



GOES-R

GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE R-SERIES

QUARTERLY NEWSLETTER ■ JULY–SEPTEMBER 2020 ■ ISSUE 31

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

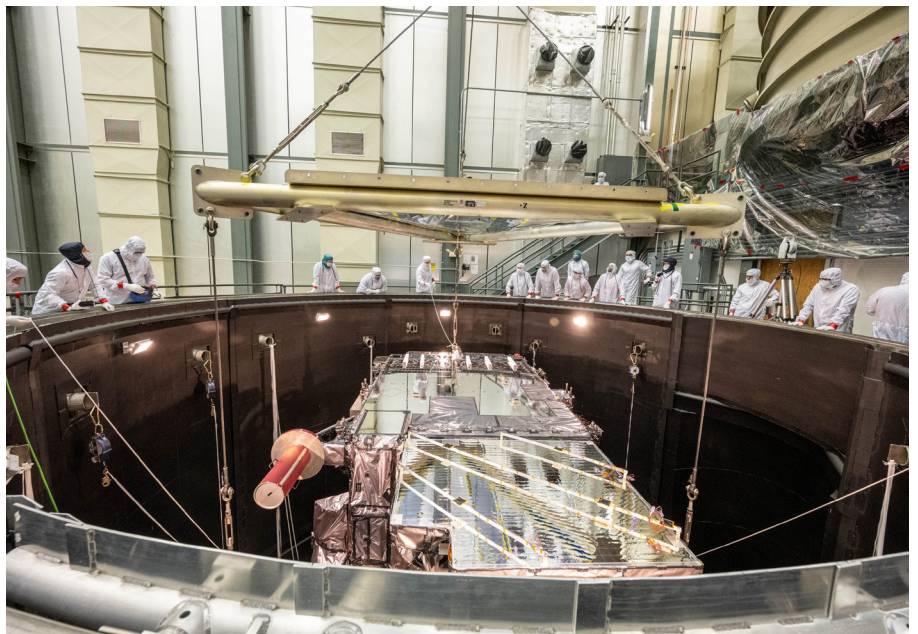


We continue to make outstanding progress while overcoming current challenges as a team. It is great to see GOES-T fully assembled, again, and now in thermal

vacuum testing. The long-planned ground system server replacement is now fully underway. We have enhanced remote access capabilities to keep team members safe while still accomplishing GOES-T testing and launch preparations. We are supporting GOES-16 and 17, which are providing critical service for the unprecedented fire conditions and a record-breaking hurricane season. And we are picking up steam in GEO-XO planning. We are working to determine initial Level 1 requirements by the end of this calendar year and preparing to issue the RFP for the GEO-XO Imager Phase A study contracts in November. We continue to engage users and stakeholders to gather feedback on their needs from future NOAA satellite systems through workshops, surveys, listening sessions, and interviews. We closed out the quarter with a hugely successful Community Meeting on NOAA Satellites, where more than 1,000 people joined us to share their input on what the GEO-XO system could be.

PROGRAM HIGHLIGHTS

GOES-T is fully assembled and integrated and is undergoing a set of rigorous tests to ensure it can withstand the harsh conditions of launch and its orbital environment. The testing is taking place at Lockheed Martin Corporation's Littleton, Colorado, facility, where the spacecraft was built. [GOES-T began thermal vacuum testing in late September](#), after a successful Pre-Environmental Review in August that assessed the spacecraft test activities completed to date and the environmental testing plans. Thermal vacuum testing simulates the extreme temperatures GOES-T will experience during launch and in the space environment once on orbit. After GOES-T is removed from the thermal vacuum chamber, several other tests will follow. The full set of environmental, mechanical, end-to-end, and electromagnetic tests will take approximately ten months to complete. GOES-T is scheduled to launch in December 2021.



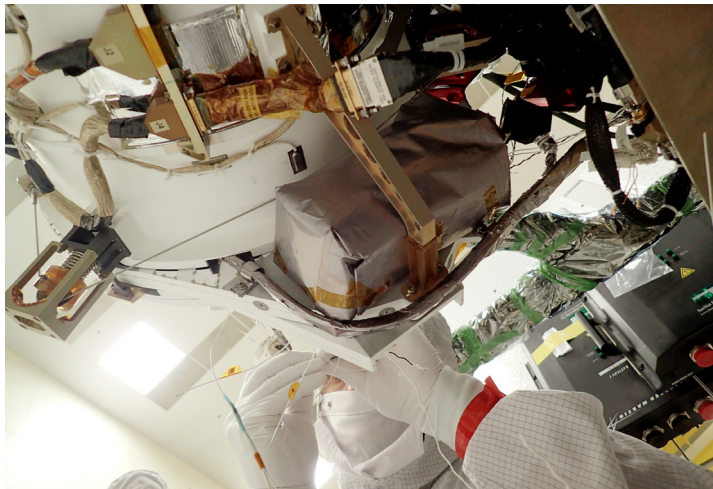
GOES-T is lowered into the thermal vacuum chamber. Credit: Lockheed Martin

DID YOU KNOW?

