space LLC of Palo Alto, California.** [Each company will conduct a ten-month definition-phase study of a geostationary GeoXO spacecraft.](#) These studies will assist the government by developing the spacecraft concept, maturing necessary technologies, and helping define the spacecraft's potential performance, risks, costs, and development schedule.

**On Aug. 16, 2022, NASA posted the request for proposals for GeoXO Imager (GXI) implementation, inviting industry to submit a proposal for implementing NOAA's GXI instrument.** The contract scope includes the tasks and deliverables necessary to design, analyze, develop, fabricate, integrate, test, verify, evaluate, support launch, supply and maintain the instrument ground support equipment, and support mission operations. Proposals were received in late September and are under review. NASA plans to select a development contractor in early 2023.

**The GeoXO System Requirements Review was held Aug. 23-25, 2022.** The Standing Review Board concluded the defined GeoXO requirements and preliminary program plan meet the needs of the mission. This was the first major GeoXO lifecycle review, and mission requirements are now baselined. GeoXO is proceeding toward Department of Commerce Milestone 2, which will formally approve the program and allow GeoXO to move into the

implementation phase of the mission. The Milestone review process will begin in October and conclude with the Dec. 14 Review Board with the Deputy Secretary of Commerce.

**Future GeoXO capabilities to provide better data for weather forecasting and modeling were highlighted during the House Science, Space, and Technology subcommittees on Environment and Space & Aeronautics hearing "Looking Back to Predict the Future: The Next Generation of Weather Satellites"** on Sept. 21, 2022. NESDIS assistant administrator, Steve Volz, NASA director of the Joint Agency Satellite Division, John Gagosian, and Department of Commerce assistant inspector general, Fred Meny, testified during the hearing.

**NOAA, NASA, and the Department of Commerce approved the GeoXO mission emblem and wordmark for public use.**



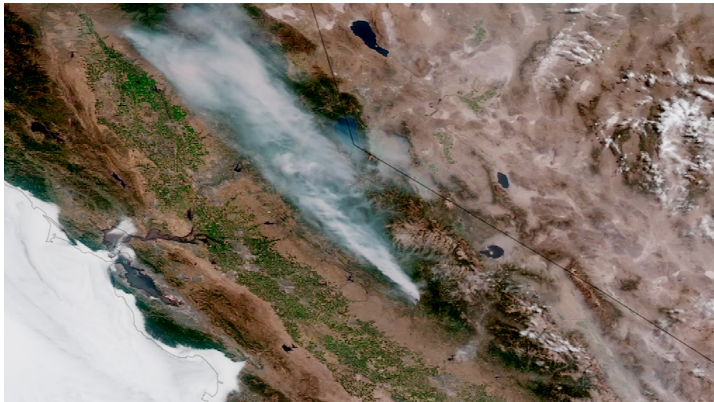
## IMAGERY AND SCIENCE APPLICATIONS

**NOAA/NASA Research Opportunities in Space and Earth Sciences (ROSES) reports from September 2021 through February 2022 were posted in July.** These grants are intended to advance research and practical applications using data derived from instruments aboard U.S. and international geostationary satellites. These include

NOAA's GOES-R Series, the Japan Meteorological Agency's Himawari, and Korea's GEO-KOMPSAT-2A. [These research projects will address ways to improve the generation of data products and/or the utilization of data products in scientific research and operational applications from operational geostationary satellite data.](#)