[2020 is only the second year on record to use the Greek alphabet to name Atlantic tropical cyclones.](#) The original list of 21 names was exhausted on Sept. 18 with Tropical Storm Wilfred. The other time this happened was in 2005 when Zeta was the last storm to be named.

PROGRAM HIGHLIGHTS (CONTINUED)

In July, the Goddard Magnetometer (GMAG) that will fly on GOES-T was delivered to the spacecraft facility after a successful Pre-Shipment Review. The NASA Goddard Space Flight Center team hand-carried the GMAG sensor units to Littleton, Colorado, and they were successfully installed on the GOES-T spacecraft. GMAG was the final instrument delivery and integration for GOES-T.



A technician works to install GMAG on the GOES-T spacecraft. Credit: Lockheed Martin

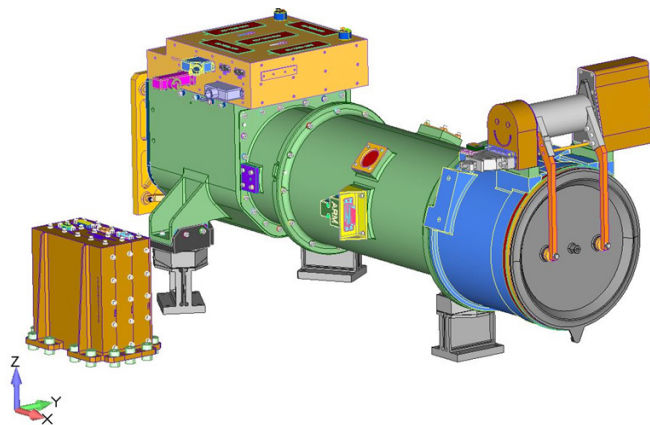
The GOES-16 and GOES-17 Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS) X-ray Sensor data products were fully validated following a Peer Stakeholder-Product Validation Review on Aug. 19. These products are now at full validation maturity and operational.

The first of four planned end-to-end (ETE) validation tests between the GOES-T satellite and the ground system took place Sept. 2-4. ETE tests serve as a validation of the compatibility of flight and ground hardware, software, and communications interfaces in a mission operations context. During the first ETE test, the operations team, located at the NOAA Satellite and Operations Facility in Suitland, Maryland, transmitted operational command sequences to the GOES-T spacecraft and instruments, located at the Lockheed Martin facility in Littleton, Colorado, and validated the responses.

The GOES-R ground segment project held a System Deployment Readiness Review (SDRR) for the IBM server replacement Sept. 14-18. The SDRR confirmed the

maturity of the updated ground system design, completion of factory integration and testing, server replacement deployment and checkout plans, maintenance and training updates, and the procurement and shipment readiness of all material before deployment to the site.

The Naval Research Laboratory completed the Critical Design Review (CDR) for the second Compact Coronagraph (CCOR-2) instrument on Sept. 23. CCOR-2 will fly on NOAA's Space Weather Follow On mission. The CDR confirmed the instrument design meets requirements and is ready to proceed with full-scale fabrication, assembly, integration, and testing.



CCOR model: Credit: Naval Research Laboratory

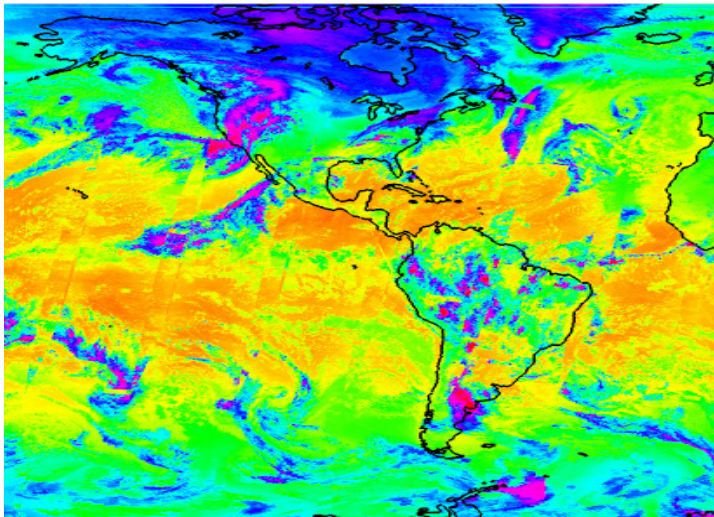
The NOAA Office of Satellite and Product Operations implemented the GOES-17 (GOES-West) ABI mode 3 cooling timeline Aug. 11 – Sept 1. This operation mitigates the number of saturated images resulting from the loop heat pipe (LHP) temperature regulation anomaly. [In this timeline, ABI generates a single full disk once per 15 minutes and generates one mesoscale domain sector \(MDS\) each minute for a six-hour period each day.](#) Alternating MDS domains are collected one time each per two-minute period. The contiguous United States (CONUS) domain is not scanned during the timeline, as those periods are used for cooling. The cooling operation reduces the daily peak focal plane module temperature by ~4 Kelvin, which shortens the period of lost imagery by 30–90 minutes. For most channels and on most days, that means an additional 50–150 MDS images, 2–8 CONUS images, and 2–6 full disk images. This timeline occurs seasonally in operations for four periods each year.