## IMAGERY AND SCIENCE APPLICATIONS (CONTINUED)

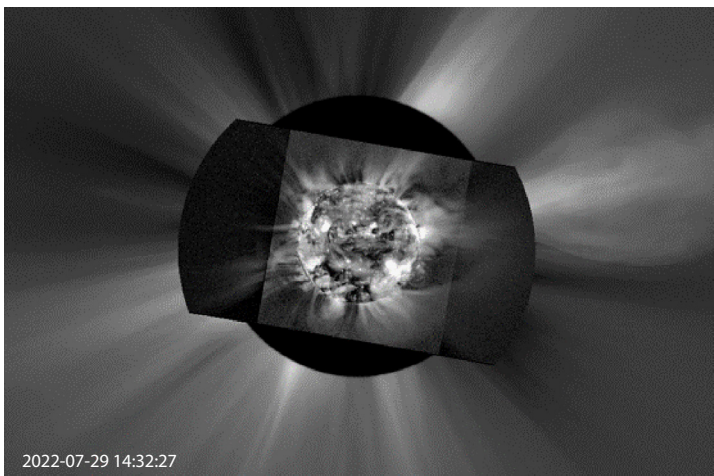
**Strong winds and extremely dry conditions fueled a wildfire that ignited on July 22, 2022, near Yosemite National Park. [At the time, the Oak Fire was the largest active wildfire in California, burning more than 18,800 acres.](#)** NOAA satellites monitored the rapidly spreading fire and provided critical data. GOES-17 measured the Oak Fire's intensity, tracked its spread, and monitored the movement of smoke in near real-time.



GOES-17 GeoColor imagery from July 22, 2022, shows the smoke plume from the Oak Fire. Image credit: NOAA

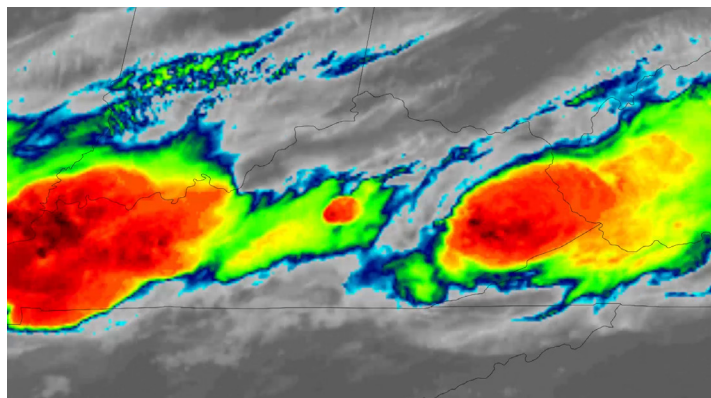
**Special scanning during post-launch testing allowed the GOES-18 SUVI to image the extended solar corona.**

During extended coronal imaging, scientists created a larger field of view for SUVI by taking images from one side of the sun, pointing directly at the sun, and then imaging the other side of the sun. They tiled the images together to view an area of the corona that is normally difficult to see. These SUVI observations reveal how the middle corona influences the solar wind and eruptions from the sun, a finding that could improve space weather forecasting. The GOES-18 SUVI captured a coronal mass ejection on July 29, 2022. The SUVI image, showing the normal SUVI field-of-view and the extended coronal imaging, is overlaid on NASA Large Angle Spectrometric Coronagraph data, which is similar to what we will see from the GOES-U Compact Coronagraph.



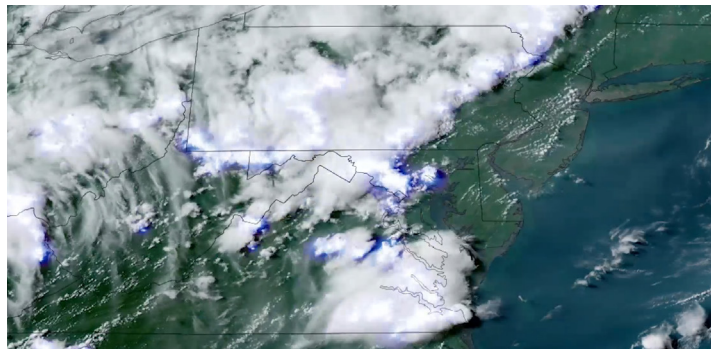
GOES-18 SUVI imagery from July 29, 2022, captured a coronal mass ejection. Image credit: NOAA/NASA

**Hundreds of miles apart but connected by the same weather system, urban St. Louis and rural Appalachia experienced devastating flash flooding in late July. [GOES-16 \(GOES East\) monitored the storms that produced catastrophic flooding, measuring the amount of water vapor in the atmosphere, cloud top temperatures, and lightning activity.](#)**



GOES-18 visible and infrared "sandwich" imagery of the storms that brought flash flooding to Kentucky and Missouri in late July 2022. Image credit: NOAA

**Several incidents of injuries and fatalities from lightning strikes in early August 2022 highlighted the importance of lightning safety and awareness. [GLM can show forecasters areas where the risk of lightning strikes presents a public safety hazard.](#)** GOES-16 and GOES-17 can not only detect current lightning activity, but their data can also help predict the occurrence of lightning in the future. Scientists are using an artificial intelligence (AI) model, ProbSevere LightningCast, to predict where lightning is most likely to occur up to 60 minutes in advance.

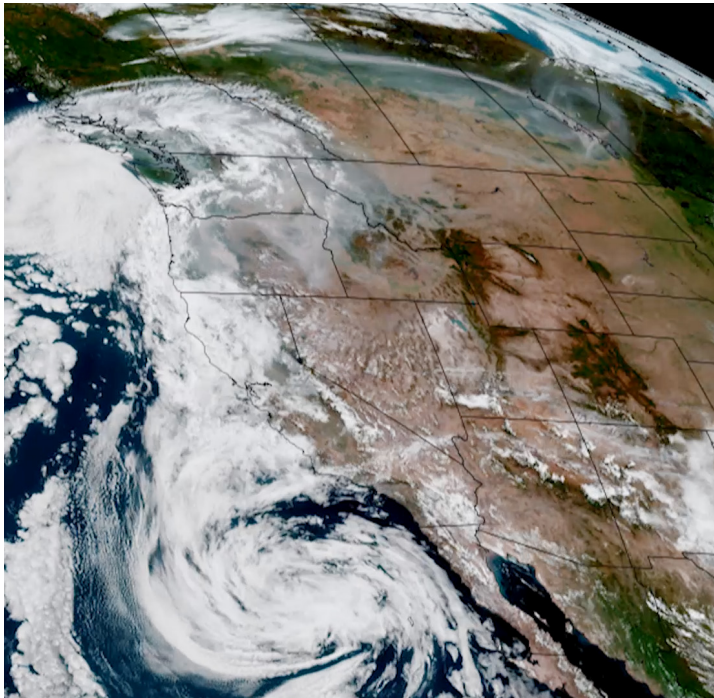


GOES-16 GeoColor and GLM imagery of severe storms on Aug. 4, 2022, that resulted in lightning fatalities in Washington, D.C. Image credit: NOAA

**On Aug. 7, 2022, before the Collective Madison Meeting, the American Meteorological Society (AMS) and NOAA hosted a hybrid short course, *Joint Satellite Lake Data and Products*.** The course provided an opportunity for participants to use readily available tools to process, display, and analyze GOES-R, Joint Polar Satellite System (JPSS), and other environmental satellite data products in lake application scenarios.

## IMAGERY AND SCIENCE APPLICATIONS (CONTINUED)

**NOAA satellites monitored a lot of activity across western North America in September 2022.** [From wildfires to a hurricane to heavy rains in the drought-stricken region, satellite imagery was vital in monitoring these events.](#) Pacific moisture from Hurricane Kay brought heavy rain and flash flooding to areas in California and Arizona. The remnants of Kay provided temporary relief to some communities battling wildfires. Meanwhile, the Northwest continued to experience dry conditions and wildfires.



Hurricane Kay and wildfire smoke are seen in this GOES-17 GeoColor imagery. Image credit: NOAA

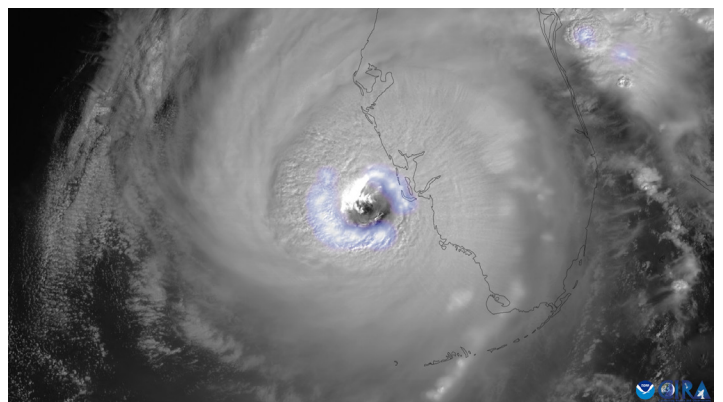
**Hurricane Fiona, the first major (Category 3, 4 or 5) storm of the 2022 Atlantic hurricane season, wreaked havoc from the Caribbean to Canada in September.** [The storm caused devastating flooding and damaged critical infrastructure.](#) On Sept. 18, Fiona strengthened into a hurricane before making landfall along the island's southwestern coast. Fiona knocked out power to the entire island and left most residents without running water. After pounding Bermuda with heavy rain and winds as a Category 4 hurricane on Sept. 23, Fiona headed northward toward eastern Canada. Post-tropical-storm Fiona made landfall in Nova Scotia on Sept. 24 as the most intense cyclone to impact Canada on record. GOES-16 provided