GEO-XO

The Geostationary and Extended Orbits (GEO-XO) program is working toward the determination of initial requirements by the end of the 2020 calendar year and a Mission Concept Review in early 2021. Activities currently underway include future scenario evaluations; user needs

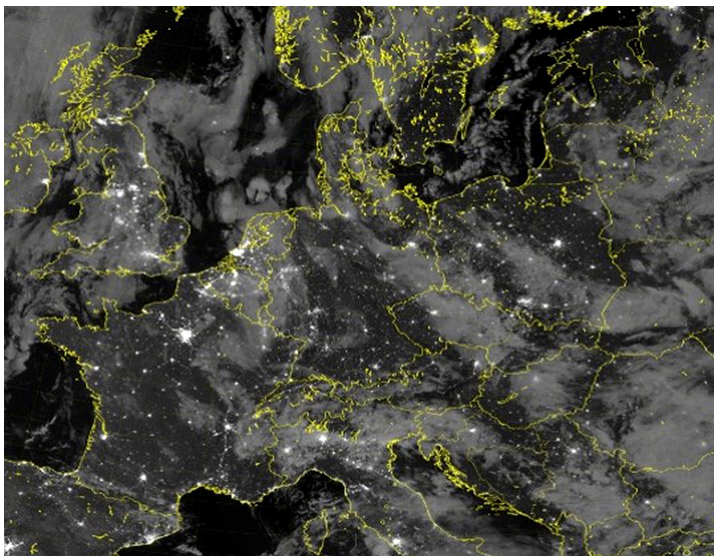
assessments; observational capability studies and value assessments; industry studies of instruments, architecture concepts, and commercial services; and program studies of instruments and constellation options.

Based on the interim results of the GEO-XO constellation trade study, the second phase of the study will focus on the highest-ranked geostationary observations. These include visible/infrared imagery, day/night imagery, infrared sounding, lightning mapping, ocean color imagery, and atmospheric composition measurements.



Infrared sounding would provide atmospheric temperature and moisture observations and contribute to numerical weather prediction. Credit: NOAA

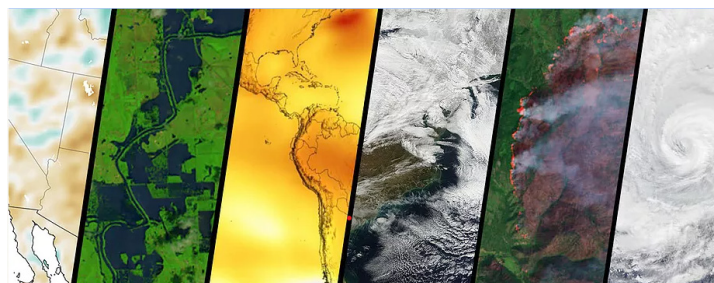
The GEO-XO program is beginning the process to conduct instrument “Phase A” studies. These competitive industry studies will study baseline instrument design, investigate optional improvements, assess performance against specified requirements, demonstrate the development timeline can be met, answer specific trade studies, and advance needed technologies. The GEO-XO imager will be the first instrument to undergo a Phase A study. The program expects to release a request for proposal later this year, with the award of Phase A studies in April 2021.



GEO-XO imager Phase A studies will look at the possibility of a day/night band, which can provide better detection and tracking of low clouds, fog, and smoke as well as improved analysis of tropical cyclones. Credit: NOAA

The GEO-XO user engagement team held three user needs workshops this quarter. These workshops were conducted to gather feedback on NOAA’s environmental satellite capabilities and data products through structured discussion. Each workshop was guided by hypothetical environmental scenarios in the 2030-2050 timeframe to solicit future satellite data needs. Participants included U.S. and international government agencies, academia and research institutions, industry, and other state, local and tribal stakeholders.

The [Weather Stakeholder Virtual Workshop](#) was held July 20-24 and engaged members of the weather community who use NOAA’s remote sensing data in the fields of winter weather, marine weather, tropical weather, arctic monitoring and prediction, severe storms, climate modeling and applications, and routine weather prediction. The [Human Health Stakeholder Virtual Workshop](#), held July 28-31, connected with NOAA data users in the human health community, particularly in the areas of extreme temperature, air quality, diseases, and harmful algal blooms. During the [Agriculture and Land Use Stakeholder Virtual Workshop](#) Sept. 15-18, users in the fields of agriculture and agricultural weather, land prediction and land use, land cover change, and ecosystem and habitat monitoring, assessment, and forecasting highlighted their needs from NOAA satellites. Follow-up interviews and surveys are being conducted to solicit more detailed feedback. These user needs will be used to inform the remote sensing capabilities of NOAA’s next generation of environmental satellites, including the GEO-XO program.