vital information for forecasting Fiona and monitoring its location, movement, and intensity.



Hurricane Fiona, a Category 4 storm, churns northward in the Atlantic on Sept. 21, 2022. Image credit: NOAA/CIRA

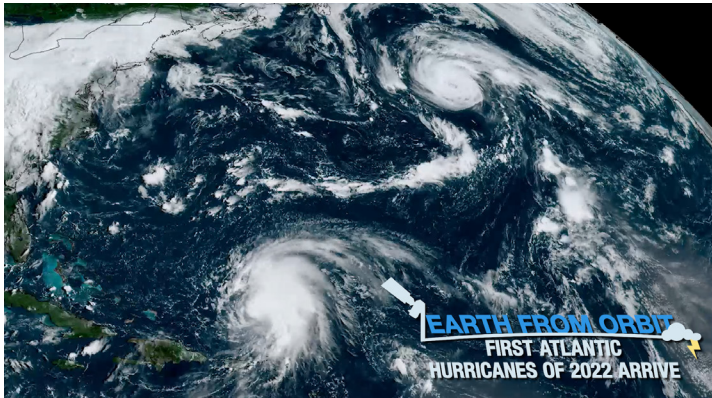
**GOES-16 provided critical data for monitoring Hurricane Ian.** [The National Hurricane Center used 30-second imagery to monitor Ian's progression.](#) The imagery captured the storm in tremendous detail, helping forecasters to pinpoint the center of circulation in real-time, track thunderstorm activity both in the eyewall and in the tornado-producing outer rain bands, and help to determine when landfall would occur. [Ian made landfall near Cayo Costa, Florida, on Sept. 28 as a Category 4 hurricane with maximum sustained winds of 150 mph.](#) Ian caused catastrophic damage in southwestern Florida, particularly in the Fort Meyers area. After weakening to a tropical storm as it moved across the Florida Peninsula, Ian regained hurricane strength when it reached the Atlantic Ocean, before making landfall as a Category 1 hurricane near Georgetown, South Carolina, on Sept. 30.



GOES-16 visible ABI imagery with GLM overlay of Hurricane Ian as it approached landfall in Florida on Sept. 28. Significant lightning is seen in the eyewall. Image credit: NOAA/CIRA

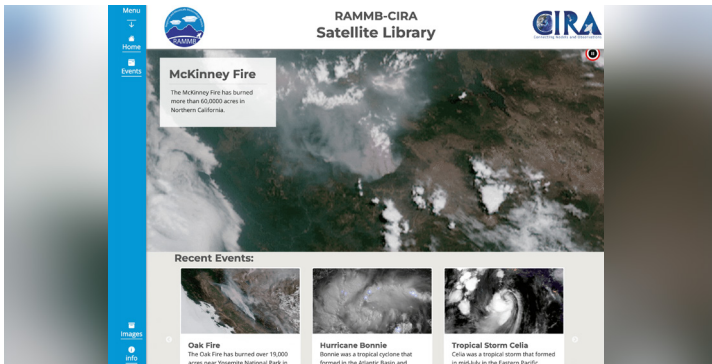
## EDUCATION AND OUTREACH

The GOES-R Program, in partnership with JPSS, NOAA Satellite and Information Service, NASA Goddard Space Flight Center, and the Cooperative Institute for Research in the Atmosphere (CIARA) produced eight “Earth from Orbit” videos this quarter. [Earth from Orbit](#) is a series of short videos that showcase a compelling weather event, environmental hazard, or interesting meteorological phenomenon, as seen by NOAA satellites. A web article with additional information accompanies each video. Topics featured this quarter include wildfires, flash flooding, lightning hazards, the 30<sup>th</sup> anniversary of Hurricane Andrew, and the 2022 hurricane season.