The GEO-XO user needs workshops covered a variety of NOAA satellite data applications. Credit: Cadmus Group, LLC

The 2020 National Weather Association Annual Meeting was held virtually Sept. 13-17. This meeting connected operational meteorologists in weather forecasting, communication, and service. At the meeting, a GEO-XO “listening session” was held, during which NOAA provided information about the upcoming GEO-XO program and asked for feedback from participants about their observational needs. More than 200 people joined the session and approximately 100 of them provided feedback via polls and chat.

The 2020 Community Meeting on NOAA Satellites was held virtually Sept. 29 – Oct. 2. The theme of the meeting was “Informing the Future of NOAA Satellite Observations.” [The Community Meeting brought together more than 1,000 NOAA data users and stakeholders from 250 organizations in 33 countries.](#) At the meeting, NOAA provided updates on strategic objectives, current activities, and plans for the GEO-XO, Low-Earth Orbit (LEO), and Space Weather programs that will operate in 2030 and beyond. Session topics also included NOAA ground system evolution, updates from international meteorological agencies, and findings from a series of user needs workshops. The meeting also featured three user/industry “lean-in” sessions, where users from U.S. and international federal agencies and meteorological associations, private industry, and academia shared their thoughts and ideas on NOAA future satellite planning.

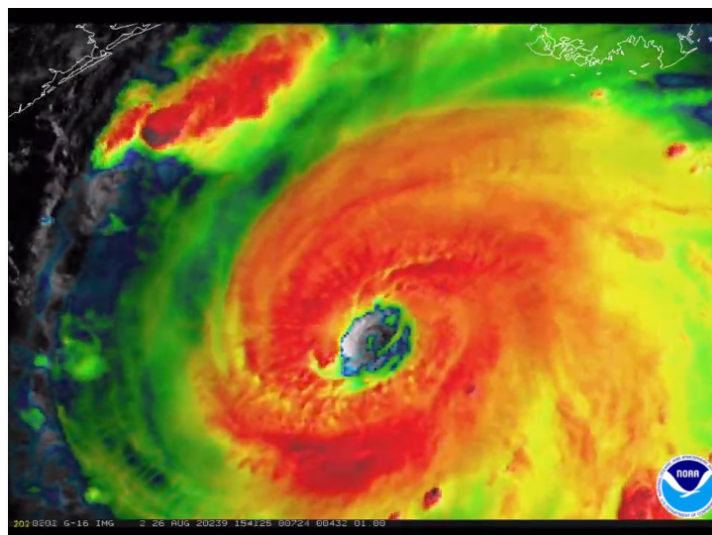


IMAGERY AND SCIENCE APPLICATIONS

This year’s Atlantic hurricane season is one for the record books. As of Sept. 30, there had been 23 named Atlantic storms, exhausting the list of 2020 tropical cyclone names, with additional storms being named using the Greek alphabet. Most of these storms broke records for how early in the hurricane season they formed. By Sept. 30, nine named storms had made landfall in the continental U.S. – Bertha, Cristobal, Fay, Hanna, Isaias, Marco, Laura, Sally, and Beta. This tied the 1916 Atlantic hurricane season for the most named storms to make continental U.S. landfall in an Atlantic hurricane season on record. Atlantic hurricane season officially ends on Nov. 30. Following are some highlights and imagery from the 2020 Atlantic hurricane season so far.

On July 25, Hanna became the first hurricane of the 2020 Atlantic hurricane season. Tropical Storm Hanna formed in the Gulf of Mexico on July 23, becoming the earliest “H” storm on record since the satellite era began in 1966. The previous record was in 2005 when Harvey formed on Aug. 3. GOES-16 (GOES-East) monitored Hanna as it moved toward the Texas coast and made landfall twice in Texas on July 25, first on Padre Island and then in Kennedy County. Hanna brought strong winds, flooding rainfall, an inundating storm surge, and several tornadoes to South Texas. [View GOES-16 animation of Hanna’s voyage to the Texas Coast.](#)

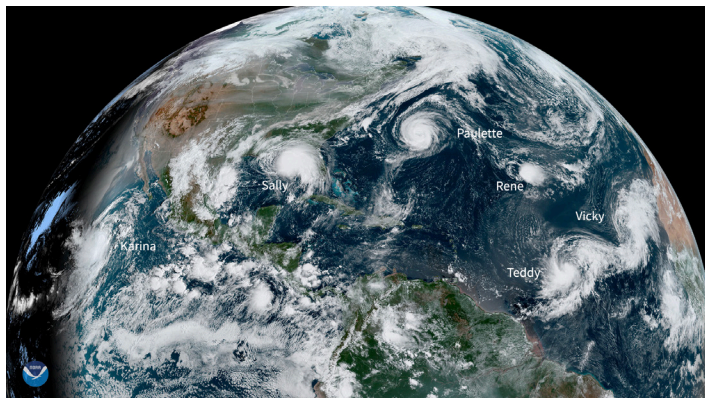
Hurricane Laura made landfall near Cameron, Louisiana, on Aug. 27 as a category 4 storm with 150 mph maximum sustained winds. Laura was the first major hurricane (category 3 or higher) of the 2020 Atlantic season and was the strongest hurricane to make landfall in Louisiana since the Last Island Hurricane of 1856 (also with 150 mph max winds). Laura formed on Aug. 21 as the earliest “L” storm on record and rapidly intensified into a category 4 hurricane. GOES-16 imagery was used by news outlets across the country in their reporting on the hurricane. [View visible animation of Laura’s eye.](#) [See lightning activity during Laura’s rapid intensification.](#)



GOES-16 visible and infrared “sandwich” imagery of Hurricane Laura as it approached the Gulf Coast on Aug. 26. [View animation of this imagery.](#)
Credit: NOAA

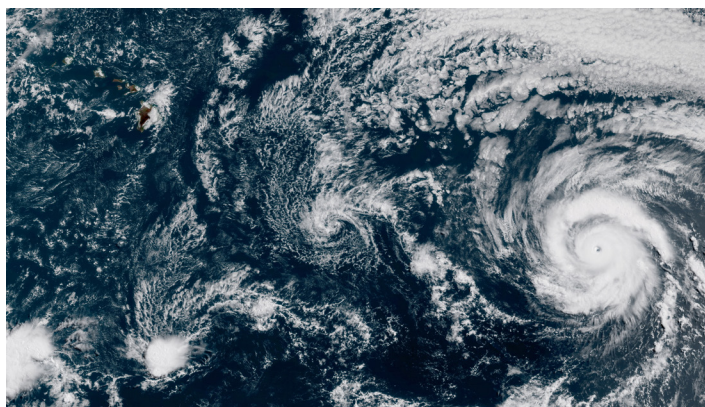
IMAGERY AND SCIENCE APPLICATIONS (CONTINUED)

On Sept. 14, GOES-16 spied six active tropical systems spanning the Atlantic and Pacific Oceans. On that day, there were five named storms—Paulette, Rene, Sally, Teddy, and Vicky—in the Atlantic. [This was the first time since 1971 that there were five named storms in the Atlantic Basin at once.](#) In the eastern Pacific, Karina was seen churning up the waters.



GOES-16 spied, from left, Karina, Sally Paulette, Rene, Teddy and Vicky on Sept. 14. Credit: NOAA

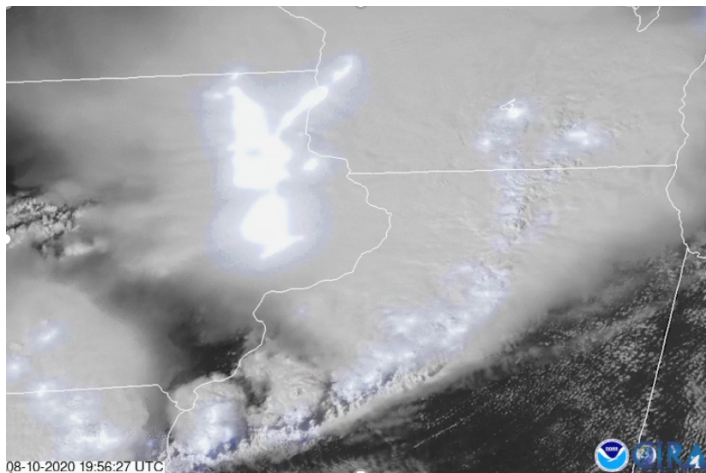
Tropical Storm Douglas strengthened over the eastern North Pacific Ocean on July 22, becoming the first hurricane of the 2020 Eastern Pacific season. Douglas further strengthened to a major hurricane and was a category 4 storm as it entered the Central Pacific on July 24. Douglas passed north of Maui, Oahu and Kauai on July 26 as a category 1 hurricane. [View a time-lapse GOES-17 animation of Douglas' six-day journey across the Pacific.](#)