After a slow start to the 2022 Atlantic hurricane season, activity ramped up in September, when the first two hurricanes of the season formed. Image credit: NOAA/NASA/CIARA

In August 2022, CIARA introduced the [Satellite Library](#), a comprehensive collection of satellite imagery of notable weather events and environmental hazards. The [Satellite Library](#) is organized by event type and date and is targeted toward the media and educators.



Satellite Library web interface. Image credit: CIARA/CSU & NOAA

**What Causes Lightning?** Lightning can be a beautiful—and scary—part of Earth’s weather. [A new video and poster from NOAA SciJinks explain why lightning happens.](#)



GOES-R/GeoXO chief of staff Kevin Fryar was profiled as part of NOAA’s “Your Place in Space” initiative, which highlights the many [space-related careers that exist at NOAA](#). Satellite programs require a large team of people with a variety of skills, not just astronauts and rocket scientists. This program aims to make students and educators more aware of the possibilities for space-related careers. The National Space Council asked federal agencies to help educators expose their students to space careers across the federal government and the diversity of professionals in those roles.



Kevin Fryar and NASA colleague Megan Cruz at the broadcast desk during the GOES-T launch. Photo credit: NASA

## CONFERENCES AND EVENTS

On Aug. 8-12, 2022, the American Meteorological Society (AMS) partnered with NOAA to host the **Collective Madison Meeting in Madison, Wisconsin**. The [Collective Madison Meeting](#) included the 25th Conference on Satellite Meteorology, Oceanography, and Climatology joint with the NOAA Satellite Meeting, the 17th Conference on Polar Meteorology and Oceanography, and

the 16th Conference on Cloud Physics/16th Conference on Atmospheric Radiation. Many GOES-R and GeoXO presentations and posters covered capabilities, current status, science applications, user engagement, and plans. Feedback sessions were also held to gather user inputs for future communications services.

## CONFERENCES AND EVENTS (CONTINUED)

**On Aug. 10, 2022, AMS and NOAA broadcasted a special webinar, *GOES-18: NOAA's Newest Eyes on the West*, from the Collective Madison Meeting in Madison, Wisconsin. More than 200 virtual and in-person attendees heard from GOES-R Program scientist, Dan Lindsey, about NOAA's newest**

**satellite, GOES-18. Lindsey showed examples of the data from GOES-18, provided details of planned data flows, and highlighted the capabilities of its instrumentation.**



GLM Science Team Meeting attendees gathered for a photo. Photo credit: NOAA

**The 2022 GLM Science Team Meeting was held Sept. 13-15, 2022, in Huntsville, Alabama, and virtually.**

The meeting highlighted program, instrument, mission operations, and user services updates as well as validation studies, science applications, and operational uses of GLM data.

**The European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) held its 2022 Meteorological Satellite Conference on Sept. 19-23 in Brussels, Belgium.** The theme of this year's conference was "A digital ecosystem for earth observing." [Several GOES-R/GeoXO team members presented at the conference on topics including current status, plans, instrumentation, science applications, and mission operations.](#)

## AWARDS

**On July 12, 2022, NASA recognized several GOES-R and GeoXO individuals with Robert H. Goddard honor awards for their achievements.**

### *Customer Service*

- Mike Grotenhuis
- GOES-R Program Support and IT Services Team
- Goddard Magnetometer Team

### *Engineering:*

- Gabriel Gonzalez

### *Leadership:*

- Jason Hair

### *Quality and Process Improvement:*

- GOES-18 Split Post Launch Test (PLT) Team

## UPCOMING EVENTS

**2022 American Geophysical Union Fall Meeting**

Dec. 12-16, 2022

**CCOR-1 Flight Operations Review**

Dec. 13, 2022

**GeoXO Milestone 2 Review Board**

Dec. 14, 2022

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