GOES-17 view of Hurricane Douglas approaching Hawaii. Credit: NOAA

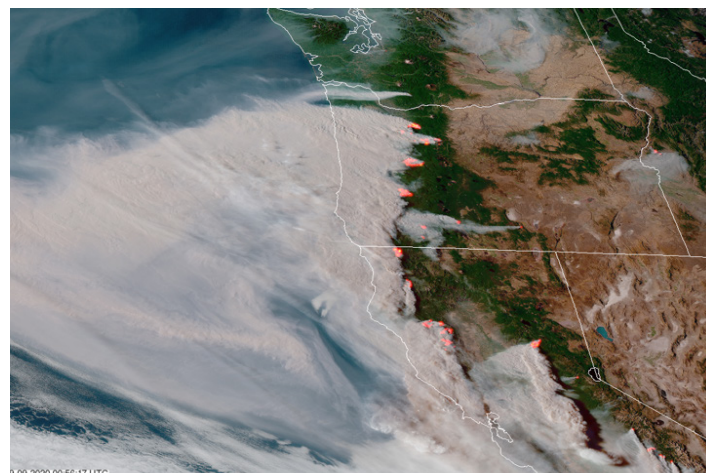
GOES-16 tracked a powerful derecho that swept across the Midwest on Aug. 10. The fast-moving, straight-line windstorm brought widespread damaging wind gusts, including some above 100 mph in Iowa. According to NOAA's Storm Prediction Center, the derecho tracked about 770 miles over 14 hours – from southeast South Dakota into Ohio. National media, including [ABC World News Tonight](#) and [NBC Nightly News](#), used [GOES-16 visible and lightning imagery](#) in their stories on the

storm. [WeatherNation TV interviewed Scott Rudlosky, physical scientist at NESDIS/STAR, about the Geostationary Lightning Mapper and the derecho event on August 12.](#) More information and satellite imagery of the event can be found at the [CIMSS Satellite Blog](#) and [Satellite Liaison Blog](#).



08-10-2020 19:56:27 UTC
GOES-16 visible and lightning imagery of the derecho on August 10. Credit: NOAA/CIRA

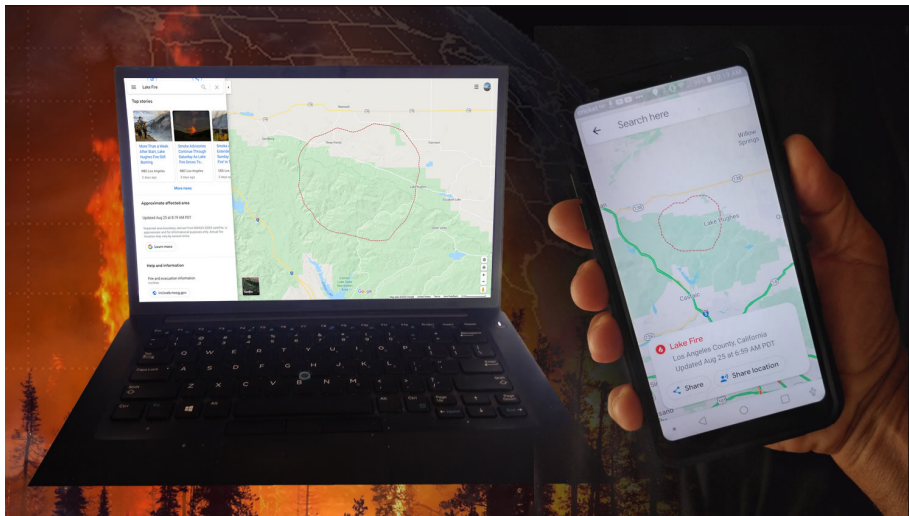
California is experiencing one of the worst wildfire seasons in the state's history. On Aug. 17, nearly 11,000 lightning strikes ignited at least 367 fires across Northern California. Five of the six largest fires in state history have erupted since mid-August. Around the state, 17,000 firefighters are battling nearly two dozen major blazes, and to date, more than 8,300 wildfires have burned over four million acres in California. Oregon has also experienced severe fire activity, with nearly one million acres burned as of Sept. 30. Dry vegetation, record heat, and high winds have fueled wildfire activity across the Western U.S., blanketing the region with smoke and triggering air quality alerts.



09-08-2020 00:56:17 UTC
GOES-17 monitored extreme wildfire activity on the West Coast in this GeoColor and fire temperature imagery from Sept. 8. This imagery shows hot spots and thick smoke plumes from multiple wildfires burning in Oregon and northern California. [View animation of this fire imagery.](#) Credit: NOAA/CIRA

IMAGERY AND SCIENCE APPLICATIONS (CONTINUED)

Amid a particularly severe wildfire season, GOES-16 and GOES-17 data are helping show the public where active wildfires are located so they can avoid dangerous areas. [A new Google feature uses satellite data to guide the mapping of fire boundaries and assist in providing official updates and alerts.](#) The maps are updated hourly to provide the latest available information. The advanced data and information GOES-16 and GOES-17 provide continue to make possible new and innovative ways to help keep us informed and stay safe.



Google's new wildfire-mapping feature, created using GOES data, includes fire boundaries and official updates. Credit: Steve Sabia, GOES-R/NOAA/NASA

On Sept. 15, NOAA's Satellite and Information Service (NESDIS)/GOES-R awarded \$9.6 million in grants 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 satellites, and Korea's GEO-KOMPSAT-2A. [The awardees' proposals will address ways to improve the generation of data products and/or the utilization of data products in scientific research and operational applications from geostationary satellite data.](#) The results of these research awards will improve the utility of NOAA's operational satellite data. NOAA conducted the solicitation with NASA under the NASA Research Opportunities in Space and Earth Sciences (ROSES) program.

EDUCATION AND OUTREACH

On Aug. 19, several NOAA satellite/hurricane experts participated in a series of live and recorded interviews with 68 local, national, international, and global media outlets. [This event focused on the record-breaking Atlantic hurricane season underway, NOAA's mid-season update to the Hurricane Outlook \(released Aug. 6\),](#) and the impact NOAA's advanced satellites have on hurricane forecasting, monitoring, and tracking. Experts discussed what makes this Atlantic hurricane season such an active one, what we should expect from the rest of hurricane season, public safety threats from hurricanes and tropical storms, environmental factors affecting the development of hurricanes, and how NOAA satellites enhance the way we forecast and monitor hurricanes. Along with the media live shots, a new [feature story summarized the record-breaking Atlantic hurricane season through mid-August](#) and highlighted the critical information NOAA satellites provide for forecasting and tracking tropical storms and hurricanes.



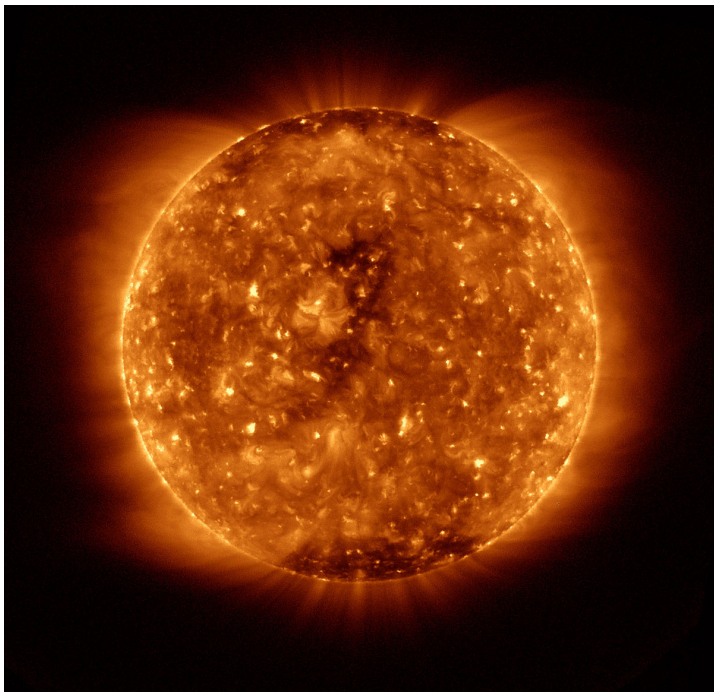
GOES-R chief of staff Kevin Fryar speaks with WTVT-TV in Tampa, Florida, during the hurricanes media event on Aug. 19. Credit: WTVT.



Why does the wind blow? Wind is a part of weather that we've all experienced at one time or another. And whether it's a welcome breeze on a hot day or a destructive gust during a storm, it all starts in the same way: differences in air pressure. [Learn more about what causes wind and how satellites measure it in a new video from NOAA SciJinks.](#)

EDUCATION AND OUTREACH (CONTINUED)

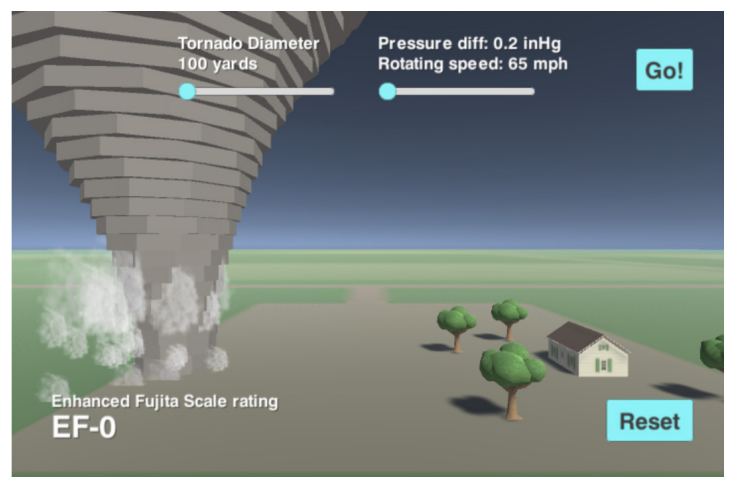
Solar Cycle 25 is here! On Sept. 15, NOAA and NASA announced that the solar minimum between Solar Cycles 24 and 25 – the period when the sun is least active – happened in December 2019. [NOAA's National Weather Service published a web story with the official announcement](#), including predictions for Solar Cycle 25 and information on upcoming satellites that will enhance observations of the Sun. [NASA published a web feature on what it means to be in a new solar cycle](#). The Solar Cycle 25 Prediction Panel, co-chaired by NOAA and NASA, expects Solar Cycle 25 to be a fairly weak cycle, with peak sunspot activity in 2025.



Solar minimum – the period when the sun is least active – as seen by the GOES-16 Solar Ultraviolet Imager on Dec. 15, 2019. Credit: NOAA

NOAA and NASA scientists discussed the announcement and predictions for the upcoming solar cycle during a special episode of [NASA Science Live: Our Next Solar Cycle](#). Also on Sept. 15, NOAA and NASA scientists participated in a [Reddit AMA](#) (Ask Me Anything) and addressed questions about the announcement and the science of the solar cycle. On Sept. 16, solar experts from NOAA, NASA, and the Solar Cycle Prediction Panel participated in a series of interviews with 74 local, national, and international media outlets. [The media live shots event](#) focused on the solar cycle, space weather, and how NASA and NOAA study and monitor the Sun. On Sept. 17, [NOAA Satellites](#) hosted a space-weather-themed #Datapalooza Twitter chat as part of [NOAA DataFest](#). NOAA scientists answered questions from the public about space weather and the solar cycle on Twitter.

A new tornado simulator from NOAA SciJinks lets you see this destructive force in action. [Adjust the width and pressure difference of a tornado and watch what happens!](#)



SciJinks tornado simulator: Credit: SciJinks

AWARDS AND ACCOLADES



A team of NESDIS scientists and engineers was awarded the Gears of Government President's Award in September. [Pam Sullivan, Dan Lindsey, Harry Cikanek, Joseph Pica, and Vanessa Griffin were honored for leadership and excellence in restoring the functionality of NOAA's new GOES-17 weather satellite](#), following a major post-launch anomaly. The team used a coordinated approach with innovative techniques to restore the satellite's ability to observe critical weather conditions, such as severe storms, hurricanes, fires, and volcanic activity, with minimal data loss. This team's response to the crisis restored the value of the nation's \$1 billion investment and provided a vital asset for meeting the National Weather Service's mission. The President's Award is the highest level of distinction within the Gears of Government Awards program, recognizing the exemplars of our nation's civil servants.

AWARDS AND ACCOLADES (CONTINUED)

Several GOES-R Program team members received 2020 NASA Agency Honor Awards. The Agency Honor Awards are approved by the NASA Administrator and presented to the most highly-deserving individuals and groups who have distinguished themselves by making outstanding contributions to the Agency's mission. These are NASA's most prestigious awards.

Distinguished Service Medal

Gene Ungar

Outstanding Public Leadership Medal

Daniel Gall



Exceptional Service Medal

Craig Keeler

Ron Williams

Exceptional Public Service Medal

Michelle Smith

Clem Tiller

MEET THE TEAM



In this issue, meet Jason Hair, GEO-XO Flight Project Manager. Jason is responsible for leading the team to develop the flight elements of the architecture that NOAA selects to become the next-generation geostationary observing system. This includes the study of instrument, observatory, launch, and early orbit operation concepts to determine the GEO-XO instrument and constellation capabilities. He will then lead efforts to procure and oversee the design, build, test, and eventual launch and on-orbit checkout of the GEO-XO system. "I look forward to working with the outstanding GEO-XO team during this very exciting time," said Jason. "It is fulfilling to be a part of formulating and implementing a project with such national importance."

Jason holds a Bachelor of Science degree in mechanical engineering from the University of Washington and a Master of Space Studies from the International Space University in Strasbourg, France. He began his career at NASA as a co-op before starting full-time work as the deployment system lead engineer for the Solar Dynamics Observatory. He transitioned to become

an instrument project manager and earned NASA and Robert H. Goddard Outstanding Leadership Awards for his work developing instruments for the OSIRIS-REx mission. He has expanded his knowledge of instrument systems and their science applications by working on field campaigns to validate the on-orbit performance of several imagers including the Landsat 8 Operational Land Imager and the GOES-16 and GOES-17 Advanced Baseline Imagers.

He and his family recently bought an RV and have been traveling across the country, enjoying the nation's national parks and wildlife and logging hundreds of miles of hiking and backpacking. Jason enjoys most outdoor activities and is a sailor who competes in ocean, regional, and national regattas. He is also a volunteer leader with the Boy Scouts.

UPCOMING EVENTS

GEO-XO Ocean Stakeholder Workshop

November 17-20, 2020

American Geophysical Union Fall Meeting

December 7-11, 2020

American Meteorological Society Annual Meeting

January 10-14, 2021

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